Draft

Commonwealth of the Northern Mariana Islands
Joint Military Training
Environmental Impact Statement/
Overseas Environmental Impact Statement

Cooperating Agencies:
Department of Interior, Office of Insular Affairs
Federal Aviation Administration
International Broadcasting Bureau
National Oceanic and Atmospheric Administration, National Marine Fisheries Service
U.S. Army Corps of Engineers, Honolulu District

April 2015
Draft Environmental Impact Statement/Overseas Environmental Impact Statement for Commonwealth of the Northern Mariana Islands Joint Military Training

Lead Agency: United States Department of the Navy
Cooperating Agencies: Federal Aviation Administration
International Broadcasting Bureau
National Oceanic and Atmospheric Administration, National Marine Fisheries Service
Department of the Interior, Office of Insular Affairs
U.S. Army Corps of Engineers
U.S. Air Force

Title of Proposed Action: Commonwealth of the Northern Mariana Islands Joint Military Training
Affected Jurisdiction: Commonwealth of the Northern Mariana Islands
Designation: Draft Environmental Impact Statement/Overseas Environmental Impact Statement

Abstract

The United States (U.S.) Pacific Command designated the U.S. Marine Corps Forces Pacific as Executive Agent to oversee preparation of this Draft Environmental Impact Statement (EIS)/Overseas EIS (OEIS) in accordance with the National Environmental Policy Act, federal regulations, federal executive orders, and military procedures. The proposed action is to establish a series of live-fire ranges, training courses, and maneuver areas within the Commonwealth of the Northern Mariana Islands (CNMI) to reduce existing joint service training deficiencies and meet the U.S. Pacific Command Service Components’ unit level and combined level military training requirements in the Western Pacific. The proposed action would take place on the islands of Tinian and Pagan within the CNMI. A unit level Range and Training Area on Tinian and combined level Range and Training Area on Pagan would be established to meet the purpose and need. To meet the purpose and need, an alternative must include one Tinian alternative and one Pagan alternative.

This EIS/OEIS analyzed three training action alternatives and a no-action alternative on Tinian. The Tinian action alternatives are primarily distinguished by the number and location of the Battle Area Complexes; the number of engagement zones in the Convoy Course and the course length; and whether or not the International Broadcasting Bureau is relocated (it would no longer operate at its current location under two of the unit level alternatives). The no-action alternative on Tinian would allow for currently authorized training to continue in addition to the previously approved development and use of four live-fire ranges on the island.

In addition, two training action alternatives and a no-action alternative on Pagan were analyzed for this EIS/OEIS. The Pagan action alternatives are primarily distinguished by size of maneuver areas and correspondingly the number and size of the High Hazard Impact Areas. The no-action alternative on Pagan would allow for the continuation of non-live-fire military training exercise (e.g., search and rescue) on the island.

The resources evaluated include geology and soils, water resources, air quality, noise, airspace, land and submerged land use, recreation, terrestrial biology, marine biology, cultural resources, visual resources, transportation, utilities, socioeconomics and environmental justice, hazardous materials and waste, and public health and safety.

Prepared By: U.S. Marine Corps Forces Pacific

Comments on the Draft EIS/OEIS may be submitted electronically at: www.CNMJointMilitaryTrainingEIS.com

Comments may be mailed to:
Naval Facilities Engineering Command, Pacific
Attn: 09PA, Public Affairs Office
258 Makalapa Drive, Suite 100
JBP HH, HI 96860-3134

Public Comments Due by: June 2, 2015 midnight (HST); June 3, 2015 midnight (ChST)

April 2015
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How to Use This Document

The Marine Corps’ goal is to provide a reader-friendly document that presents a thorough, accurate analysis of the current environment, the proposed action, and its potential environmental impacts. The organization of this Draft Environmental Impact Statement/Overseas Environmental Impact Statement, or Draft EIS/OEIS, is shown below. Because of their size, the appendices for this document have been included on a separate CD for ease of handling and reference. For reference purposes, a list of Pagan’s local place names is provided below along with the names currently used in the EIS/OEIS maps. The document is also available online at: www.CNMIJointMilitaryTrainingEIS.com.

<table>
<thead>
<tr>
<th>READER’S GUIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>- How to Use This Document</td>
</tr>
<tr>
<td>- Acronyms and Abbreviations</td>
</tr>
<tr>
<td>- Local Place Names for Pagan</td>
</tr>
<tr>
<td>- Project Location Map</td>
</tr>
<tr>
<td>- Glossary</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXECUTIVE SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>A shortened description of the findings of the entire EIS/OEIS for ease of use.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHAPTER 1</th>
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<tr>
<td>The introduction presents an overview of why and how the United States (U.S.) military trains (Section 1.2) and the purpose and need for the proposed action (Section 1.3), including supporting studies, reports, assessments, statements, and international agreements. It also contains a basic history of the Mariana Islands as well as the Military Lease Areas (Section 1.4) and an explanation of the Environmental Review Process and Public Involvement (Section 1.5).</td>
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<tr>
<th>CHAPTER 2</th>
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<tr>
<td>Chapter 2 describes the proposed action (Section 2.1), training requirements (Section 2.2), and the development of alternatives (Section 2.3). Section 2.4 describes the Tinian Action Alternatives and No-Action Alternative, and Section 2.5 describes the Pagan Action Alternatives and No-Action Alternative. Also included within this section is a description of all alternatives that were considered and eliminated from a detailed analysis for various reasons (Section 2.6). Section 2.7 identifies the preferred alternative and the reasons for its choice are examined.</td>
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<tr>
<th>CHAPTER 3</th>
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<td>The affected environment, or area to be impacted by the alternatives under consideration, is examined in Chapter 3. This section, beginning with Section 3.2 and continuing through Section 3.17, examines 16 resources within the affected environment. These sections provide a baseline for evaluating the effects of the proposed action. These resources include: Geology and Soils, Water Resources, Air Quality, Noise, Airspace, Land and Submerged Land Use, Recreation, Terrestrial Biology, Marine Biology, Cultural Resources, Visual Resources, Transportation, Utilities, Socioeconomics and Environmental Justice, Hazardous Materials and Waste, and Public Health and Safety.</td>
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CHAPTER 4

Environmental consequences are environmental impacts associated with implementing the no-action and proposed action alternatives. This chapter describes the analytical methodology and impact assessment criteria used to develop the analysis of environmental consequences for each of the key study areas identified in Chapter 3. Resource management measures and potential mitigation measures are included within each study area’s proposed action evaluation.

- Environmental Consequences (Sections 4.2 - 4.17)
  - Tinian Alternatives (Unit Level)
  - Pagan Alternatives (Combined Level)
  - No-Action Alternative

- Programmatic Analysis of Future Potential Project Components (Section 4.18)
  - International Broadcasting Bureau Relocation
  - Pagan Dock and Breakwater
  - Section 4(f) Evaluation (Section 4.19)
  - Summary of Impacts (Section 4.20)

CHAPTER 5

Cumulative impacts refer to the combined impacts of the proposed action as well as any present and reasonably foreseeable projects, programs, actions, and activities in the study areas identified in Chapters 3 and 4. This chapter examines the methodology used to provide the cumulative impact assessment, the historical context and current health of the resources, the assessment of potential long-term impacts of present and reasonably foreseeable actions, direct and indirect impacts of the proposed action, and the assessment for mitigation needs.

CHAPTER 6

Chapter 6 provides information regarding considerations required by NEPA and possible conflicts between the proposed action and the objectives of existing land use plans, policies, and controls. Additionally, it examines the irreversible and irrevocable commitment of resources as well as short-term use versus long-term productivity in regards to the proposed action.

CHAPTER 7

The references section provides detailed reference data for each chapter of the EIS/OEIS.

CHAPTER 8

The preparers section provides information on the individuals who prepared the EIS/OEIS.

CHAPTER 9

Chapter 9 contains the list of individuals, agencies, libraries, and interest groups who will be receiving a copy of the EIS/OEIS. This list includes cooperating agencies as well as agencies and groups with an interest in the CNMI.
APPENDICES (located on separate CD as part of this document)

Appendix A – Agency and Elected Official Correspondence
   1. Cooperating Agency Correspondence
   2. Public Notices

Appendix B – Final Scoping Summary Report

Appendix C – Unconstrained Training Concept for Tinian and Pagan

Appendix D – Best Management Practices

Appendix E – Applicable Federal and Local Regulations

Appendix F – Geology and Soils Technical Memo

Appendix G – Air Quality Technical Memo

Appendix H – Noise Study

Appendix I – Airspace Technical Memo

Appendix J – Amphibious Beach Landing Site Engineering and Coastal Processes Analyses
   1. Tinian AAV Landing Site Engineering Investigations
   2. Engineering Analysis Evaluation
   3. Coastal Processes Report

Appendix K – Summary of Historical Land Use Agreements between the U.S. and the CNMI

Appendix L – Biological Resources Supporting Documentation
   1. Terrestrial and Marine Species List
   2. Terrestrial and Marine Species Profiles
   3. Terrestrial Biological Surveys on Tinian
   4. Wetland Survey Report
   5. Biosecurity

Appendix M – Marine Biology Technical Memo and Survey Reports
   1. Marine Biological Resources Technical Memo
   2. Coral Marine Resources Survey Report
   4. Sea Turtle Marine Resources Survey Report

Appendix N – Cultural Resources Technical Memo

Appendix O – Transportation Study

Appendix P – Utilities Study

Appendix Q – Socioeconomic Impact Assessment Study

Appendix R – Hazardous Materials and Waste Technical Memo

Appendix S – Draft Engineering Drawings of Airport Layout Plan
## Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>%</td>
<td>percent</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
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<tr>
<td>CIP</td>
<td>Capital Improvements Projects Program Office</td>
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<tr>
<td>CJMT</td>
<td>Commonwealth of the Northern Mariana Islands Joint Military Training</td>
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<tr>
<td>CNMI</td>
<td>Commonwealth of the Northern Mariana Islands</td>
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<tr>
<td>DDT</td>
<td>dichlorodiphenyltrichloroethane</td>
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<tr>
<td>Divert</td>
<td>Divert Activities and Exercises</td>
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<tr>
<td>DoN</td>
<td>Department of the Navy</td>
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<tr>
<td>EA</td>
<td>Environmental Assessment</td>
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<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
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<tr>
<td>MSL</td>
<td>mean sea level</td>
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<tr>
<td>NAVFAC</td>
<td>Naval Facilities Engineering Command</td>
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<tr>
<td>n.d.</td>
<td>no date</td>
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<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<tr>
<td>NMC-CREES</td>
<td>Northern Marianas College Cooperative Research, Extension and Education Service</td>
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<tr>
<td>OEA</td>
<td>Overseas EA</td>
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<td>OEIS</td>
<td>Overseas EIS</td>
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<tr>
<td>QDR</td>
<td>Quadrennial Defense Review</td>
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<tr>
<td>R</td>
<td>Restricted Airspace</td>
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<tr>
<td>RTA</td>
<td>Range and Training Area</td>
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<tr>
<td>U.S.</td>
<td>United States</td>
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<tr>
<td>W</td>
<td>Warning Area</td>
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A project location map is shown on the next page. For reference purposes, a list of local place names for Pagan is provided below along with the names currently used for maps in the EIS/OEIS.

### Local Place Names for Pagan

<table>
<thead>
<tr>
<th>Map Place Name</th>
<th>Local Place Name</th>
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<tbody>
<tr>
<td>Blue Beach</td>
<td>Apan</td>
</tr>
<tr>
<td>Gold Beach</td>
<td>Dikiki (or Unai Dikidiki)</td>
</tr>
<tr>
<td>Green Beach</td>
<td>Palapala</td>
</tr>
<tr>
<td>Lower Lake</td>
<td>Laguna Sanhiyon</td>
</tr>
<tr>
<td>North Beach</td>
<td>Tarague</td>
</tr>
<tr>
<td>Red Beach</td>
<td>Shomshon</td>
</tr>
<tr>
<td>South Beach</td>
<td>Regussa</td>
</tr>
<tr>
<td>South Point</td>
<td>Minami Saki</td>
</tr>
<tr>
<td>Upper Lake</td>
<td>Laguna Sanhalom</td>
</tr>
</tbody>
</table>
31st Marine Expeditionary Unit Training: A combat element with ground, aviation, and logistics units (approximately 2,200 personnel) which train simultaneously. For example, some unit personnel arrive at the training location and come ashore via Amphibious Assault Vehicles, Landing Craft Air Cushion, and other types of vessels. Other personnel parachute into the training area from rotary- and tilt-wing aircraft. The units’ associated equipment arrives via ship-to-shore vessels and/or aircraft.

A-weighted Scale: The human ear cannot perceive all pitches or frequencies of sounds equally. To mimic the human ear’s sensitivity and perception of different frequencies, sound is measured by applying an A-weighted scale. Sound measurement uses decibels and the A-weighted scale filters out very low and very high-pitched sounds. The A-weighted scale is used to evaluate noise generated by vehicles, aircraft, and small arms firing (up to .50-caliber).

Above Ground Level: Typically applied to aircraft operations, this is a measurement of the altitude (or height) above the ground surface expressed in feet (or meters).

Airfield: The area comprising the runways and taxiways.

Airport: Includes runways, taxiways, and support facilities including ground maintenance and control tower. Airports may be public, private or military operated.

Airspace: Airspace is a three-dimensional configured resource managed and controlled by the Federal Aviation Administration in the U.S. and its territories. There are four types—controlled, uncontrolled, special use, and other airspace.

Airspace, Controlled: This is a generic term that includes the different classifications of airspace and defined dimensions within which air traffic control service is provided according to the airspace classification. Controlled airspace is divided into five classes, dependent upon location, use, and degree of control: Classes A, B, C, D, and E.

Airspace, Special Use: This is an airspace of defined dimensions in which certain activities must be confined or where limitations may be imposed on aircraft operations not part of those identified activities. Special use airspace usually consists of prohibited, restricted, warning, military operation, alert, and controlled firing areas.

Airspace, Uncontrolled: This is airspace not otherwise designated as Class A, B, C, D, or E and without air traffic control authority or responsibility.

Affected Environment: A description of the existing environment to be affected by the proposed action (40 Code of Federal Regulations 1502.15).

Alternative: Options to meet the purpose and need of the proposed action, which is to establish a unit level Range and Training Area on Tinian and combined level Range and Training Area on Pagan.

Alternative, No-Action: The alternative describing the conditions that would be found if the proposed action were not implemented.
Alternative, Preferred Alternative: The alternative that the lead agency prefers, if such an alternative exists. The preferred alternative may be based on the lead agency’s needs, mission requirements, legislative or executive direction, and other factors.

Alternative, Reasonable: Reasonable alternatives are those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the lead agency.

Amphibious Landing Beaches: Beaches used for vehicles that operate in water and on land. They also support combat swimmer training and inflatable boat landings.

Area of Potential Effect: The geographic area(s) within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

Baseline: The basis of environmental conditions against which impacts of the proposed action and its alternatives can be compared.

Base Load Power: The minimum power load or the power generation capacity needed to meet the continuous demand for the system, 24 hours a day, and 7 days a week.

Battalion, Marine Corps: A team of approximately 1,300 personnel, consisting of an infantry attachment (960 personnel) and landing team attachment (approximately 340 personnel). The infantry battalion includes three rifle companies and one weapons company. The landing team attachments include an artillery battery, a light anti-armor reconnaissance platoon, an amphibious assault vehicle platoon, a combat engineer platoon, a tank platoon, and a reconnaissance platoon.

Bilateral Training: Training that occurs when U.S. and allied forces train together.

Biosecurity: Measures taken to avoid, minimize, and mitigate the inadvertent introduction of invasive plant or animal species.

Bivouac: A temporary encampment under little or no shelter.

Caldera: A volcanic crater formed by the collapse of the central part of a volcano or by explosions of extraordinary strength.

C-weighted Scale: The human ear cannot perceive all pitches or frequencies of sounds equally. To mimic the human ear’s sensitivity and perception of different frequencies, sound is adjusted or weighted. Noise measurements use decibels and the C-weighted scale to filter out low pitched, impulsive sounds. The C-weighted scale is used to measure percussive noise and vibrations generated by explosive charges and large-caliber weapons (over .50-caliber).

Cetacean: A mammal which lives in the ocean, such as whales, dolphins, and porpoises.

Chaff: A fiber used as a countermeasure for radar. An aircraft spreads a cloud of small, thin pieces of aluminum, metallized glass fiber, or plastic, which either appears as a cluster of primary targets on radar screens or swamps the screen with multiple returns.

Coastal Zone: For this analysis, the coastal zone extends from the high tide mark on the land to the edge of the continental shelf, to a water depth of less than 538 feet (164 meters). The coastal zone
supports 90% of all marine species and is the area where most of the larger commercial vessels fish. This differs from the “coastal zone” defined in the Federal Coastal Zone Management Act where the “coastal zone” typically extends from the low tide mark to several hundred feet into the ocean.

**Cooperating Agency:** A federal agency, other than the lead agency, that has legal jurisdiction or special expertise to comment on the proposed action of a lead agency.

**Council on Environmental Quality:** The Council on Environmental Quality was established within the Executive Office of the President by Congress as part of the National Environmental Policy Act. Consisting of three members appointed by the President, the Council coordinates federal environmental efforts in the U.S. and works closely with the White House and federal agencies developing environmental and energy policies and initiatives.

**Critical Habitat:** Specific areas within the geographical region occupied by the species at the time of listing (under the Endangered Species Act), if they contain physical or biological features essential to conservation. Those features may require special management considerations or protection; and specific areas outside the geographical region occupied by the species if the agency (U.S. Fish and Wildlife Service or National Marine Fisheries Service) determines the area itself is essential for conservation.

**Culvert:** A channel or tunnel that allows water to flow under a road, trail, or similar obstruction.

**Cumulative Impact:** The incremental environmental impact or effect of the proposed action, together with impacts of past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 Code of Federal Regulations 1508.7).

**Danger Zone:** A Danger Zone is a water area(s) used for especially hazardous operations. Consistent with military safety requirements, danger zones are open to the public only when hazards are minimized to assure the safety of the non-participating public.

**Day-Night Average Sound Level:** A measure of the average annual noise levels over a 24-hour period.

**Eco-tourism:** Travel to areas of natural or ecological interest where minimal impact to the environment is a primary concern.

**Endangered Species:** Defined under the Endangered Species Act as “any species which is in danger of extinction throughout all or a significant portion of its range.”

**Endangered Species Act:** Passed by Congress in 1973, the Endangered Species Act recognized the rich natural heritage of “esthetic, ecological, educational, recreational, and scientific value to our Nation and its people.” The Act protects and recovers imperiled species and the ecosystems upon which they depend and is administered by the U.S. Fish and Wildlife Service and the Commerce Department’s National Marine Fisheries Service.

**Endemic:** Belonging or native to a particular area, place, or people.

**Environmental Consequences:** The short-term/long-term, direct/indirect impacts of the proposed action and alternatives to the environment.
Executive Agent: The agency acting on behalf of the action proponent or lead agency.

Expeditionary Airfield: A runway, typically of bare ground, gravel, or grass, in a remote location used by aircraft to deliver and transport personnel, equipment, and supplies.

Extirpate: To eliminate a population completely from a specific location.

Flares: These are pyrotechnics that produce a brilliant light or intense heat without an explosion. Flares are used for signaling, illumination, or defensive countermeasures. Flares may be ground, projectile, or parachute-suspended pyrotechnics to provide maximum illumination time over a large area. Projectile pyrotechnics may be dropped from aircraft, fired from rocket or artillery, or deployed by flare guns or handheld percussive tubes.

Geographic Information System: A computer application used to store, view, and analyze geographical data. It is a tool that assists decision making by providing a visual depiction of complex data, customized for the situation and circumstances associated with the decision.

Global Positioning System: A small-computerized device that uses satellite triangulation to provide a precise location on the surface of the earth.

Hazardous Materials: Substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. In general, hazardous materials include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or the environment when released into the environment.

Hazardous Waste: Substances defined as hazardous and regulated under the Resource Conservation and Recovery Act. They are defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes that either have one or more of the hazardous characteristics of ignitability, corrosivity, toxicity, or reactivity, or are listed as a hazardous waste under 40 Code of Federal Regulations Part 261.

High Hazard Impact Area: An area into which live and inert munitions and explosives are thrown, shot or dropped. The area is designed and placed to minimize interaction and provide for safe separation of hazardous activities. These activities include ground-based military personnel using small and large arms, aircraft employing weapons from the air to the ground, and ships delivering munitions from the sea to the ground surface.

Impact: To have an effect on someone or something. Impacts can be adverse/beneficial, direct/indirect, short/long-term, or significant/insignificant.

Impact, Adverse: Negative, abnormal, or harmful impacts.

Impact, Beneficial: Positive or added impacts.

Impact, Direct: An effect caused by the proposed action that occurs at the same time and place.

Impact, Indirect: Impacts that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.
Impact, Less than Significant: Refers to the severity of the effect. Impacts are less than significant when they have not exceeded an identified threshold of significance. Criteria used to determine the threshold of significance varies by resource while considering the context and intensity.

Impact, Long-Term: Impacts that occur during, continue after the completion of an action, and may take the form of delayed changes or changes resulting from the cumulative effects of many individual actions.

Impact, Short-Term: Effects that occur temporarily, typically during the time of the action causing the impact.

Impact, Significant: Refers to the severity of the effect. Typically, a threshold is identified so that if it is exceeded then a significant impact is likely to occur. Criteria used to determine the threshold of significance varies by resource.

Inert Munitions: Ammunition that does not contain explosive material, sometimes referred to as dummy munitions.

International Broadcasting Bureau: An independent U.S. federal agency that supports day-to-day operations of the Voice of America and provides transmission and technical support to non-military U.S. broadcasting services. The International Broadcasting Bureau is within the Military Lease Area of Tinian and is a Cooperating Agency for this EIS/OEIS.

Instrument Flight Rules: The pilot relies on instruments to navigate in accordance with a set of Federal Aviation Administration rules. The pilot has minimal or no reliance on visual information.

Isthmus: A narrow piece of land that connects two larger land areas.

Jeopardy: Under the Endangered Species Act, jeopardy occurs when an action is reasonably expected, directly or indirectly, to diminish a species’ numbers, reproduction, or distribution so that the likelihood of survival and recovery in the wild is appreciably reduced.

Joint Services Training: Military training involving multiple units from various Service Components jointly conducting integrated training. For example, a forward-placed Marine Corps squadron calling in an Air Force fighter jet to an “enemy” target.

Landing Zone: An unimproved area (e.g., lava, bare ground, or grass) that can accommodate helicopter and MV-22 landings and take-offs. Used for incoming and outgoing personnel and equipment.


Liquefaction: When loose sand and silt is saturated or partially saturated with water and shaken by an earthquake it behaves like a liquid. The soil can lose its ability to support structures, flow down gentle slopes, and come to the ground surface to form sand boils.

Live-Fire Training: Training with ammunition and devices that contain explosive material.

Maneuver Area: Land used for ground-based personnel and vehicles moving across the landscape to patrol, establish defensive positions, and fire weapons.
**Marine Mammal Protection Act:** Enacted on 21 October 1972, the Marine Mammal Protection Act prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens in the high seas, and the importance of marine mammals and marine mammal products to the U.S.

**Maximum Sound Level:** This is the highest A-weighted sound level for aircraft measured during a single event in which the sound level changes value as time passes (e.g., an aircraft overflight). The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleeping, or other common activities.

**Mean Sea Level:** Typically applicable to aircraft operations and special use airspace configurations. It is the altitude (or height) expressed in feet (or meters) above the average sea level.

**Military Lease Area:** This is the northern two-thirds of Tinian that the U.S. military leases. It includes the Lease Back Area where local residents are allowed to perform agricultural activities and where military training is conducted in the Exclusive Military Use Area.

**Military Operations Area:** This is a special use airspace unit established to safely separate military aircraft training activities from non-participating military and civil aircraft operations. This type of airspace is generally established over land and offshore, but not beyond the U.S. 12-nautical mile (about 22-kilometer) territorial limit.

**Mitigation:** A measure taken to minimize, avoid, rectify, reduce, or compensate for the severity of an impact.

**Multinational Training:** Training that occurs when U.S. forces train with two or more allied forces.

**Munitions:** Military weapons, ammunition, equipment, and stores.

**Munitions and Explosives of Concern:** These are specific categories of military munitions such as unexploded ordnance, discarded munitions, or munitions constituents that may pose unique explosive safety risks.

**National Ambient Air Quality Standards:** Established by the U.S. Environmental Protection Agency, specific standards were developed for criteria pollutants that represent the maximum levels of pollutant concentrations that are considered safe, with an adequate margin of safety, to protect public health and safety.

**Nautical Mile:** Unit of measure in surface water that follows the earth’s circumference. It is slightly longer than a land measured mile.

**National Environmental Policy Act:** 42 United States Code 4321, as amended, passed by Congress in 1969. The Act established a national policy designed to encourage consideration of the influences of human activities, such as population growth, high-density urbanization, or industrial development, on the natural environment. The National Environmental Policy Act procedures require that environmental information be made available to the public and decision-makers before decisions are made. Information contained in National Environmental Policy Act documents must focus on the relevant issues in order to facilitate the decision-making process.

**National Historic Landmark:** These are places that “possess exceptional value or quality in illustrating and interpreting the heritage of the United States” and include battlefields, architectural or engineering masterpieces, ruins, and historic towns and communities.
National Historic Preservation Act: The National Historic Preservation Act of 1966, as amended, established a program for the preservation of historic properties throughout the United States.

Notice of Intent: An announcement made by an agency, and published in the Federal Register, notifying the public of its intent to prepare statement document such as an environmental impact statement. The notice includes a summary of the proposed action and the lead agency’s point of contact.

Overseas Environmental Impact Statement: An Overseas Environmental Impact Statement is a National Environmental Policy Act document that is required (per Executive Order 12114) when a proposed action has the potential to significantly harm the environment outside the geographical borders of the U.S. and its territories and possessions.

Ordnance: Any item carried by an aircraft for dropping or firing, including but not limited to, live or inert bombs, ammunition, air-to-air missiles, chaff, and flares.

Peak Sound Level: This is the instantaneous, maximum value reached by the sound pressure produced by percussive sources such as small- and large-caliber weapons.

Pelagic: Relating to, or living in, the sea far from the shore.

Proposed Action: A plan that contains appropriate details of what is being proposed to meet the agency’s purpose and need. Sufficient details must be presented so that reasonable alternatives are developed and the consequent environmental impacts analyzed (40 Code of Federal Regulations 1508.23).

Quadrennial Defense Review: A congressionally mandated description of the national defense strategy updated every four years by the Secretary of the Department of Defense. The review describes force structure goals and modernization plans based on potential military threats.

Range: Areas controlled and restricted for firing live ammunition from direct fire or line-of-sight weapons at targets. Typically, a range has a left and right boundary that extends from the firing line forward to just past the last target array. Training ranges are normally reserved and equipped for practice and qualification in targeted weapons delivery and shooting. Typically, a range comprises a control tower/observation post, lanes or pits to the targets, and cleared or graded areas to allow sighting of the target. An automated range is equipped to systematically control the targets, score the target hits, and provide the user a digital, print, or audio/visual after-action report for evaluation purposes.

Range Complex: A geographically integrated set of ranges, maneuver areas, and associated special use airspace, designated and equipped with a command and control system and supporting infrastructure for freedom of movement and practice in live-fire and inert ordnance use against scored and/or tactical targets.

Range and Training Area: A collective term referring to a group of (1) ranges, (2) training courses and maneuver areas, and (3) surface danger zones, warning areas, restricted airspace, and high hazard impact areas.

Record of Decision: After issuance of the Final Environmental Impact Statement/Overseas Environmental Impact Statement and the 30-day waiting period, a Record of Decision will be released. This is a concise public document that records a federal agency’s decision(s) concerning a proposed action. The Record of
Decision identifies the alternatives considered in reaching the decision, the environmentally preferable alternative(s), factors balanced by the agency in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not. A formal notice is published in the Federal Register by the U.S. Environmental Protection Agency and advertisements are placed in local newspapers to announce that the Record of Decision was made.

**Relationship of Short-Term Uses and Long-Term Productivity:** The balance or trade-off between short-term uses and long-term productivity of resources need to be defined in relation to the proposed action in question (40 Code of Federal Regulations 1502.16).

**Restricted Area:** A special use airspace unit established over ranges and training areas within which the flight of aircraft, while not wholly prohibited, is subject to constraints. Restricted areas denote the existence of unusual hazards to aircraft, often invisible, such as artillery firing, personnel rocket and missile employment, and air-to-ground munitions operations.

A Restricted Area can also refer to a defined water area for the purpose of prohibiting or limiting public access to the area. Restricted areas generally provide security for government property and/or protection for the public from the risks of damage or injury arising from the government’s use of that area.

**Seabees:** Seabees are members of the United States Naval Mobile Construction Battalion. The name Seabee comes from the abbreviation for Construction Battalion, "CB."

**Significance:** Requires consideration of both context and intensity (40 Code of Federal Regulations 1508.27). Context means the significance of an action must be analyzed and its current and proposed short-and long-term effects on the whole of a given resource (e.g.-affected region). Intensity refers to the severity of the effect.

**Scoping:** An early and open process for determining the scope of issues to be addressed in an environmental impact statement and for identifying significant issues related to a proposed action. During scoping, input is solicited from affected agencies as well as the interested public.

**Sound Exposure Level:** This metric accounts for both the maximum sound level and the length of time a sound lasts. Sound Exposure Level does not directly represent the sound level heard at any given time but it provides a measure of the total sound exposure for an entire event averaged over 1 second.

**Submerged Lands:** The area extending from the shoreline, out into the ocean for 3 nautical miles (6 kilometers).

**Surface Danger Zone:** Designated areas associated with land-based, weapons ranges. These zones are three-dimensional and delineate portions of the earth’s surface and the air above in which personnel and/or equipment may be endangered by ground weapons firing or detonation activities because of ricochet or fragmentation hazards. The size and configuration of surface danger zones are dependent on the performance characteristics of a given weapons system, training requirements, range configuration, geographical location, and environmental conditions.

**Take:** The Endangered Species Act makes it unlawful for a person to take a listed animal without a permit. Take is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct.” Through regulations, the term “harm” is defined as “an act
which actually kills or injures wildlife. Such an act may include significant habitat modification or
degradation where it actually kills or injures wildlife by significantly impairing essential behavioral
patterns, including breeding, feeding, or sheltering.” Listed plants are not protected from take, although
it is illegal to collect or maliciously harm them on federal land. Protection from commercial trade and
the effects of federal actions do apply to plants.

**Threatened Species:** According to the Endangered Species Act, a threatened species is one that is likely
to become endangered within the foreseeable future throughout all, or a significant portion of its range.

**Traditional/Cultural Resource:** Cultural and traditional resources are any prehistoric or historic district,
site or building, structure, or object considered important to a culture, subculture, community, or
population for scientific, traditional, religious or other purposes.

**Training:** The process by which someone is taught the particular skills needed for a job. The U.S. military
trains their personnel using the “crawl-walk-run” concept. The first phase (crawl) is individual training
where each person is trained in particular skills (e.g., weapons shooting, parachuting, driving tanks, and
engaging artillery). The second phase (walk) is unit level training and the third phase (run) is combined
level training.

**Training, Combined Level:** Training at this advanced level involves multiple units, of either the same or
different types. An important aspect of combined level training is the command and control component.
Combined level training can include multiple U.S. Services (i.e., Air Force, Army, Marine Corps, or Navy)
and units from allied nations conducting integrated training that simulates combat conditions.

**Training, Unit Level:** Training at this level can include an aviation squadron, an infantry company,
amphibious and armored vehicle platoons, an artillery battery, or various logistics support detachments
(e.g., communications, transportation, landing, maintenance, health services, or military police). Larger
than individual training, unit conduct training to achieve their mission essential tasks. For instance,
armored vehicles maneuver across a range while engaging targets.

**Unavoidable Adverse Effects:** Effects that cannot be avoided due to constraints in alternatives. These
effects do not have to be avoided by the planning agency, but they must be disclosed, discussed, and
mitigated, if possible (40 Code of Federal Regulations 1500.2(e)).

**Unconstrained Training Concept:** A 2014 document that developed detailed training concepts for Tinian
and Pagan using the 42 unfilled training requirements as a foundation. The unconstrained evaluation
determined the optimal training tempo (i.e., the number and frequency of training); identified various
scenarios for the layout (or laydown) of ranges, training courses, maneuver areas, impact areas, and safety
zones (i.e., training assets) that comprise the two Range Training Areas; and defined the proposed action
and alternatives that best met the 42 unfilled training requirements.

**Unexploded Ordnance:** Military munitions that (a) have been primed, fused, armed, or otherwise
prepared for action; (b) have been fired, dropped, launched, projected, or placed in such a manner
as to constitute a hazard to operations, property, installations, personnel, or material; and (c)
remained unexploded either by malfunction, design, or any other cause [10 U.S. Code 101 (e)(5)(A)
through (C)].

**Ungulates:** Hoofed mammals.
**Visual Flight Rules:** These apply when the pilot relies entirely on visual clues (e.g., other aircraft, topography, tall objects) when flying. The visibility distance, cloud cover, and pilot experience are all important factors for the regulatory agency to consider when delineating specific three-dimensional airspace on the aeronautical charts.

**Warning Area:** A Warning Area is a special use airspace unit similar to a Restricted Area but is located offshore over domestic and international waters. Warning Areas generally begin 3 nautical miles (6 kilometers) off shore. Warning Areas separate hazardous military activities such as aerial gunnery, bombing, aircraft carrier operations, surface and subsurface operations, naval gunfire, missiles, etc. from non-participating military and civil aircraft. When the Warning Area is activated, the public is restricted from entering.

**Wetland:** Wetlands are defined by Section 404 of the Clean Water Act as: “areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” The Commonwealth of the Northern Mariana Islands Water Quality Standards define wetlands as “waters of the Commonwealth”, and state that all wetlands are subject to the provisions of the standards. Areas described and mapped as wetland communities may also contain small streams, shallow ponds, and lake edges. A *jurisdictional wetland* is a wetland that meets all three U.S. Army Corps of Engineers criterion for jurisdictional status: Appropriate hydrologic regime, hydric soils, and facultative to obligate wetland plant communities under normal growing conditions.
EXECUTIVE SUMMARY

Table of Contents

EXECUTIVE SUMMARY ................................................................................................................... ES-I
ES.1 INTRODUCTION ............................................................................................................... ES-1
ES.2 PURPOSE AND NEED FOR THE PROPOSED ACTION ............................................................ ES-4
ES.3 AGENCY AND STAKEHOLDER COORDINATION .......................................................... ES-5
ES.4 ALTERNATIVES DEVELOPMENT ......................................................................................... ES-6
ES.5 PROPOSED ACTION ........................................................................................................ ES-12
ES.6 RESOURCE MANAGEMENT MEASURES ........................................................................... ES-49
ES.7 MITIGATION MEASURES ................................................................................................ . ES-49
ES.8 PREFERRED ALTERNATIVE ..............................................................................................  ES-49
ES.9 OVERVIEW OF ENVIRONMENTAL IMPACTS ..................................................................... ES-50
ES.10 REFERENCES................................................................................................................... ES-78

List of Figures

ES-1 U.S. Pacific Command Area of Responsibility ................................................................. ES-2
ES-2 Mariana Islands Regional Map .......................................................................................... ES-3
ES-3 Tinian All Action Alternatives Military Lease Area-wide Training Assets ...................... ES-25
ES-4 Tinian All Action Alternatives Surface Danger Zones .................................................. ES-27
ES-5 Tinian All Action Alternatives Special Use Airspace: Two-Dimensional Perspective ...... ES-29
ES-6 Tinian All Action Alternatives Base Camp ...................................................................... ES-30
ES-7 Tinian All Action Alternatives Munitions Storage Area ................................................ ES-31
ES-8 Tinian All Action Alternatives Airport Improvements .................................................. ES-32
ES-9 Tinian All Action Alternatives Port Improvements and Supply Route .......................... ES-33
ES-10 Tinian All Action Alternatives Range Access Improvements, Fence Lines, and Gates .. ES-35
ES-11 Tinian All Action Alternatives Utility Improvements .................................................. ES-37
ES-12 Unai Chulu Tactical Amphibious Beach Landing Dredging and Construction ............ ES-38
ES-13 Unai Chulu Tactical Amphibious Beach Landing Operations ........................................ ES-39
ES-14 Pagan Alternative 1 Range Complexes ........................................................................ ES-45
ES-15 Pagan Alternative 2 Range Complexes ........................................................................ ES-46
ES-16 Pagan All Action Alternatives Surface Danger Zones .................................................. ES-47
List of Tables

ES-1  Summary of No-Action Alternative Training on Tinian Exclusive Military Use Area by U.S. Air Force, Army, Marine Corps, Navy, and Guam National Guard/Reserve .................. ES-17
ES-2  Summary Comparison of Action Tinian Alternatives .................................................. ES-19
ES-3  Summary Comparison of Pagan Alternatives ......................................................... ES-42
ES-4  Summary of Impacts for Tinian Alternatives ......................................................... ES-51
ES-5  Summary of Impacts for Pagan Alternatives ......................................................... ES-58
ES-6  Summary of Potential Mitigation Measures .......................................................... ES-62
# Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
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<td>%</td>
<td>percent</td>
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<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
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<td>CIP</td>
<td>Capital Improvements Projects Program Office</td>
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<td>CJMT</td>
<td>Commonwealth of the Northern Mariana Islands Joint Military Training</td>
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<td>CNMI</td>
<td>Commonwealth of the Northern Mariana Islands</td>
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<td>DoN</td>
<td>Department of the Navy</td>
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<td>EIS</td>
<td>Environmental Impact Statement</td>
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<td>mean sea level</td>
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<td>National Environmental Policy Act</td>
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<td>RTA</td>
<td>Range and Training Areas</td>
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ES.1 INTRODUCTION

The National Environmental Policy Act (NEPA) requires federal agencies to examine the potential effects of their proposed actions on the human environment. The human environment includes the natural and physical environment and the relationship of people with that environment. An Environmental Impact Statement (EIS) is a detailed public document that complies with the requirements of NEPA by assessing the potential effects that a major federal action may have on the human environment. This Executive Summary presents a summary of information presented in the EIS/Overseas EIS (OEIS). A list of technical terms and definitions is presented in the Glossary.

The proposed action is to establish a series of live-fire ranges, training courses, and maneuver areas within the Commonwealth of the Northern Mariana Islands (CNMI) to reduce existing joint service training deficiencies and meet the United States (U.S.) Pacific Command Service Components’ unfilled unit level and combined level training requirements in the Western Pacific. Under the proposed action, unit level training would occur on Tinian and combined level training would occur on Pagan. Use of both islands is required to meet the purpose and need for the proposed action. The proposed action includes: construction, range management, expanded training and operations (to include combined arms, live-fire, and maneuver training at the unit and combined level), establishment of danger zones, designation of Special Use Airspace, and interest in land to support simultaneous and integrated training.

An OEIS is required per Executive Order 12114 when a proposed action has the potential to significantly harm the environment of the U.S. Exclusive Economic Zone, the global commons, or a foreign nation’s Exclusive Economic Zone, territorial sea, or land mass. An OEIS is warranted for the proposed action described in this document because of proposed changes to international airspace past 12 nautical miles (22 kilometers). To reduce duplication, the EIS and OEIS are combined into one document. This EIS/OEIS identifies the proposed action, along with a preferred alternative, and evaluates the potential environmental effects associated with a variety of reasonable alternatives. Each of the action alternatives, as well as the no-action alternative, is described in Chapter 2, Proposed Action and Alternatives.

Several studies, reports, assessments, and international agreements have documented the need for additional training capabilities in the U.S. Pacific Command’s Area of Responsibility in the Western Pacific (Figure ES-1). Relevant documents are summarized in Section ES.2, Purpose and Need for the Proposed Action. Within the Western Pacific, the greatest need and potential opportunity for increased training capacity and capability occurs in the Mariana Islands, specifically the CNMI which is comprised of 14 islands north of Guam (Figure ES-2).
Figure ES-1
U.S. Pacific Command Area of Responsibility

Legend
- Mariana Islands (see inset, exaggerated for visibility)
- Areas of Responsibility:
  - Pacific Command (PACOM)
  - Northern Command (NORTHCOM)
  - Southern Command (SOUTHCOM)
  - European Command (EUCOM)
  - Africa Command (AFRICOM)
  - Central Command (CENTCOM)

MARIANA ISLANDS
(included in the U.S. Pacific Command Area of Responsibility)

- Tinian
- Pagan
ES.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to reduce joint training deficiencies for military services in the Western Pacific. Existing U.S. military live-fire, unit and combined level training ranges, training areas, and support facilities are insufficient to support U.S. Pacific Command Service Components’ training requirements in the Western Pacific, specifically in the Mariana Islands. The proposed action is needed to enable U.S. Pacific Command forces to meet their U.S. Code Title 10 requirements to maintain, equip, and train combat and humanitarian forces in the Western Pacific. The proposed action assists in correcting these training deficiencies by establishing live-fire unit and combined level range and training areas (RTAs) in the CNMI. Establishing unit and combined level RTAs in the CNMI would support ongoing operational requirements, changes to U.S. force structure, geographic repositioning of forces, and U.S. training relationships with allied nations.

The following studies, reports, assessments, and international statements and agreements document the need for additional training capabilities in the Western Pacific, and specifically in the CNMI.

- The 2009 Institute for Defense Analyses Study assessed the ability of the Service Components to meet training requirements in the U.S. Pacific Command’s Area of Responsibility (Institute for Defense Analyses 2009).
- In 2010, the Quadrennial Defense Review (hereafter “2010 QDR”) evaluated global U.S. military strategy and priorities (Department of Defense 2010). The 2010 QDR requires a more widely distributed U.S. presence in Asia.
- In November 2011, President Obama underlined the Asia Pacific’s regional importance in his speech to the Australian parliament.
- The bilateral Realignment Roadmap agreement between the U.S. and Japan calls for transforming Guam and the CNMI into a hub for security activities in the region (Security Consultative Committee 2012).
- In 2013, the Training Needs Assessment: An Assessment of Current Training Ranges and Supporting Facilities in the U.S. Pacific Command Area of Responsibility (hereafter the “Assessment”) identified and validated unfilled training requirements for units/commands in the U.S. Pacific Command Area of Responsibility (Department of the Navy [DoN] 2013a). This process provided an initial list of 62 unfilled training requirements, with all Service Components identifying unfilled training needs in the Western Pacific.
- The 2013 CNMI Joint Military Training Requirements and Siting Study (DoN 2013b) (hereafter referred to as “the Siting Study”) refined the analysis of unfilled training requirements in the Mariana Islands that was identified in the 2013 Training Needs Assessment. The initial 62 requirements were refined by the Executive Agent (U.S. Marine Corps Forces Pacific) to review previously identified Pacific-wide unfilled training requirements for those that could potentially be filled in the CNMI. This resulted in reducing the number of unfilled training requirements carried forward into this Siting Study from 62 to 42. These 42 unfilled training requirements served as the basis for developing the proposed action and alternatives in this EIS/OEIS.
- In 2014, the Quadrennial Defense Review (hereafter “2014 QDR”) re-evaluated global U.S. military strategy and priorities (Department of Defense 2014). The 2014 QDR confirmed the U.S.
military’s continued commitment to rebalance the Asia-Pacific region, which is increasingly central to U.S. political, economic and security interests.

**ES.3 AGENCY AND STAKEHOLDER COORDINATION**

**ES.3.1 Cooperating Agencies**

As defined by 40 Code of Federal Regulations (CFR) § 1508.5, a cooperating agency is “any federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major federal actions significantly affecting the quality of the human environment.” Numerous agencies were invited to serve as cooperating agencies for this EIS/OEIS. The following agencies agreed to be cooperating agencies: Department of Interior, Office of Insular Affairs; Federal Aviation Administration; International Broadcasting Bureau; National Marine Fisheries Service; U.S. Army Corps of Engineers, Honolulu District; and the U. S. Air Force. The U.S. Fish and Wildlife Service declined to serve as a cooperating agency due to staffing and workload constraints, but they agreed to work collaboratively with the Executive Agent (U.S. Marine Corps Forces Pacific) throughout the EIS/OEIS process. In addition, the Executive Agent signed a Memorandum of Understanding with the following Pacific Command Service Components: U.S. Air Force, U.S. Army, and U.S. Special Operations Command. These Service Components operate in the same capacity as cooperating agencies.

**ES.3.2 Agency Consultation**

The proposed action is subject to federal and CNMI regulatory requirements in addition to NEPA. Agency reviews must be conducted and procedures followed before starting construction activities or initiating operations. Appropriate consultations with regulatory entities will be completed as part of the EIS/OEIS process, and relevant information will be included in the EIS/OEIS as applicable. Various agency consultations are underway as part of this EIS/OEIS process and as applicable will be summarized in the Final EIS/OEIS. Agency consultations include:

- Endangered Species Act, Section 7: U.S. Fish and Wildlife Service and National Marine Fisheries Service
- Marine Mammal Protection Act: National Marine Fisheries Service
- National Historic Preservation Act, Section 106: Advisory Council on Historic Preservation, and CNMI Historic Preservation Office
- Magnuson-Stevens Fishery Conservation and Management Act: National Marine Fisheries Service
- Coastal Zone Management Act: CNMI Bureau of Environmental and Coastal Quality
- Section 404 of the Clean Water Act: U.S. Army Corps of Engineers

**ES.3.3 Collaborative Stakeholder Coordination**

The Council on Environmental Quality regulations (40 CFR 1500.1 [b]) provide that public input and scrutiny are essential to implementing NEPA. For this reason, the Executive Agent (U.S. Marine Corps
Forces Pacific) has implemented a collaborative coordination approach with CNMI government agencies, local organizations, and individual stakeholders for this EIS/OEIS including but not limited to:

- The CNMI Governor’s Office
- The CNMI agencies: Bureau of Environmental and Coastal Quality, Capital Improvements Projects Program Office (CIP), Commonwealth Ports Authority, Military Integration Management Committee, Department of Public Works
- Tinian Mayor’s Office
- Tinian Cattlemen’s Association and other cattle ranchers
- Northern Islands Mayor’s Office representatives

### ES.4 ALTERNATIVES DEVELOPMENT

The U.S. Marine Corps Forces Pacific as the Executive Agent undertook the following methodical process to identify potential alternatives for meeting unfilled, joint military training requirements in the CNMI. The U.S. Marine Corps Forces Pacific first developed and applied operational siting criteria (see Section 2.3.1, Operational Siting Criteria) which identified Tinian and Pagan as the only suitable locations for development of RTAs for unit level and combined level training, respectively. Use of both islands is required to meet the purpose and need for the proposed action. The Alternative development process then analyzed various laydowns on Tinian and Pagan to address the unfilled training requirements.

#### ES.4.1 Operational Siting Criteria

Operational siting criteria were developed as part of the CNMI Joint Military Training Requirements and Siting Study (DoN 2013b) (see Section 1.3.6) to identify potential locations within the CNMI that could meet these unfilled training requirements. These criteria included land use and topographic compatibility, the need for beachfront and transition lands for amphibious training, airspace and sea space, military training trails, and the ability to employ a spectrum of weapons systems.

The operational siting criteria were applied to screen the 14 CNMI islands for feasible RTA sites. Of the 14 CNMI islands, only a combination of RTAs on Tinian and Pagan were identified as capable of meeting unit level and combined level screening criteria, and could address virtually all 42 unfilled training requirements.

While the ideal scenario would be to site both RTAs on one island, neither Tinian nor Pagan individually have the space to support both. In addition, the lands currently leased by the Department of Defense on Tinian lack land areas large enough to accommodate the safety footprint for the broad spectrum of weapons used in combined level training. Therefore, Tinian would be most suitable for unit level RTA development and Pagan for combined level RTA training. Tinian and Pagan collectively is the only combination of training locations that meets the purpose of and need for the proposed action.
ES.4.2 Development of Unit Level Range and Training Area Alternatives on Tinian

The primary criteria for unit level RTA alternative development was maximizing use of the Military Lease Area—an area controlled by the U.S. government under a long-term lease.

The Military Lease Area meets the operational siting criteria for a unit level training RTA. It is located away from civilian population centers to ensure safe separation of military activities and the public. The Military Lease Area also has accessible beaches for amphibious training and roadways for tracked and wheeled vehicles. There is suitable topography and land area for maneuvering purposes for unit level RTAs. There are suitable airfields, available airspace, and adjacent sea space to accommodate the proposed training activities on Tinian. Additionally, Tinian International Airport and the Port of Tinian are both in close proximity to provide efficient personnel, cargo, and equipment transport.

The goal for Tinian unit level RTA training is two-fold: the first provides the capability and capacity for using the weapons organic to (i.e., belonging to and brought along with) units ranging in size from about 30 to 2,200 personnel. The second goal is to link ground-based activities with aviation and amphibious training. Tinian alternatives development went through two stages: initial identification of the locations of training facilities and support facilities on Tinian, followed by refinement of alternatives to better meet the purpose and need for the proposed action and address socioeconomic and environmental concerns and input from public comment.

ES.4.2.1 Initial Development of Tinian Unit Level Range and Training Area Alternatives

Initial alternative development on Tinian involved identifying where unit level support facilities and training facilities could be accommodated (DoN 2014). To be considered a viable and reasonable alternative, any RTA layout on Tinian must satisfy the following criteria:

**Land Use Compatibility:** An alternative must have a suitable location and sufficient land area for the High Hazard Impact Area that will accommodate the spectrum of weapons and munitions proposed; allow for a variety of targets; and provide a buffer area to ensure public safety. Additionally, this impact area must be situated in such a manner that when it is active, maneuver training could still be conducted in its vicinity.

**Simultaneous Use:** An alternative needs to maximize the potential for simultaneous use so that multiple ranges and training areas can be used simultaneously and the use of one range does not necessarily preclude the use of other ranges. Opportunities for compatible combinations or configurations of ranges, training courses, or maneuver area laydowns were evaluated to minimize land needed and maximize the ability to train at a given location if other types of training were ongoing in another location (i.e., simultaneity of use).

**Topographic Compatibility:** An alternative must have land areas with adequate space and suitable topography (slope) for the largest components of proposed training.
**Beachfront and Transition to Land:** An alternative must have beaches suitable to conduct ship-to-objective maneuvering or amphibious training. Required capability is that four Amphibious Assault Vehicles can land at one location at one time and transit from the training beach to suitable land areas for conducting tactical maneuvering to established ranges.

**Airspace and Sea Space:** An alternative must have sufficient land, airspace and sea space for ground-training activities to operate in conjunction with aircraft maneuvering in overlying airspace (e.g., Close Air Support Range training, Offensive Air Support Range training).

An alternative must include suitable locations for aircraft Drop Zones (e.g., personnel and cargo delivery via parachute) and Landing Zones (i.e., locations for aircraft takeoffs and landings), and airfields and open space where Unmanned Aircraft Systems can operate in Special Use Airspace. An alternative must have enough sea space to safely separate military operations from non-participating marine vessels.

The next step of alternative development identified how Tinian could accommodate the various training components and included the steps identified below.

**Step 1: Apply Screening Criteria for Large-Scale Unit Level Training Components.** Initial planning involved siting the largest ranges (i.e., Tank/Fighting Vehicle Multi-Purpose Range Complex, and Battle Area Complex), High Hazard Impact Area, and their associated surface/weapons danger zones. Siting of the largest ranges took into account alternatives that allowed for (1) the continued operation of the International Broadcasting Bureau in its present location within the Military Lease Area; and (2) eventual discontinuation of the operation of the International Broadcasting Bureau within the Military Lease Area.

**Step 2: Apply Screening Criteria for Additional Unit Level Training Components.** Following placement of the larger training components, the smaller ranges/training areas (e.g., Combat Pistol Range) and supporting infrastructure were sited.

**Step 3: Evaluate and Select Alternatives for Analysis.** The above process identified three reasonable alternatives to be carried forward for analysis (see Section ES.5.2, Tinian Alternatives). These alternatives on Tinian were identified and presented during the scoping period.

**ES.4.2.2 Refinement of Tinian Unit Level Range and Training Area Alternatives**

After the public scoping meetings, intensive field surveys, and ongoing dialogue with the CNMI government, the alternatives were further refined. Notable changes since presentation of the preliminary alternatives at the public scoping meetings include:

**Tank/Fighting Vehicle Multi-Purpose Range Complex.** The Tank/Fighting Vehicle Multi-Purpose Range Complex was shifted west due to airspace conflicts, avoidance of National Historic Landmark, and terrain obstacles. Firing locations were moved to avoid terrain obstacles and provide longer engagement zones for Light Armor Vehicle weapon training.

**High Hazard Impact Area.** The High Hazard Impact Area was reduced in size by eliminating explosive aviation ordnance and restricting use to inert aviation ordnance. This facilitated improved mortar firing positions and accommodated fire and maneuver activities on the Battle Area Complex. This reduction
enabled the layout of the fire break/road to shift it away from cliff line/limestone forests and off the National Historic Landmark. These changes minimized environmental impacts.

**Convoy Course.** The Convoy Course was moved to reduce the size of the course and number of engagement areas. These changes were made to keep training activities away from Lake Hagoi, provide a portion of the course the ability to fire into the High Hazard Impact Area, maximize the use of existing paved areas to the greatest extent possible, distance the engagement areas from surface water bodies to minimize potential negative socioeconomic and environmental effects, and to reduce the overlap of surface danger zones with commercial airspace.

**Field Artillery Indirect Fire Range.** One Field Artillery Indirect Fire Range firing position was shifted away from Ushi Point and onto flat terrain.

**Special Use Airspace.** Special Use Airspace was modified to avoid conflict with Saipan International Airport’s Class D airspace and to encompass the surface danger zones associated with the Convoy Course and other ranges. Additional modifications to Special Use Airspace overlying Tinian were made to minimize impacts to aircraft transiting between Saipan and Tinian. Previously planned Special Use Airspace was partitioned both vertically and horizontally to allow a greater degree of scheduling precision to match specific airspace with specific ground range use, and commercial on-land operations.

**Amphibious Training.** All beaches within the Military Lease Area were considered for amphibious training operations; however, a careful selection process was employed based on analysis and environmental factors. Beaches on the windward side of the Military Lease Area, including Unai Chiget, Unai Dankulo and Unai Masalok, were not considered for use of Amphibious Assault Vehicle landings due to wind and wave action. Based on environmental criteria including analysis of bathymetry and coral cover, Unai Babui and Unai Chulu were both considered for Amphibious Assault Vehicle and Landing Craft Air Cushion vessel training. A detailed engineering analysis of construction alternatives was conducted for these two locations. Different methods for constructing amphibious landing ramps were considered, including a dredge only option, a pile- armored ramp, and a tribar- armored ramp. The pile- armored ramp alternative was chosen for its stable design and long-term durable surface. Ultimately, Unai Babui was dismissed for Amphibious Assault Vehicle training to lessen environmental impacts, but it would still support training for Landing Craft Air Cushion vessels, small boat and swimmer training. Unai Chulu was chosen as the single beach for Amphibious Assault Vehicle landings as it offered better training opportunities and was not as constrained by size as Unai Babui. Areas outside of Military Lease Area were discounted for tactical amphibious training because they would not provide immediate access (i.e., contiguous) to live-fire training, which is a training criterion.

**Compatibility with Existing Land Uses Outside of the Military Lease Area.** Potential conflicts with existing land uses were accounted for, such as location of populated areas (i.e., noise receptors), recognized historic properties, sensitive natural resources, existing infrastructure (e.g., runways, roads, power supply), recreation sites, and economic activities.
ES.4.3 Development of Combined Level Range and Training Area Alternatives on Pagan

ES.4.3.1 Initial Development of Pagan Combined Level RTA Alternatives

Combined level training is different from unit level in that it allows various units and unit types to train simultaneously towards a single training objective within the RTA whereas in unit level training, generally only one unit type trains together towards an objective. As in combat, each unit works in coordination with one another during combined level training. The land area for combined level training must be capable of supporting multiple unit level tasks simultaneously, combined into a broader task. The combined level training RTA is designed to replicate, to the extent possible, the fluid nature of a battlefield with multiple land, sea, or air-based units engaging in a series of activities at the same time (DoN 2014).

The primary criterion for combined level RTA alternative development was to maximize land use on northern Pagan. This portion of the island is sparsely vegetated due to volcanic activity, has several accessible beaches, and contains an inactive World War II-era airfield. The relative lack of vegetation provides the visibility required for various types of combined level training. Accessible beaches allow for amphibious training and logistical support for delivering cargo and personnel. The presence of an airfield supports aviation activities.

Development of combined level RTA alternatives on Pagan involved identifying where training facilities could potentially be accommodated on the island (DoN 2014). To be a viable and reasonable alternative, any RTA on Pagan must at a minimum satisfy the conditions for unit level training as well as the following additional criteria:

**Land Use Compatibility:** An alternative must have land areas with a suitable location for a High Hazard Impact Area (or areas) that will accommodate the spectrum of weapons and munitions proposed, allow for ground-based, aviation, and naval munitions; and provide a buffer to ensure public safety. This impact area (or areas) must be situated in such a manner that when it is active, maneuver training could still be conducted in its vicinity.

**Topographic Compatibility:** An alternative must have land areas with adequate space and suitable topography (slope) for maneuvering (e.g., heavy forces, amphibious forces). Land areas were identified for use as “military training trails;” these would serve as unimproved pathways to move and maneuver personnel, vehicles, and equipment across the island to an objective. The maneuver area should be at least 1,640-feet (500-meters) wide with a slope of less than 30% to support a mechanized/motorized infantry company in a tactical formation.

**Beachfront and Transition to Land:** An alternative must have beaches suitable to conduct ship-to-objective maneuvering or amphibious training (e.g., Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Tactical Amphibious Training Beaches, and Maneuver Area [Amphibious Forces]).

**Airspace and Sea Space:** An alternative must have a suitable location for aircraft operations at Landing Zones (i.e., areas where aircraft land and take off) and Drop Zones (i.e., areas where aircraft drop personnel and cargo delivery via parachute), and airfields and overlying airspace to support Unmanned
Aircraft Systems and other aircraft operations. Sufficient water surfaces to accommodate danger zones that separate military operations from non-participating marine vessels.

**Full Spectrum Weapons Employment:** An alternative must include a suitable location(s) for the High Hazard Impact Area(s) that would accommodate the full spectrum of weapons required for combined level training while providing a safe distance from the proposed expeditionary base camp/bivouac area and airfield. The targets for the Field Artillery Indirect Fire Range, Mortar Range, Field Artillery Direct Fire Range, Combined Arms Training Range to Support Close Air Support and Naval Gunfire Support Training, Offensive Air Support Range, and Close Air Support Range need to be co-located as these types of training utilize high explosive munitions which require a High Hazard Impact Area to provide a larger variety of target placement and engagement scenarios. The High Hazard Impact Area needs to be in a central area for Field Artillery Indirect Fire Range points to fire overhead into the impact area.

**Mobility Corridor(s):** An alternative must allow for mobility corridors with sufficient space and flexibility for integrated ground, air, and sea training by including sufficient land, airspace, and sea space to conduct simultaneous training of combined arms, live-fire, amphibious maneuvering, naval surface fire support (i.e., ship-to-shore bombardment), air-delivered munitions, and indirect (i.e., artillery and mortars) and direct munitions firing training. The area must be large enough to provide separate impact areas and maneuver areas, such that live-fire and maneuver training can be safely conducted simultaneously.

The next step of alternative development identified how Pagan could accommodate the various training components as discussed in the steps below.

**Step 1: Apply Screening Criteria for Large-Scale Combined Level Training Components.** The initial planning effort was to site the largest ranges and High Hazard Impact Area(s) and their associated surface/weapons danger zones.

**Step 2: Apply Screening Criteria for Additional Combined Level Training Components.** Following placement of various configurations of the larger training components, the bivouac area and airfield extension were sited.

**Step 3: Evaluate and Select Alternatives for Analysis.** The above process identified two reasonable alternatives to be carried forward for analysis (see Section ES.5.3, Pagan Alternatives). These alternatives on Pagan were identified and presented during the scoping period.

**ES.4.3.2 Refinement of Pagan Combined Level Range and Training Area Alternatives**

After the public scoping meetings, intensive field surveys, and ongoing dialogue with the CNMI government, the alternatives were further refined. Notable changes since presentation of the preliminary alternatives at the public scoping meetings include:

**High Hazard Impact Area.** Changes were made to the configuration of the northern High Hazard Impact Area to provide separation from Lake Sanhalom and to provide space for safe maneuverability on the ground and account for danger zones associated with weapons systems and munitions employment. Under one of the alternatives, one High Hazard Impact Area was removed from the Pagan isthmus to reduce environmental impact and allow for greater room for ground maneuvers.
Special Use Airspace. Airspace was modified to better facilitate civil aviation activity during periods of military training. Previously planned Special Use Airspace was partitioned both vertically and horizontally to allow a greater degree of scheduling precision to match specific airspace with specific ground range use. Airspace was partitioned to enable certain aviation and maritime activities to occur during training and to facilitate access into and around the island.

Amphibious Training. All beaches on Pagan were considered for amphibious training operations. A careful selection process was employed based on training operations and environmental factors. Beaches on the windward side were not considered for use of Amphibious Assault Vehicle landings due to wind and wave action. Based on environmental criteria including analysis of bathymetry and coral cover, Blue, Green, and Red Beach were considered for Amphibious Assault Vehicle landings. Blue, Green, Red, and South were also considered for Landing Craft Air Cushion vessel training. North Beach was identified for small boat and swimmer insertions.

Environmental and Operational Considerations. Environmental (e.g., lakes, coral reef habitat, Endangered Species Act species presence, cultural resources) and operational (e.g., lack of beach access or foot trails to southern Pagan) considerations were evaluated and resulted in readjustment of the locations or configurations of ranges, maneuver areas, or supporting infrastructure.

ES.4.4 Action Alternatives Carried Forward for Analysis

Action alternatives carried forward for analysis in this EIS/OEIS, which meet the purpose and need for the proposed action, include three unit level RTA alternatives on Tinian and two combined level RTA alternatives on Pagan and their associated operations. Implementation of one Tinian unit level alternative and one Pagan combined level alternative is required to satisfy the purpose and need for the proposed action.

ES.5 PROPOSED ACTION

ES.5.1 Overview

The proposed action is to establish live-fire range and training areas (RTAs) within the CNMI to address the U.S. Pacific Command Service Components’ unfilled unit level and combined level training requirements in the Western Pacific. An RTA refers to live-fire ranges, training courses, maneuver areas, and associated support facilities, collectively, that are located in close proximity to each other. Under the proposed action, a unit level RTA is proposed on Tinian and a combined level RTA is proposed on Pagan. Establishing a unit level RTA and combined level RTA in the CNMI would support joint Service training requirements, ongoing operational requirements, changes to U.S. force structure, and geographic repositioning of forces in the Western Pacific.

The alternatives include several common elements:

- **Land Use Agreements** to provide land area necessary to support simultaneous and integrated training as appropriate (including amendments to existing agreements).
• **Construction** to support RTA development and associated infrastructure.

• **Range Management** to sustain unit level and combined level RTA training capabilities in an environmentally responsible manner.

• **Expanded Training and Operations** to include combined arms, live-fire, amphibious landings, and maneuver training at the unit level and combined level.

• **Danger Zones** to establish safe separation of non-participating military personnel and the public from live-fire training over water (i.e., sea space). Danger zones may be closed to the public on a full-time or intermittent basis (Title 33 CFR Part 334). Danger zones are established pursuant to statutory authority of the Secretary of the Army and are administered by the Army Corps of Engineers. Surface danger zones are three-dimensional areas that delineate portions of the earth’s surface and the overlying airspace in which personnel and/or equipment may be endangered by ground weapons firing or detonation activities because of ricochet or fragmentation hazard.

• **Designation of Special Use Airspace** to identify areas to which activities must be confined because of their nature, or where limitations are imposed upon aircraft that are not part of those activities, or both. Special Use Airspace is geographically defined by vertical and horizontal limits over a portion of the earth’s surface. The Federal Aviation Administration is the agency responsible for regulatory oversight and implementation of Special Use Airspace.

Construction would occur to support range and target installation; administrative, command, and control functions; access roads and trails; delivery of utilities (i.e., water, electric, wastewater, communications and solid waste handling); personnel billeting; and equipment and munitions storage. Additionally, all alternatives include RTA management activities, RTA use and scheduling, range observation to provide live feedback on training activities and target scoring, vegetation management for range use and firebreak purposes, as well as vehicle and equipment use and maintenance activities for RTA training. For all action alternatives, it is anticipated that approximately 95 full-time personnel would be needed to carry out range management and maintenance activities. These personnel would have responsibility for both RTAs on Tinian and Pagan; for purposes of analysis it is assumed these employees would live on Tinian. Both the Tinian RTA and the Pagan RTA require amphibious training beaches linked to an existing or improved road/trail system, maneuver areas to support personnel on foot or in vehicles, as well as access points (i.e., airfields, ports) for personnel, equipment, and cargo deliveries.

Based on the planned deployment and training exercise tempo for units in the U.S. Pacific Command Area of Responsibility, it was determined that 20 weeks of live-fire training on Tinian and 16 weeks of live-fire training on Pagan would meet the unfilled training requirements; therefore, these time periods are analyzed in this document. In addition, other activities including pre-training and post-training activities (arrival and departure of trainees and equipment), non-live-fire training (e.g., logistics training), and RTA maintenance and management functions would occur outside of the live-fire training durations throughout the year. Major conflicts, terrorism, international lawlessness, natural disasters, and the current U.S. national strategy to focus on the Pacific theater have the potential to change the structure of military forces in the region and the required training frequency. A potential change in force...
structure, unit type, and/or location may result in the need to change operational training tempo in the future.

The potential increase in training described in the Unconstrained Training Concept (Appendix C) reflects the maximum training capacity for each island. Potential future live-fire training could be accommodated up to a total of 45 weeks of training on Tinian and a total of 40 weeks of training on Pagan. Should the tempo of live-fire training need to be increased above the annual live-fire training demand of 20 weeks for Tinian and 16 weeks for Pagan analyzed in this EIS/OEIS, additional NEPA compliance and agency consultations would be completed before implementing any increase in tempo.

Two additional projects are not being formally proposed at this time, but they are anticipated to be needed and would be implemented in the future although no specific timeframe has been identified. The two projects are: (1) relocation of the existing International Broadcasting Bureau (currently located on Tinian), and (2) new dock and associated breakwater on Pagan. If, as a result of the selected alternative, the International Broadcasting Bureau must be relocated outside of the Military Lease Area, then additional NEPA analysis will be done as needed. The new International Broadcasting Bureau facility must be complete and fully operational before relocation occurs. Potential relocation of the International Broadcasting Bureau and the dock and breakwater on Pagan are analyzed programmatically in this EIS/OEIS (see Section 4.18, Programmatic Analysis of Future Potential Project Components).

**ES.5.2 Tinian Alternatives**

**ES.5.2.1 Land Use Agreements**

Land use agreements would be required to implement the proposed action on Tinian. The U.S. currently has a real estate agreement for nearly two-thirds of Tinian, (i.e., the Military Lease Area). The Department of Defense would acquire jurisdictional control of additional lands outside of the Military Lease Area through long-term real estate agreements. Since the 1975 Covenant and Technical Agreement (see Appendix K, Summary of Historical Land Use Agreements between the U.S. and the CNMI), some areas covered under the original lease were returned to the CNMI government through lease amendments. Long-term real estate agreements with the CNMI for roadway and utility easements would be required. The additional areas would include the north portion of Tinian International Airport and parcels near the Port of Tinian.

The International Broadcasting Bureau site is located within the Military Lease Area. Under Tinian Alternative 1, the International Broadcasting Bureau facility would continue to operate. Under Tinian Alternatives 2 and 3, the International Broadcasting Bureau facility would no longer exist in its current location. The International Broadcasting Bureau is a cooperating agency for this EIS/OEIS and has been involved in this NEPA process. A full discussion of land acquisition and land uses on Tinian is provided in Sections 3.7 and 4.7, Land and Submerged Land Use.

**ES.5.2.2 Construction and Improvements**

Construction of the training facilities (e.g., ranges, training courses, High Hazard Impact Area, Landing Zones, Drop Zones, range
Observation Posts, Surface Radar sites) would start after the Record of Decision (anticipated in Summer 2016). Construction is expected to span 8 to 10 years depending on funding and operational commitments of the U.S. military. Construction and improvements for this alternative include two broad categories: (1) support facilities and infrastructure, and (2) training facilities. These are further described below.

Support Facilities and Infrastructure Construction. Support facilities include the base camp, Munitions Storage Area, airport and port improvements, access roads, gates, fences, and utilities (including water, wastewater, electrical, information technology, communications, and solid waste).

Training Facilities Construction. Numerous training facilities (e.g., ranges, training courses, maneuver areas, High Hazard Impact Area, Landing Zones, Drop Zones, range Observation Posts, Surface Radar sites) would be constructed within the Tinian RTA for all action alternatives. To provide the reader with an easier way to identify the various RTA training facilities, they were grouped into four range complexes based on geographic proximity. The complexes are identified as Range Complex A, B, C, and D. An underwater tactical amphibious beach landing area would be constructed for Amphibious Assault Vehicles at Unai Chulu. Construction would modify the seafloor (i.e., limestone, coral reef) by contouring landing area to create a pile- armored ramp.

ES.5.2.3 Training Operations

At the proposed Tinian RTA, the amount and variety of training would progressively increase over the 8 to 10 year construction period culminating in the final 20 weeks proposed. Live-fire training using small arms would occur from the start; however, training with large-caliber weapons would not occur until the Special Use Airspace is approved and mapped by the Federal Aviation Administration. Live-fire ranges would be managed in accordance with current Marine Corps range management policies and procedures, which are designed to ensure the safe, efficient, effective, and environmentally sustainable use of the range areas. The proposed training operations at the four range complexes are summarized as follows:

- Range Complex A comprises the High Hazard Impact Area where live-fire high explosives from ground-based and aviation training activities would be employed. Ground-based activities would include hand grenades thrown and launched from the Live Hand Grenade and Grenade Launcher ranges. Aviation activities would use live munitions from machine guns and rockets and delivery of inert aviation ordnance at targets within the High Hazard Impact Area as part of Offensive Air Support Range and Close Air Support Range training.

- Range Complex B primary emphasis would be live-fire vehicle-mounted (e.g., tanks, fighting vehicles) training. Personnel in vehicles would move to firing points and using the lines of sight they would practice firing at stationary and moving targets (i.e., target objectives). Although not the primary purpose for this range complex, personnel would maneuver on foot within the range complex in squads. Simulated aviation training would occur within Range Complex B but it would not involve firing of weapons.

- Range Complex C primary emphasis would be the live-fire training activities associated with the Infantry Platoon Battle Course and the Urban Assault Course. Training activities at the Infantry Platoon Battle Course and Urban Assault Courses would involve personnel moving primarily on foot to target objective areas employing live munitions for rifles and inert munitions for
grenade and rocket launchers. Simulated aviation training would occur within Range Complex C but it would not involve firing of weapons.

- Range Complex D emphasizes both aviation training and ground training. Aviation training would occur within a Drop Zone, a Landing Zone, an Unmanned Aircraft Systems Ground Station, and a Forward Arming and Refueling Point. Aviation training would include takeoff and landing practice for fixed wing, helicopters, tilt-rotor aircraft, and unmanned aircraft (i.e., drones), drop (parachute) of personnel/cargo/equipment, aircraft refueling, and aviation command and control.

Other training operations within the Military Lease Area would include the following:

- Field Artillery Indirect Fire Range would involve personnel firing live rounds from 10 designated firing points into the Range Complex Area A.
- Convoy Course training involve personnel driving vehicles in a convoy along a specific route through the Tinian RTA. The primary emphasis of this course is for vehicles (wheeled and tracked) to progress from one engagement zone to the next, firing weapons at targets and maneuvering the vehicles.
- Tracked Vehicle Driver’s Course training would involve personnel driving tracked vehicles (e.g., Amphibious Assault Vehicles) along designated roads or pathways. This training is non-live-fire.
- Tactical Amphibious Landing Beach training (i.e., “amphibious training”) would take place to varying degrees at four beaches within the Military Lease Area: (1) Unai Babui; (2) Unai Chulu; (3) Unai Lam Lam; and (4) Unai Masalok. Amphibious training operations include non-live-fire tactical and administrative operations on Tinian. Typically, an amphibious craft leaves the larger ship (or stages itself for the training event) anywhere between 2 to 4 miles (4 to 7 kilometers) away from the landing beach. The types of tactical amphibious training proposed include Amphibious Assault Vehicle landings, Landing Craft Air Cushion Vessel landings, small boat training, and combat swimmer training.
- Maneuver Area (Light Forces) training would involve personnel moving on foot along roadways, pathways, and open land areas within the Military Lease Area. This training is non-live-fire and would use blank munitions to conduct force on force weapons training.
- Maneuver Area (Amphibious Forces) training would involve personnel driving Amphibious Assault Vehicles from designated amphibious training beaches to engage in training within the RTA. This training is non-live-fire and would use blank munitions to conduct force on force weapons training.
- Landing Zone training would involve fixed wing, helicopters, tilt-rotor, and unmanned aircraft landing and taking off at existing (cleared) North Field runways. Five smaller designated Landing Zones at Pina, base camp, east of base camp, within Range Complex C, and north of Range Complex C would involve helicopters and tilt-rotor aircraft landing and taking off. Landing Zone training is non-live-fire, and no aviation munitions would be employed (including blanks).
- Airfield training would include airfield operations for training at Tinian International Airport, North Field, and on proposed Landing Zones.
ES.5.2.4 Tinian No-Action Alternative

Section 1502.14(d) of Council on Environmental Quality regulations implementing NEPA requires an EIS/OEIS to analyze the no-action alternative. No action means that the proposed action would not take place. Analysis of the no-action alternative provides a benchmark, enabling decision-makers to compare the magnitude of the environmental effects of the proposed action or alternatives versus the potential impacts if no action were implemented. In many projects, a no-action alternative is the same as the description of the existing condition. However, in the case of this Proposed Action, the no-action alternative would not be a static situation but represents the continuation of having military training exercises on Tinian as well as the implementation of training ranges and operations that have been documented in recent Records of Decisions for NEPA actions. The no-action alternative would continue current training activities on Tinian, including those contained in other Department of Defense documents such as the Mariana Islands Range Complex EIS/OEIS (July 2010 Record of Decision, DoN 2010a), and would complete construction of four live-fire ranges on Tinian contained in the September 2010 Record of Decision in the Guam and CNMI Military Relocation EIS/OEIS (DoN and Department of the Army 2010). These activities are summarized in Table ES-1.

Table ES-1. Summary of No-Action Alternative Training on Tinian Exclusive Military Use Area by U.S. Air Force, Army, Marine Corps, Navy, and Guam National Guard/Reserve

<table>
<thead>
<tr>
<th>Training Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mariana Islands Range Complex EIS/OEIS</strong> (see Tables 2-7 and 2-8 in the EIS/OEIS)</td>
<td>The battalion and its combat and service support units deploy to field locations to conduct tactical training activities under simulated combat conditions.</td>
</tr>
<tr>
<td>Field Training Exercise</td>
<td>Training conducted to gain a tactical advantage over the enemy; it is not aimed at seizing the beach but expanding the battle space.</td>
</tr>
<tr>
<td>Ship to Objective Maneuver</td>
<td>Training activities are conducted when directed by the Departments of State and Defense, or other appropriate authority whereby noncombatants are evacuated from foreign countries to safe havens or to the U.S., when their lives are endangered by war, civil unrest, or natural disaster.</td>
</tr>
<tr>
<td>Noncombatant Evacuation Operation</td>
<td>This training provides helicopter support for Command and Control, assault escort, troop lift/logistics, reconnaissance, search and rescues, medical evacuation, reconnaissance team insertion/extract, and helicopter coordinator duties.</td>
</tr>
<tr>
<td>Assault Support</td>
<td>Activity conducted to evaluate the battlefield and enemy forces, and to gather intelligence.</td>
</tr>
<tr>
<td>Reconnaissance and Surveillance</td>
<td>Train rescue forces personnel in the tasks needed to be performed to affect the recovery of distressed personnel during war or military operations other than war.</td>
</tr>
</tbody>
</table>
Table ES-1. Summary of No-Action Alternative Training on Tinian Exclusive Military Use Area by U.S. Air Force, Army, Marine Corps, Navy, and Guam National Guard/Reserve

<table>
<thead>
<tr>
<th>Training Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional Training Activities Occurring on Tinian (NEPA coverage - Categorical Exclusion)</strong></td>
<td></td>
</tr>
<tr>
<td>Geiger Fury</td>
<td>The U.S. military conducts aviation and expeditionary force training exercises on Tinian and Pagan. For components not specifically covered under the MIRC EIS/OEIS, Joint Region Marianas prepared a Categorical Exclusion document, conducted Section 106 consultation, and ensured compliance with all regulations.</td>
</tr>
<tr>
<td>Forager Fury</td>
<td></td>
</tr>
<tr>
<td>Forager Fury II</td>
<td></td>
</tr>
<tr>
<td>Forager Fury III</td>
<td></td>
</tr>
<tr>
<td><strong>Guam and CNMI Relocation EIS/OEIS (see Table 2.3-1 in the Guam and CNMI Relocation EIS)</strong></td>
<td></td>
</tr>
<tr>
<td>Known Distance Range</td>
<td>This range trains personnel on the skills necessary to identify, engage, and hit stationary targets from a known distance with a rifle.</td>
</tr>
<tr>
<td>Automated Combat Pistol/Military Police Firearms Qualification</td>
<td>This range is designed to meet training and qualification requirements with combat pistols and revolvers and used to train and test personnel on the skills necessary to identify, engage, and hit stationary infantry targets.</td>
</tr>
<tr>
<td>Field Firing Range</td>
<td>This range supports training in target engagement techniques with the rifle, including identifying, engaging, and hitting stationary infantry targets.</td>
</tr>
<tr>
<td>Platoon Battle Course</td>
<td>A range designed for training and qualifying infantry platoons, either mounted or dismounted, on movement techniques and operations. This course trains and tests platoons on the skills necessary to conduct tactical movement techniques, detect, identify, engage, and defeat stationary and moving infantry targets in a tactical array.</td>
</tr>
</tbody>
</table>

ES.5.2.5 Comparison of Tinian Alternatives

Table ES-2 provides a summary comparison of the proposed action elements for each of the three Tinian action alternatives and the no-action alternative. Best management practices would be incorporated into the proposed action and common to all three Tinian action alternatives. Figure ES-3 shows an overview of proposed activities in the Military Lease Area. Figure ES-4 shows a comparison of range layouts and “composite” surface danger zones for the three alternatives. The composite consists of individual surface danger zones for all proposed training activities. Typically, only certain surface danger zones within this composite would be active at any given time depending on the type of training being conducted. Figure ES-5 shows proposed Special Use Airspace. Figures ES-6 through ES-13 show elements of the proposed action common to all three Tinian action alternatives.
## Table ES-2. Summary Comparison of Action Tinian Alternatives

**Comparison of Tinian Action Alternatives**

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Differences</strong></td>
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<tr>
<td>Lacks a southern Battle Area Complex.</td>
<td>Includes a southern Battle Area Complex.</td>
<td>Lacks a northern Battle Area Complex.</td>
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<td></td>
</tr>
<tr>
<td>Includes a northern Battle Area Complex.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6 Convoy Course engagement areas.</td>
<td>11 Convoy Course engagement areas.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface danger zones supports live-fire ranges over land and over water.</td>
<td>Surface danger zones larger than Alternative 1.</td>
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<tr>
<td><strong>Simultaneous Use</strong></td>
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<td></td>
</tr>
<tr>
<td>Presence of one (northern) Battle Area Complex limits training options.</td>
<td>Presence of two Battle Area Complexes provides most training options.</td>
<td>Presence of one (southern) Battle Area Complex limits training options.</td>
<td></td>
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</tr>
<tr>
<td>Simultaneous use of training assets coordinated with Range Control and training exercise planners to maximize training for participants.</td>
<td></td>
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</tr>
<tr>
<td><strong>Training Value</strong></td>
<td></td>
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</tr>
<tr>
<td>International Broadcasting Bureau presence limits some of the firing directions that could be used in Range Complexes C and D. Fewer Convoy Course engagement areas.</td>
<td>International Broadcasting Bureau absence allows for full array of weapons employment in Range Complex C and D. The full array of RTA training facilities available providing</td>
<td>International Broadcasting Bureau absence allows for full array of weapons employment in Range Complex C. The southern Battle Area Complex affords more training options</td>
<td>Limited training value, but continued importance of Tinian MLA for periodic training is critical</td>
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</tbody>
</table>
Table ES-2. Summary Comparison of Action Tinian Alternatives

<table>
<thead>
<tr>
<th>Elements Common to All Tinian Action Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training Facilities Construction</strong></td>
</tr>
<tr>
<td><strong>Base Camp</strong></td>
</tr>
<tr>
<td><strong>Munitions Storage Area</strong></td>
</tr>
<tr>
<td><strong>Airport Improvements</strong></td>
</tr>
<tr>
<td><strong>Port Improvements</strong></td>
</tr>
<tr>
<td><strong>Access Road Improvements, Fence Lines, Gates</strong></td>
</tr>
</tbody>
</table>
## Table ES-2. Summary Comparison of Action Tinian Alternatives

### Elements Common to All Tinian Action Alternatives

<table>
<thead>
<tr>
<th>Training Facilities Construction</th>
<th>Alternatives 1, 2, and 3</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Utility Improvements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Training Facilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td><em>Electrical power</em>—distribution system from the power plant to facilities in the Military Lease Area, base camp, Munitions Storage Area, range/target activities, Range Control, etc. Lines would be either underground or overhead. Potable Water—new dedicated military water supply system to support proposed action within the Military Lease Area plus improvements to existing Commonwealth Utilities Corporation water system to serve the proposed Port of Tinian facilities. Wastewater—new wastewater treatment plant and disposal facilities at the base camp with an underground sewer system; septic system at the Munitions Storage Area; portable toilets across the RTA, Port and Tinian International Airport for trainee use that would be transferred to the base camp treatment and disposal system; holding tank for wastewater generated at the biosecurity building at the port; treatment and disposal for vehicle wash water at the proposed vehicle wash down facility at Port of Tinian. Communications—install overhead and underground lines to the base camp, Range Control facilities, Munitions Storage Area, port facilities, IT&amp;E cable landing facility on Broadway. Solid Waste—proposed base camp transfer station and recycling center.</td>
<td>Limited upgrades</td>
</tr>
<tr>
<td><strong>Tactical Amphibious Beach Landing</strong></td>
<td>Construct an underwater tactical amphibious beach landing area for Amphibious Assault Vehicles at Unal Chulu. Construction would modify the seafloor (i.e., limestone, coral reef) by contouring landing area to create a pile-armored ramp.</td>
<td>Not planned</td>
</tr>
<tr>
<td><strong>Range Operations and Maintenance</strong></td>
<td>Approximate 95 personnel would work year-round supporting RTA operations and maintenance activities.</td>
<td>Not planned</td>
</tr>
<tr>
<td><strong>Public Access</strong></td>
<td>Common to all alternatives would be the prohibition of public access at any time to the High Hazard Impact Area (includes portions of Broadway Avenue), Munitions Storage Area, base camp, the Range Observation Posts and Surface Radar sites. Only certain portions of the Military Lease Area would be open during the training periods. As training cycles are better defined, an access plan would be developed and published for public information.</td>
<td>Public access would be limited during periodic training exercises (Broadway Avenue to remain open when ranges are not in use.)</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>Fences and monitoring systems would ensure safety and security within Military Lease Area boundaries. Only certain portions of the Military Lease Area would be open during the training periods. As training cycles are better defined, an access plan would be developed and published for public information.</td>
<td>Existing security during periodic military training exercises</td>
</tr>
<tr>
<td><strong>Biosecurity</strong></td>
<td>Biosecurity protocols would be established for personnel, cargo, and equipment arriving on Tinian. Specific protocols for logistics movements and tactical movements would be developed. Washdown and inspection areas would be established.</td>
<td>Biosecurity would be done for periodic training exercises</td>
</tr>
<tr>
<td><strong>Emergency Services</strong></td>
<td>Military fire and safety services would be established as well as medical emergency procedures.</td>
<td>No emergency services established</td>
</tr>
</tbody>
</table>
Table ES-2. Summary Comparison of Action Tinian Alternatives

<table>
<thead>
<tr>
<th>Range Operations and Maintenance</th>
<th>Alternatives 1, 2, and 3</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>Various roads and trails would be improved. Aircraft and marine operations would be conducted for arriving and departing personnel, equipment, cargo, and fuel.</td>
<td>Limited upgrades</td>
</tr>
<tr>
<td>Munitions</td>
<td>Total: 4,882,013 rounds/year</td>
<td>Total: 3,280,000 rounds/year*</td>
</tr>
<tr>
<td>Amphibious Training Beaches</td>
<td>Alternatives 1, 2, and 3</td>
<td>No-Action Alternative</td>
</tr>
<tr>
<td>Operations</td>
<td>The following amphibious operations would occur:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Unai Chulu would be used for Amphibious Assault Vehicle landings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Unai Babui and Unai Masalok would be used for Landing Craft Air Cushion vessel landings, swimmer training and insertions, and small boat landings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Unai Lam Lam would be used for swimmer training and insertions, and small boat landings.</td>
<td></td>
</tr>
<tr>
<td>Airspace Requirement</td>
<td>Alternatives 1, 2, and 3</td>
<td>No-Action Alternative</td>
</tr>
<tr>
<td>Operations</td>
<td>Special Use Airspace would be established.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Restricted Area 7203 East/West/A/B/C/X/Y/Z would be established and activated from the surface to various altitudes based on the training being conducted, up to a maximum of 18,000 feet (5,486 meters) mean sea level (MSL).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tinian Military Operations Area would extend 12 nautical miles (22 kilometers) from the Tinian shoreline. The floor would start at 3,000 feet (914 meters) MSL and extend to a ceiling of up to a maximum of 18,000 feet (5,486 meters).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• An Air Traffic Control Assigned Airspace would be activated whenever military operations are occurring in the Military Operations Area. This overlying airspace starts at the Military Operations Area ceiling (at 18,000 feet [5,486 meters]) and extends to 30,000 feet (9,144 meters).</td>
<td></td>
</tr>
<tr>
<td>Sea Space Requirement</td>
<td>Alternatives 1, 2, and 3</td>
<td>No-Action Alternative</td>
</tr>
<tr>
<td>Operations</td>
<td>Danger zones would be established using the Tinian Restricted Area boundaries. These danger zones would be activated when corresponding airspace is activated.</td>
<td>Limited to actions in periodic military training exercises</td>
</tr>
<tr>
<td><strong>Comparison of Tinian All Action Alternatives: Ground Disturbance and Newly Created Impervious Surfaces</strong></td>
<td><strong>Alternative 1</strong></td>
<td><strong>Alternative 2</strong></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>Total Ground Disturbance/Newly Created Impervious Surface</strong></td>
<td>Total: 1,902 acres (771 hectares)/662 acres (270 hectares)</td>
<td>Total: 2,025 acres (820 hectares)/784 acres (319 hectares)</td>
</tr>
<tr>
<td><strong>Base Camp</strong></td>
<td>257 acres (104 hectares) only 30 acres (12 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td><strong>Munitions Storage Area</strong></td>
<td>38 acres (15 hectares) only 8 acres (3 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td><strong>Airfield Improvements (Tinian International Airport)</strong></td>
<td>41 acres (17 hectares) only 41 acres (17 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td><strong>Port of Tinian Improvements</strong></td>
<td>5 acres (2 hectares) only 5 acres (2 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td><strong>Roadway Improvements</strong></td>
<td>133 acres (53 hectares) only 133 acres (53 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td><strong>Range Complex A</strong></td>
<td>527 acres (213 hectares)</td>
<td>Same as Alternative 1</td>
</tr>
<tr>
<td><strong>Range Complex B</strong></td>
<td>47 acres (20 hectares) all of which would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
</tr>
</tbody>
</table>
Table ES-2. Summary Comparison of Action Tinian Alternatives

<table>
<thead>
<tr>
<th>Comparison of Tinian All Action Alternatives: Ground Disturbance and Newly Created Impervious Surfaces</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range Complex C</strong></td>
<td>80 acres (32 hectares) all of which would be considered newly created impervious surface</td>
<td>157 acres (65 hectares) all of which would be considered newly created impervious surface</td>
<td>157 acres (65 hectares) all of which would be considered newly created impervious surface</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Range Complex D</strong></td>
<td>475 acres (192 hectares) only 22 acres (9 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
<td>453 acres (183 hectares) none of which would be considered newly created impervious surface</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Military Lease Area-wide</strong></td>
<td>296 acres (120 hectares) all of which would be considered newly created impervious surface</td>
<td>342 acres (138 hectares) all of which would be considered newly created impervious surface</td>
<td>342 acres (138 hectares) all of which would be considered newly created impervious surface</td>
<td>Minor increases in impervious surface</td>
</tr>
</tbody>
</table>

Note: *DoN 2010b*
Figure ES-3

Tinian All Action Alternatives
Military Lease Area-Wide Training Assets

ES-25
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Figure ES-5
Tinian All Action Alternatives
Special Use Airspace: Two-Dimensional Perspective

Legend
- Military Lease Area Boundary
- Proposed Special Use Airspace
- Tinian Military Operations Area / Air Traffic Control Assigned Airspace
  (R = Restricted Area)

Legend
- Military Lease Area Boundary
- Proposed Special Use Airspace
- Tinian Military Operations Area / Air Traffic Control Assigned Airspace
  (R = Restricted Area)

Tinian International Airport
North Field

Tinian International Airport
North Field

Legend
- Military Lease Area Boundary
- Proposed Special Use Airspace
- Tinian Military Operations Area / Air Traffic Control Assigned Airspace
  (R = Restricted Area)
Figure ES-7
Tinian All Action Alternatives
Munitions Storage Area

Legend
- Military Lease Area Boundary
- Existing Roads (Improved and Unimproved)
- Proposed Access Road
- Proposed Supply Route
- Convoy Course
- FAA Runway Protection Zone
- Munitions Storage Area
- Notional Safety Area

Note: Layouts are notional. Final design subject to modification within proposed ground disturbance footprint.
Figure ES-8
Tinian All Action Alternatives
Airport Improvements

Note: Layouts are notional. Final design subject to modification within proposed ground disturbance footprint.

Source: NAVFAC Pacific 2013
Figure ES-9
Tinian All Action Alternatives
Port Improvements and Supply Route
Figure ES-10
Tinian All Action Alternatives
Range Access Improvements, Fence Lines, and Gates

Note 1: Roadway sections have alphabetic designations which are discussed in Table 2.4-1, Proposed Tinian Unit Level RTA Road Improvements.

Note 2: Layouts are notional. Final design subject to modification within proposed ground disturbance footprint.

Legend

- Military Lease Area
- Existing Roads (Improved and Unimproved)
- High Hazard Impact Area
- Landing Zones
- Observation Post
- Surface Radar Site
- Access Gate
- Tinian Fencelines

Roadway Improvement Segments
  - Repair Existing Road for Public Use
  - Repair Existing Road for Public Use - Boulevard
  - Construct New Paved Road
  - Construct New Gravel Road
  - Establish Military Training Road
  - Repair Existing Road for General Use
  - Improve Road Right of Way for Utilities
  - Perimeter Patrol Road
  - Road Closure - No Improvements
  - No Action
  - Vegetation Cleared Area
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North Field
Mount Lasso
Tinian International Airport

San Jose
Tinian Harbor
Lamanibot Bay
Unai Chulu
Unai Babui
Unai Lam Lam
Lake Hagoi

Unai Chiget
Unai Dankulo
Unai Masalok

Pacific Ocean

Figure ES-11
Tinian All Action Alternatives
Utility Improvements

Note: Layouts are notional. Final design subject to modification within proposed ground disturbance footprint.
Figure ES-12 Unai Chulu
Tactical Amphibious Beach Landing
Dredging and Construction

Legend
- Amphibious Landing Ramp
- Proposed Tracked Vehicle Route
- Existing Road
- Maximum reach of excavator
- Sheetpile Causeway
- Trestle Causeway
- Approach Zone
- LCAC - Craft Landing Site (75 ft radius)
- LCAC Landing Footprint
- Construction Footprint (4.32 acres)
- 4 Meter Depth Contour
- 1 Meter Depth Contour

Depth Relative to Mean Lower Low Water¹
- Greater than 40 feet Depth
- 40 to -20 feet Depth
- 20 to -12 feet Depth
- 12 to -7 feet Depth
- 7 to -5 feet Depth
- 5 to -3 feet Depth
- 3 to -1 feet Depth
- 1 to 0 feet Depth
- 0 to 3 feet
- 3 to 5 feet
- Greater than 5 feet

¹ Depth values based on mean-mean low water and grouped to distinguish between the following depths of concern:
- Maximum Potential Impact Depth (-12 feet)
- In-water Draft of AAV (-7 feet)
- Wave Surge Potential Track Impact (-5 feet)
- Track Engagement (-3 feet)
- Reef Flat Maneuver (-1 feet or above)

² Unai Chulu will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.

Source: NAVFAC Pacific 2013; Sea Engineering, Inc. 2014
Figure ES-13 Unai Chulu
Tactical Amphibious Beach Landing Operations

Legend
- Amphibious Landing Ramp
- Proposed Tracked Vehicle Route
- Existing Road
- 4 Meter Depth Contour
- 1 Meter Depth Contour
- Approach Zone
- Craft Landing Site (75 ft radius)
- Landing Footprint
- Operations Footprint

Depth Relative to Mean Lower Low Water¹
- Greater than 40 feet Depth
- 40 to -20 feet Depth
- -20 to -12 feet Depth
- -12 to -7 feet Depth
- -7 to -5 feet Depth
- -5 to -3 feet Depth
- -3 to -1 feet Depth
- -1 to 0 feet Depth
- 0 to 3 feet
- 3 to 5 feet
- Greater than 5 feet

¹ Depth values based on mean-mean low water and grouped to distinguish between the following depths of concern:
- Maximum Potential Impact Depth (-12 feet)
- In-water Draft of AAV (-7 feet)
- Wave Surge Potential Track Impact (-5 feet)
- Track Engagement (-3 feet)
- Reef Flat Maneuver (-1 feet or above)

² Unai Chulu will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.

Source: NAVFAC Pacific 2013; Sea Engineering, Inc. 2014
ES.5.3 Pagan Alternatives

ES.5.3.1 Land Use Agreements

Land use agreements will be required to implement the proposed action on Pagan. Pagan is owned entirely by the CNMI government; there are no federal lands on the island. The federal government would seek to acquire a real estate interest for the entire island of Pagan (approximately 11,794 acres [4,443 hectares]) from the CNMI government. A full discussion of proposed land acquisition and land uses on Pagan is provided in Section 4.7, Land and Submerged Land Use.

ES.5.3.2 Construction and Improvements

Construction and improvements at Pagan RTA would commence only upon completion of required real estate actions. Construction is anticipated to span 8 to 10 years depending on funding and operational commitments of the U.S. military. Construction improvements may be part of initial training exercises on Pagan, and subsequent training events would include maintenance. Construction and improvements for the Pagan action alternatives include two broad categories: (1) support facilities and infrastructure, and (2) training facilities. These are further described below.

Support Facilities and Infrastructure Construction. Support facilities to be constructed include an expeditionary base camp/bivouac area, airfield, expeditionary military training trails, and a temporary Munitions Storage Area.

Training Facilities Construction. The combined level RTA is composed of High Hazard Impact Area(s), maneuver areas, amphibious training beaches, and Landing Zones, regardless of the alternative. To provide the reader with an easier way to identify the various RTA training facilities, they were grouped into two range complexes based on geographic proximity. The complexes are labeled North and South Range Complexes.

ES.5.3.3 Training Operations

The training would occur in two areas identified as the North Range Complex and the South Range Complex.

ES.5.3.3.1 North Range Complex

Ground training in the North Range Complex would include the following:

- High Hazard Impact Area centered on Mount Pagan would be used for ground, air, and naval surface fire support live-fire and inert munitions expenditures.
- Training in the northern maneuver areas includes, but is not limited to: (1) patrolling, establishing defensive positions, and firing live-fire weapons into and/or around the High Hazard Impact Area; and (2) integrating supporting arms (including aviation, artillery, and naval gunfire assets).

Amphibious training would include Amphibious Assault Vehicles and Landing Craft Air Cushion operations. Up to six beaches would be used for amphibious training. Targets along the beachfront
would be established for tactical training (primarily at Red Beach) and a path maintained to provide access to the military trail network. Amphibious forces would maneuver from naval ships via water or air to various locations on Pagan, based on the design of the training exercise.

Landing Zones Training Operations would involve tilt-rotor and rotary-wing aircraft such as CH-53, UH-1, and AH-1 would take off and land from Landing Zones proposed across northern Pagan. Fixed-wing aircraft would use the airfield as would rotor and tilt-rotor aircraft. Live-fire would be allowed at the Landing Zones. Other aviation training would include Drop Zones, unmanned aircraft operating areas, and training flight maneuver areas.

**ES.5.3.3.2 South Range Complex**

The training in the South Range Complex includes the following:

- Maneuver Area Training Operations would involve small units, a platoon or less, of special operations personnel (Navy SEALS; Marine Corps Special Forces Operations Command; Army Rangers, etc.) that would move toward an objective or Observation Post. Troops would access South Pagan via air insertion (e.g., helicopter using fast rope) or using small boat (raiding craft) and swimmers. No tactical Landing Zones would be created in the south. Units would either walk out of the southern area or be extracted by helicopters using Special Control Insertion/Extraction, or small boats.
- Small boat and swimmer training, and combat swimmer training.

**ES.5.3.4 Pagan No-Action Alternative**

As a result of the CNMI government’s mandate prohibiting residents from Pagan because of the 1981 volcano eruption, the island has not been officially occupied and there is limited visitation. The no-action alternative for Pagan assumes the continuation of this occupancy prohibition and limited activity. Therefore, the no-action alternative essentially reflects existing conditions as described in Chapter 3, Affected Environment, of this EIS/OEIS.

The limited visitations under the no-action alternative would continue the infrequent eco-tourism cruise visits. This would be a low impact activity with no permanent pier or wharf construction with visitation facilitated by small boat landings from the larger vessel moored offshore. It is also assumed that these would be day trips with no permanent accommodations on the island. Another probable and low impact activity on Pagan would be periodic visits for scientific or related research conducted by federal and CNMI organizations. Unlike Tinian where the military has long held training exercises on leased land, activities by the military, while not excluded, would be minimal under the no-action alternative and would entail infrequent search and rescue type training exercises following coordination and approval from the CNMI government.

**ES.5.3.5 Comparison of Pagan Alternatives**

Table ES-3 provides a comparison of Pagan combined level action alternatives. It is assumed that training throughput (total personnel) and munitions usage would be the same for both alternatives; however, the type of training and maneuvering capability would vary. Best management practices would be incorporated into the proposed action and common to both Pagan action alternatives. Figures ES-14 and ES-15 show range layouts for Pagan Alternative 1 and Pagan Alternative 2, respectively. Figure ES-16
shows “composite” surface danger zones for both alternatives. The composite consists of individual surface danger zones for all proposed training activities. Typically, only certain surface danger zones within this composite would be active at any given time depending on the type of training being conducted.

Table ES-3. Summary Comparison of Pagan Alternatives

<table>
<thead>
<tr>
<th>Comparison of Pagan Action Alternatives</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Differences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Two High Hazard Impact Areas (on Mount Pagan and isthmus).</td>
<td>• One High Hazard Impact Area (Mount Pagan) and, as a result, smaller surface danger zones.</td>
<td>• Very limited military training and minimal human visitation and related activities</td>
<td></td>
</tr>
<tr>
<td>• Larger High Hazard Impact Areas on Mount Pagan.</td>
<td>• Smaller High Hazard Impact Area on Mount Pagan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 11 Landing Zones</td>
<td>• 13 Landing Zones</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 6 Mortar Range Firing Positions</td>
<td>• 5 Mortar Range Firing Positions</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Simultaneous Use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Both the North and South Complex Ranges could be used at the same time.</td>
<td>• Same as Alternative 1, however, the North Range Complex would only have one High Hazard Impact Area.</td>
<td>• Not applicable</td>
<td></td>
</tr>
<tr>
<td><strong>Training Value</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• This alternative provides greater combined arms training value but less ground maneuver flexibility as compared to Alternative 2.</td>
<td>• Lesser live-fire training options, flexibility in attack approach and more limited options for weapons deployment due to smaller northern High Hazard Impact Area on Mount Pagan and lack of a High Hazard Impact Area on the isthmus.</td>
<td>• Military visits to Pagan would continue to be limited and coordinated with the CNMI government</td>
<td></td>
</tr>
</tbody>
</table>

Elements Common to All Pagan Action Alternatives

<table>
<thead>
<tr>
<th>Training Facilities Construction</th>
<th>Alternatives 1 and 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expeditionary Base Camp/Bivouac Area</strong></td>
<td>Includes bivouac area for tents “housing” personnel. Staging areas for equipment and vehicles, and temporary infrastructure such as water tanks, portable toilets, and diesel generators.</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Airfield Improvements</strong></td>
<td>Includes extending the runway, space for aircraft turnaround and parking, refueling, and munitions loading space.</td>
<td>No activities</td>
</tr>
<tr>
<td><strong>Military Training Trail Network</strong></td>
<td>Includes a 22-mile (35 kilometer) military training trail network from the expeditionary base camp/bivouac area to the North Range Complex.</td>
<td>No activities</td>
</tr>
</tbody>
</table>
### Table ES-3. Summary Comparison of Pagan Alternatives

#### Comparison of Pagan Action Alternatives

<table>
<thead>
<tr>
<th>Training Facilities Construction</th>
<th>Alternatives 1 and 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Range Complex</td>
<td>No construction footprint.</td>
<td>No activities</td>
</tr>
<tr>
<td>Range Operations and Maintenance</td>
<td>Alternatives 1 and 2</td>
<td>No-Action Alternative</td>
</tr>
<tr>
<td>Security</td>
<td>As training cycles are better defined an access plan would be developed and published for public information.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Public Access</td>
<td>Prohibition of public access at all times to the High Hazard Impact Area (s). Portions of the island and surrounding waterways may be available for public access depending on the type of training and the training scenario. Public access would be allowed when training is not occurring.</td>
<td>Access would continue to be limited and coordinated with the CNMI government</td>
</tr>
<tr>
<td>Biosecurity</td>
<td>Biosecurity measures would be established to wash down and inspect equipment prior to arriving on and upon departure from Pagan.</td>
<td>Biosecurity would be done as needed</td>
</tr>
<tr>
<td>Emergency Services</td>
<td>Establishing fire, safety, and medical emergency procedures for all visiting personnel.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Munitions</td>
<td>Total: 700,298 rounds/year</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Amphibious Training Beaches</td>
<td>Alternatives 1 and 2</td>
<td>No-Action Alternative</td>
</tr>
<tr>
<td>Operations</td>
<td>The following amphibious operations would occur:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Red, Green, Blue (Shomshon, Palapala, Apan Beaches) – Amphibious Assault Vehicle, Landing Craft Air Cushion vessel, small boat, and combat swimmer training.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- South (Regussa Beach) would be used for Landing Craft Air Cushion vessel, small boat, and combat swimmer training.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Gold (Unai Dikidiki Beach) would be used for small boat and combat swimmer training.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Public Access to Beaches</td>
<td>Access allowed to Pagan beaches when no training is occurring</td>
<td>No limits to public access beyond those imposed by the CNMI government</td>
</tr>
<tr>
<td>Airspace Requirement</td>
<td>Alternatives 1 and 2</td>
<td>No-Action Alternative</td>
</tr>
<tr>
<td>Operations</td>
<td>Special Use Airspace would be established.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Warning Area 14, a quadrilateral with a dimension of roughly 60 nautical miles by 80 nautical miles (111 kilometers by 148 kilometers), from the center of Pagan. The floor would start at the surface and extend to a ceiling of 59,999 feet (18,288 meters) MSL.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Restricted Area 7204 extends horizontally 12 nautical miles (22 kilometers) from Pagan’s shoreline with a floor starting at the surface to a ceiling of 60,000 feet (18,300 meters) MSL.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Sea Space Requirement</td>
<td>Alternatives 1 and 2</td>
<td>No-Action Alternative</td>
</tr>
<tr>
<td>Operations</td>
<td>Danger zones would be established using the Pagan</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
Table ES-3. Summary Comparison of Pagan Alternatives

<table>
<thead>
<tr>
<th></th>
<th>Comparison of Pagan Action Alternatives</th>
<th>Comparison of Pagan All Action Alternatives: Ground Disturbance and Newly Created Impervious Surfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Restricted Area boundaries. These danger zones would be activated when corresponding airspace is activated.</td>
<td></td>
</tr>
<tr>
<td><strong>Element</strong></td>
<td><strong>Alternative 1</strong></td>
<td><strong>Alternative 2</strong></td>
</tr>
<tr>
<td>Total Ground Disturbance/Newly Created Impervious Surface</td>
<td>Total: 764 acres (310 hectares)/350 acres (142 hectares)</td>
<td>Total: 697 acres (283 hectares)/347 acres (140 hectares)</td>
</tr>
<tr>
<td>Expeditionary Base Camp/Bivouac Area</td>
<td>42 acres (17 hectares) all of which is considered newly created impervious surface</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Expeditionary Airfield</td>
<td>41 acres (17 hectares) all of which is considered newly created impervious surface</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Munitions Storage Area and Supply Route</td>
<td>42 acres (17 hectares)/only 12 acres (5 hectares) is considered newly created impervious surface</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Military Training Trails</td>
<td>39 acres (16 hectares) all of which is considered newly created impervious surface</td>
<td>Not applicable</td>
</tr>
<tr>
<td>North Range Complex (Landing Zones, Firing Positions, Target Areas)</td>
<td>600 acres (243 hectares)/216 acres (88 hectares)</td>
<td>533 acres (241 hectares)/213 acres (86 hectares)</td>
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<tr>
<td>South Range Complex</td>
<td>0 acre (0 hectare)</td>
<td>0 acre (0 hectare)</td>
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Minimal disturbance/no increase in impervious surfaces

Not applicable
Figure ES-14
Pagan Alternative 1
Range Complexes

Legend

- Range Complex
  - North
  - South

Proposed Actions:
- Field Artillery Direct Fire Range Firing Position
- Field Artillery Indirect Firing Position
- Mortar Range Firing Position
- Helicopter Landing Zone

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

- Target Area
- Airfield Runway/Bivouac Area
- High Hazard Impact Area
- Dedicated Live-Fire Maneuver Area
- Non-Live-Fire Maneuver Area
Figure ES-16
Pagan All Action Alternatives Surface Danger Zones
ES.6 **RESOURCE MANAGEMENT MEASURES**

The *Resource Management Measures* section discusses applicable (1) avoidance and minimization measures, and (2) best management practices and standard operating procedures, and how they serve to lessen impacts to specific resources. Resource management measures include avoidance and minimization measures, and best management practices and standard operating procedures. Resource management measures would be incorporated into the proposed action and are common to all action alternatives. Avoidance and minimization measures that further reduce environmental impacts are not necessarily required by law, regulation, or policy. However, they are incorporated into the site planning and design of the proposed action. Examples of avoidance and minimization include moving target locations, moving firing positions, adjusting engagement zones, limiting weapons deployment, adjusting High Hazard Impact Area boundaries, and adjusting use of tactical landing beaches. Best management practices include standard operating procedures and commonly accepted practices routinely implemented by the DoN in design, construction, and operations to provide for the safety of personnel and equipment, as well as aid with regulatory compliance. The EIS/OEIS impact analysis (Chapter 4, *Environmental Consequences*) assumes that resource management measures are successfully incorporated into the proposed action. Best management practices and standard operating procedures are described in Appendix D, *Best Management Practices*.

ES.7 **MITIGATION MEASURES**

For the purpose of this EIS/OEIS, potential mitigation measures are modifications to the proposed action that are implemented for the sole purpose of reducing a specific potential environmental impact on a particular resource or implemented to actively benefit a resource. Potential mitigation measures are considered additional, project-specific measures proposed during the environmental review process and regulatory agency consultation. Examples of potential mitigation measures include habitat restoration to mitigate for habitat removed during construction, and removal of existing non-native species. While resource management measures are incorporated into the proposed action, commitments to specific mitigation measures will be documented through the Record of Decision, a permit/approval, programmatic agreement, or other formal agreement. Potential mitigation measures detailed by resource area are discussed in Chapter 4, *Environmental Consequences*. Potential mitigation measures are described throughout the EIS/OEIS, and are summarized in Table ES-6, and Section 4.20, *Summary of Impacts and Mitigations*.

ES.8 **PREFERRED ALTERNATIVE**

The preferred alternative has been identified as a combination of Tinian Alternative 2 and Pagan Alternative 2.

Tinian Alternative 2 was selected as the preferred alternative for Tinian because it is operationally superior and results in similar environmental impacts as other alternatives. The training flexibility of Tinian Alternative 2 is greater than that of the other action alternatives because it contains two Battle
Area Complexes and a Convoy Course with a greater number of engagement zones. The environmental impacts for Tinian Alternative 2 are similar to those of the other two action alternatives.

Pagan Alternative 2 was selected as the preferred alternative for Pagan because it is operationally similar to Pagan Alternative 1 but results in less environmental impacts. Operationally, Pagan Alternative 2 provides a lesser degree of combined arms training than Pagan Alternative 1; however, Pagan Alternative 2 offers a larger maneuver area within the North Range Complex due to a smaller High Hazard Impact Area on Mount Pagan and lack of a second High Hazard Impact Area on the isthmus. This operational distinction for Pagan Alternative 2 results in less environmental impacts with regard to natural resources (particularly terrestrial biological resources).

ES.9 **OVERVIEW OF ENVIRONMENTAL IMPACTS**

This section summarizes the impacts and potential mitigation measures for the three Tinian alternatives and the two Pagan alternatives analyzed in this EIS/OEIS. Tables ES-4 and ES-5 provide a summary of the impacts for both construction and operation activities for the Tinian and Pagan alternatives. The following acronyms are used in Tables ES-4 and ES-5: NI = no impact; LSI = less than significant impact; SI = significant impact and BI = beneficial impact. Shading is used to highlight the significant impacts. Not Applicable indicates an element or category with no potential for impacts.

Section 4.19 of this EIS/OEIS, *Section 4(f) Evaluation*, provides a Section 4(f) evaluation of the Tinian International Airport improvements and associated historic properties. Section 4(f) of the Department of Transportation Act of 1966, codified in Federal law at 49 United States (U.S.) Code §303, requires that the U.S. government endeavors to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites.

The assessment of cumulative impacts is presented in Chapter 5, *Cumulative Impacts*, of this EIS/OEIS and addresses the potential long-term impacts of present and reasonably foreseeable future projects in conjunction with the proposed action. Cumulative impacts were identified for the following resources within the Tinian study area: noise, airspace, land and submerged land use, recreational resources, terrestrial biology, marine biology, cultural resources. Within the Pagan study area, cumulative impacts were identified for marine biology and cultural resources. The cumulative impacts associated with terrestrial biology, marine biology, and cultural resources would primarily be the result of ground and submerged land disturbance activities. The proposed action, in conjunction with other Department of Defense projects that are considered present or reasonably foreseeable, contribute to the cumulative impacts identified for Pagan and Tinian. No additional mitigation measures beyond those described for the proposed action in Chapter 4, *Environmental Consequences*, are proposed for the potential cumulative impacts on Tinian or Pagan.
### Table ES-4. Summary of Impacts for Tinian Alternatives

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
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<tbody>
<tr>
<td>Geology and Soils</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
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<td>Nearshore Water Resources</td>
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<td>Air Quality</td>
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Table ES-4. Summary of Impacts for Tinian Alternatives

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
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<tbody>
<tr>
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### Table ES-4. Summary of Impacts for Tinian Alternatives

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<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
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### Table ES-4. Summary of Impacts for Tinian Alternatives

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<th>Resource Area</th>
<th>Recreational Area (Construction Only)</th>
<th>Historic and Cultural</th>
<th>Beaches and Parks</th>
<th>Ocean-based Resources</th>
<th>Scenic Points</th>
<th>Annual Events</th>
<th>Training Noise Impacts</th>
<th>Roadway and Access Improvements</th>
<th>Vegetation Communities</th>
<th>Native Wildlife</th>
<th>Special-status Species: Endangered Species Act-listed and Proposed Species</th>
<th>Special-status Species: Migratory Bird Treaty Act</th>
<th>Special-status Species: CNMI-listed Species</th>
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<tr>
<td>Resource Area</td>
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## Table ES-4. Summary of Impacts for Tinian Alternatives

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<tr>
<th>Resource Area</th>
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<td>LSI</td>
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<td>Ushi “Cross” Point A and B (#5 and #6)</td>
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<td>NI (#5); SI (#6)</td>
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<td>NI (#5); SI (#6)</td>
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<td>Blow Hole (#7)</td>
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<td>SI (#8); LSI (#9)</td>
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### Table ES-4. Summary of Impacts for Tinian Alternatives

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<td>Operation</td>
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<td><strong>Hazardous Materials and Waste</strong></td>
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<td>Toxic Substances</td>
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<td>Hazardous Waste</td>
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<td>LSI</td>
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<td>Contaminated Sites</td>
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### Table ES-4. Summary of Impacts for Tinian Alternatives

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<tr>
<th>Resource Area</th>
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<tr>
<td>Public Health and Safety</td>
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Notes: ¹# indicates Key Observation Point (see Section 4.12, Figure 4.12-1).
²A change in population is not considered an impact itself. However, population change has the potential to drive positive or negative impacts to other socioeconomic factors.

Legend: BI = beneficial impact; LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts. Not Applicable indicates an element or category with no potential for impacts.

### Table ES-5. Summary of Impacts for Pagan Alternatives

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<tr>
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Noise

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### Table ES-5. Summary of Impacts for Pagan Alternatives

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## Table ES-5. Summary of Impacts for Pagan Alternatives

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<td>NI</td>
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<tr>
<td>Marine Operations</td>
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Notes: A change in population is not considered an impact itself. However, population change has the potential to drive positive or negative impacts to other socioeconomic factors.

Legend: BI = beneficial impact; LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts. Not Applicable indicates an element or category with no potential for impacts.
Table ES-6. Summary of Potential Mitigation Measures

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Tinian Phase</th>
<th>Pagan Phase</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>AIRSPACE</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Tinian</td>
<td></td>
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</tr>
</tbody>
</table>
| The increase in military air traffic would not restrict access to Tinian International Airport. Private flights could experience minimal delays in departures and arrivals during the time when military aircraft are practicing approaches to the Tinian International Airport runway. Restricted Area 7203 was segmented to minimize impacts to commuter flight traffic between Tinian and Saipan. Civilian aircraft can be routed around the restricted airspace while staying within the minimum safety glide slope except for periods when Restricted Area 7203A/B/C/X/Y/Z/E/W are activated together. Indirect effects such as increased fuel consumption and time en route could be experienced. No impacts would be expected with activation of the Tinian Military Operations Area. | SI mitigated to LSI | - Establish a Letter of Procedure or Joint Use Agreement to accommodate civilian arrivals and departures into the airport.  
- Establish communication procedures between Tinian Range Control and Saipan International Airport Air Traffic Control to ensure priority access to Tinian International Airport for life-flight and other emergency-related activities.  
- Add positive control measures (e.g., air traffic control tower at Tinian, short-range radar on Tinian or Saipan that would allow air traffic controllers to see aircraft operating below 2,000 feet [609 meters]), and communications capability at Saipan or Tinian to ensure non-participating aircraft are advised of military operations.  
- Establish communication procedures to provide immediate feedback between air traffic controllers and range control to accommodate smaller inter-island commuter aircraft travelling between Saipan and Tinian. |                      |            |            |           |
### Table ES-6. Summary of Potential Mitigation Measures

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>Tinian Phase</th>
<th>Pagan Phase</th>
</tr>
</thead>
</table>
| Saipan  | SI/LSI   | • Establish a Letter of Procedure between the Federal Aviation Administration and the U.S. military that contains the procedures for access to the airspace and gives priority to large commercial aircraft. The agreement would ensure proper range scheduling procedures are in place to ensure no significant disruption of normal flights into and out of Saipan International Airport.  
• Electronically monitor each training event through the use of radar and other surveillance equipment such as an expeditionary control tower that would continually monitor the airspace to ensure the safety of the flying public during times when training is occurring.  
• Schedule and coordinate training events with Saipan International Airport arrivals and departures as to not conflict.  
• Establish procedures and communications that allow for air traffic controllers and range controllers to simultaneously see the airspace and ensure priority is given to any aircraft heading to or from Saipan International Airport. In the event of an unforeseen incursion into an active restricted airspace, the simultaneous ability to monitor activities on the ground and in the air should provide the ability to stop any training in seconds. | X |   |
### Table ES-6. Summary of Potential Mitigation Measures

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>Tinian Phase</th>
<th>Pagan Phase</th>
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</thead>
<tbody>
<tr>
<td><strong>LAND AND SUBMERGED LAND USE</strong></td>
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</tbody>
</table>
| **Land Use Within the Military Lease Area – Existing and Planned Land Use** | | • Four areas are being assessed as potential conservation areas for the protection of the Tinian monarch and other wildlife species (Section 4.9, *Terrestrial Biology*, Figure 4.9-2). These areas may also be used for additional natural resource conservation actions such as forest enhancement and/or non-native species control. The Department of Defense is coordinating with the Federal Aviation Administration and the U.S. Fish and Wildlife Service on these potential conservation areas.  
• The DoN has identified and proposed a total of 2,554 acres (1,034 hectares) of land for grazing areas within the Military Lease Area. Of this total 1,010 acres (409 hectares) would be unencumbered and 1,544 acres (625 hectares) would be encumbered by surface danger zones. | | X | |
| **RECREATION** | | | | |
| **Historic and Cultural Attractions** | | • In as much as possible, training would be scheduled around peak tourist holidays, such as the three World War II anniversaries.  
• There is no mitigation currently proposed to minimize this impact to the Shinto Shrine and Hinode American Memorial. The DoN is consulting with the CNMI Historic Preservation Officer and other interested parties regarding impacts to the Shinto Shrine and Hinode American Memorial as part of the Section 106 process (see Appendix N, *Cultural Resources Technical Memo* for a discussion of the consultation process). Potential mitigation will be determined through this consultation process and could include documentation. | | X |
## Table ES-6. Summary of Potential Mitigation Measures

<table>
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<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
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</thead>
<tbody>
<tr>
<td>Annual Events</td>
<td>SI</td>
<td>• In as much as possible, the DoN would coordinate with event sponsors to ensure that training events do not occur during annual events.</td>
</tr>
</tbody>
</table>
| Closure of recreational areas on Tinian during training operations could result in reduced event attendance. Impacts would be mitigated to less than significant with implementation of the potential mitigation measures. | SI       | • Department of Defense may implement forest enhancement on 6.3 acres (2.5 hectares) to replace the area of native limestone forest removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native limestone forest habitats.  
• To avoid and minimize impacts to native limestone forest on Tinian, the Department of Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as “No Wildlife Disturbance Areas,” with the following actions prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian. | X |
| Terrestrial Biology                         | SI       | SI                                                                                          | X |
| Vegetation Communities                      | SI       | SI                                                                                          | X |
| Alternatives 1, 2, and 3: The conversion of 6.3 acres (2.5 hectares) of native limestone forest on Tinian to developed land would be unavoidable. | SI       | SI                                                                                          | X |

### Tinian
- Construction
- Operation

### Pagan
- Construction
- Operation
Table ES-6. Summary of Potential Mitigation Measures

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<thead>
<tr>
<th>Impacts</th>
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<tbody>
<tr>
<td></td>
<td><strong>SI</strong></td>
<td><strong>Tinian.</strong>                                                                                     <strong>Tinian.</strong> Department of Defense may implement forest enhancement in areas of tangantangan or herbaceous scrub habitat to replace the forested habitats removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native forest habitats.  <strong>Pagan Phase</strong></td>
</tr>
<tr>
<td>Native Wildlife</td>
<td><strong>SI</strong></td>
<td><strong>Pagan Phase</strong>                                                                                           <strong>Pagan Phase</strong> Department of Defense may implement forest enhancement in areas of mixed introduced forest, tangantangan, or herbaceous scrub habitat to replace the forest habitat removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native forest habitats.  <strong>Tinian Phase</strong> Department of Defense may replace the current Tinian Military Retention Land for Wildlife Conservation by establishing a conservation area(s) for the protection of the Tinian monarch and other wildlife species with one or more conservation sites within the Military Lease Area. Forest enhancement and non-native species control may also be implemented within the replacement Wildlife Conservation site(s).  <strong>Tinian Phase</strong> To improve habitat quality for native wildlife on Tinian, the Department of Defense may implement monitoring and control of non-native species within forest habitat, including control of non-native plant, mammal, and insect species.  <strong>Pagan Phase</strong> To avoid and minimize impacts to native wildlife species that use native limestone forest on Tinian, the Department of</td>
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### Table ES-6. Summary of Potential Mitigation Measures

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<th>Tinian Phase</th>
<th>Pagan Phase</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as “No Wildlife Disturbance Areas,” with the following actions prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.</td>
<td>Construction</td>
<td>Operation</td>
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</table>

**Special-status Species: Endangered Species Act-listed and Proposed Species**

Noise impacts to foraging Mariana common moorhens at the Mahalang sites from large-caliber munitions on the High Hazard Impact Area would be unavoidable.

| SI                  | To avoid impacts to Mariana common moorhens at the Lake Hagoi and two Bateha wetland sites, the Department of Defense will designate the three wetland sites as “No Training Areas.” Ground disturbance and vegetation removal of any kind will be prohibited within these “No Training Areas.” In addition, CJMT-associated aircraft overflights of these sites will be limited to a minimum altitude of 500 feet (152 meters) above ground level. Wetland “No Training Area” restrictions would be implemented upon initiation of CJMT training activities on Tinian. | X |

- To mitigate for loss of Mariana common moorhen foraging habitat at Mahalang, the Department of Defense may implement portions of the DoN Tinian Wetlands Management Plan at Hagoi and two Bateha sites. This may include non-native plant surveys, monitoring, and control; habitat restoration and improvement; baseline surveys for
Table ES-6. Summary of Potential Mitigation Measures

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<td>moorhen predators; and predator control at Hagoi and Bateha.</td>
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<td></td>
<td></td>
<td>• To avoid and minimize impacts to special-status species that use native limestone forest on Tinian, the Department of Defense will implement training restrictions</td>
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<td>within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as &quot;No Wildlife Disturbance Areas,&quot; with the following actions prohibited:</td>
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<td>off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation</td>
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<tr>
<td></td>
<td></td>
<td>without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will</td>
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<tr>
<td></td>
<td></td>
<td>be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.</td>
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<tr>
<td></td>
<td></td>
<td>• To avoid and minimize impacts to nesting sea turtles, the Department of Defense will implement training protocols at all beaches used for amphibious operations on Tinian.</td>
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<td>Personnel trained in identifying sea turtle nests will survey landing beaches no more than 6 hours prior to the first craft landing or use of other beach landing equipment.</td>
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<td>Any potential sea turtle nests will be flagged, with a buffer zone of 20 feet (6 meters) from the edge of the nesting activity (area disturbed by the turtle) to ensure complete avoidance.</td>
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<td>The flagged area will be avoided by landing craft and personnel. Beach training activities will also be coordinated with monthly sea turtle nest monitoring, during which any</td>
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<td>Impacts</td>
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<td>Potential Mitigation Measures</td>
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<tr>
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<td>potential turtle nests will be flagged, with a buffer zone of 20 feet (6 meters) to ensure avoidance. If an active nest with a pre-hatch hole is discovered on a beach during monitoring, night training over the next 5 nights will be conducted only on other beaches. If beach sand is compacted by landing craft, the beach topography will be restored within 3 days using non-mechanized methods (e.g., rakes or other hand tools). The Department of Defense will implement beach training protocols upon initiation of CJMT amphibious training activities.</td>
</tr>
</tbody>
</table>
| Special-status Species: Migratory Bird Treaty Act-listed Species | SI | • Department of Defense may implement forest enhancement in areas of tangantangan or herbaceous scrub habitat to replace the mixed introduced forest and herbaceous scrub removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native forest habitats.  
• Department of Defense may establish a conservation area for the protection of the Tinian monarch and other wildlife species with one or more conservation sites within the Military Lease Area. Forest enhancement and non-native species control may also be implemented within the wildlife conservation site(s).  
• To avoid and minimize impacts to Migratory Bird Treaty Act-listed species that use native limestone forest on Tinian, the Department of Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as "No Wildlife Disturbance Areas," with the following actions |

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<th>Tinian Phase</th>
<th>Pagan Phase</th>
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<tr>
<td>Construction</td>
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<td>3800</td>
<td>3803</td>
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</table>

Alt. 1: The removal of 1,743 acres (705 hectares) of forest and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the collared kingfisher, Mariana fruit dove, and white-throated ground-dove, would be unavoidable.  
Alt. 2: The removal of 1,885 acres (763 hectares) of forest and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the collared kingfisher, Mariana fruit dove, and white-throated ground-dove, would be unavoidable.  
Alt. 3: The removal of 1,874 acres (758 hectares) of forest and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the collared kingfisher, Mariana fruit dove, and white-throated ground-dove, would be unavoidable.
Table ES-6. Summary of Potential Mitigation Measures

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<td></td>
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<td>prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.</td>
</tr>
</tbody>
</table>

- To improve habitat quality for native wildlife on Tinian, Department of Defense may implement monitoring and control of non-native species within forest habitat, including control of non-native plant, mammal, and insect species.
- To avoid and minimize impacts to Mariana fruit bats and sea turtles, hooded lights will be used to the maximum extent practicable at all new roads and facilities within sea turtle nesting habitat and fruit bat foraging and roosting habitat. “Night-adapted” lights will be installed in the briefing and bleacher areas. Illumination of forests, coastlines, and beaches will be kept to an absolute minimum. Lighting will be designed to meet minimum safety, anti-terrorism, and force protection requirements.
- To avoid impacts to Migratory Bird Treaty Act-listed species that use the Lake Hagoi and two Bateha wetland sites, the Department of Defense will designate the three wetland sites as “No Training Areas.” Ground disturbance and vegetation removal of any kind will be prohibited within these “No Training Areas.” In addition, CJMT-associated aircraft overflights of these sites will be limited to a
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<th>Potential Mitigation Measures</th>
<th>Tinian Phase</th>
<th>Pagan Phase</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>minimum altitude of 500 feet (152 meters) above ground level. Wetland “No Training Area” restrictions would be implemented upon initiation of CJMT training activities on Tinian.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Pagan Vegetation Communities</td>
<td>SI</td>
<td>• To minimize the effects of construction on native vegetation communities on Pagan, Department of Defense may facilitate native habitat regeneration on Pagan by implementing feral ungulate removal. This would consist of active control (i.e. trapping, snaring, shooting) of animals, with the goal of eradicating all feral ungulates from southern Pagan.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Loss of 20 acres (8 hectares) of native forest habitat would result in an unavoidable impact.</td>
<td></td>
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</tbody>
</table>
| Pagan Special-status Species, Endangered Species Act-listed and Proposed Species & CNMI-listed Species | SI       | • To minimize the effects of operations on Mariana fruit bats on Pagan, Department of Defense would facilitate native habitat regeneration on southern Pagan by implementing feral goat and pig removal. This would consist of active control (i.e. trapping, snaring, shooting) of animals, with the goal of eradicating all feral ungulates from southern Pagan.  
• To improve habitat quality for Mariana fruit bats on Pagan, Department of Defense may implement monitoring and control of non-native species within forest habitat, including control of non-native plant, mammal, and insect species.  
• To avoid and minimize impacts to the Mariana fruit bat, Micronesian megapode, and tree snails, the Department of Defense will implement training restrictions within native forest on southern Pagan. All native forest habitat on southern Pagan will be designated as “No Wildlife Disturbance Areas,” with the following actions prohibited: vehicle maneuvers; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation |              | X           |
Table ES-6. Summary of Potential Mitigation Measures

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<th>Potential Mitigation Measures</th>
<th>Tinian Phase</th>
<th>Pagan Phase</th>
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<tr>
<td></td>
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<td>without prior approval; open fires; flights below 500 feet (152 meters) above ground level, with the exception of personnel insertion/extraction via helicopter; and aircraft landings. Any maneuvers conducted in native forest will be on foot. In addition to restricting aircraft flights to a minimum of 500 feet (152 meters) above ground level in southern Pagan, a 0.5-mile (0.8-kilometer) lateral buffer zone will be established for the two fruit bat colonies in southern Pagan. In addition to avoiding and minimizing noise disturbance to fruit bat colonies, the proposed 0.5-mile (0.8-kilometer) buffer zone around each colony will significantly reduce the potential for aircraft strikes of fruit bats. Native forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on southern Pagan.</td>
<td>Construction</td>
<td>Operation</td>
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<tr>
<td>Impacts</td>
<td>Category</td>
<td>Potential Mitigation Measures</td>
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<tr>
<td><strong>MARINE BIOLOGY</strong></td>
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</tbody>
</table>
| Marine Habitat and Essential Fish Habitat | SI | • Department of Defense may consider transplantation of coral species.  
• Department of Defense may consider debris removal and disposal as a one-time effort to collect large quantities of debris from an area such as Dankulo Beach on Tinian.  
• Department of Defense may consider recreational mooring Buys and/or Fish Aggregation Devices to avoid impacts to coral by dropping anchors and to reduce the potential effects on access to fishing areas.  
• Implementation of Marine Species Awareness Training for all lookouts and other key personnel.  
• Additional measures may be recommended during agency consultations. |
|  • Construction of underwater landing areas for Amphibious Assault Vehicles at Unai Chulu would result in the loss of 20.6 acres (8.3 hectares) of marine habitat within these areas impacted by direct and indirect physical disturbance stressors at Unai Chulu.  
• Construction would cause short- and long-term impacts to ecological function, including abundance/distribution of marine organisms.  
• Construction would result in loss/alteration of hard-bottom habitat and bathymetry. | | |
| Marine Invertebrates | SI | See above, *Potential Mitigation Projects to Offset Impacts to Coral.* |
|  • A total area of 20.6 acres (8.3 hectares) of marine habitat that includes coral reef substrate (coral colonies and coral reef habitat) and supports populations of non-coral invertebrates would be directly and indirectly impacted by the construction of the Amphibious Assault Vehicle landing area at Unai Chulu. Adjacent corals outside the Amphibious Assault Vehicles landing areas may be indirectly impacted from the construction activities due to movement of coral rubble, and from the movement of mobile species out of the construction area. Construction would cause direct loss of coral reef substrate: 10.3 acres (4.1 hectares).  
• Amphibious training activities at Unai Babui would | | |
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<tbody>
<tr>
<td>directly impact 3.05 acres (1.2 hectares), 3.83 acres (1.55 hectares)</td>
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<td>would be directly impacted at Unai Lam Lam, and 4.50 acres (1.82 hectares) of marine habitat,</td>
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<td>including corals and coral reef habitat, would be directly impacted at</td>
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<td>Unai Masalok.</td>
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<tr>
<td>Unai Lam Lam, and 4.50 acres</td>
<td>SI</td>
<td>See above, Potential Mitigation Projects to Offset Impacts to Coral.</td>
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<tr>
<td>Special-status Coral Species</td>
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<tr>
<td>• Construction of the Amphibious Assault Vehicle landing area would</td>
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<tr>
<td>cause a loss of 1,344 Acropora globiceps coral colonies at Unai Chulu.</td>
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<td>• At Unai Chulu, an estimate of 995 colonies of Acropora globiceps</td>
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<td>would be likely to be directly affected by training activities. At Unai</td>
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<td>Babui, an estimate of 381 colonies of Acropora globiceps would be</td>
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<td>likely to be directly affected by amphibious landings; at Unai Lam Lam,</td>
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<td>an estimate of 550 colonies of Acropora globiceps would likely be</td>
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<td>directly affected by amphibious landings; and at Unai Masalok, an</td>
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<tr>
<td>estimate of 22 colonies of Acropora globiceps would likely be directly</td>
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<td>affected by amphibious landings.</td>
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<tr>
<td>Special-status Coral Species</td>
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<tr>
<td>Amphibious training activities would cause a loss of 1 Acropora</td>
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<td>globiceps coral colony at Green Beach and an estimated 10,609 colonies</td>
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<td></td>
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<tr>
<td>at South Beach.</td>
<td>SI</td>
<td>• Department of Defense may consider transplantation of coral species.</td>
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<tr>
<td>• Department of Defense may consider debris removal and disposal as a</td>
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<td>• Department of Defense may consider debris removal and disposal as a one-time effort to</td>
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<tr>
<td>one-time effort to collect large quantities of debris from an area such</td>
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<td>collect large quantities of debris from an area such as Gold Beach.</td>
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<td>as Gold Beach.</td>
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<td>• Department of Defense may consider recreational mooring Buoys and/or Fish Aggregation</td>
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<tr>
<td>Devices to avoid impacts to coral by dropping anchors and to reduce</td>
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<td>Devices to avoid impacts to coral by dropping anchors and to reduce the potential effects</td>
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<td>the potential effects on access to fishing areas.</td>
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<td>on access to fishing areas.</td>
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<td></td>
<td>Construction</td>
<td>Operation</td>
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<tr>
<td>Operation</td>
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- Implementation of Marine Species Awareness Training for all lookouts and other key personnel.
- Additional measures may be recommended during agency consultations.

**CULTURAL RESOURCES**

All Tinian alternatives would have a significant direct impact on historic properties in the Military Lease Area, immediately north of Tinian International Airport runways, and at the Port of Tinian.

- *Tinian Alternative 1* would have a significant direct impact to 172 historic properties from construction and to 15 historic properties from operations, as well as significant indirect impacts to 4 historic properties. These historic properties include the North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; World War II-era Japanese and American military sites; and potential traditional cultural properties.

- *Tinian Alternative 2* would have a significant direct impact to 182 historic properties from construction and to 15 historic properties from operations, as well as significant indirect impacts to 4 historic properties. These historic properties include. North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; World War II-era Japanese and American military sites; and potential traditional cultural properties.

**SI mitigated to LSI** Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

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<th>Pagan Phase</th>
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</thead>
<tbody>
<tr>
<td>• Tinian Alternative 3 would have a significant direct impact to 179 historic properties from construction and to 15 historic properties from operation, as well as significant indirect impacts to 4 historic properties. These historic properties include the North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; World War II-era Japanese and American military sites; and potential traditional cultural properties.</td>
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<th>Pagan Phase</th>
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<tbody>
<tr>
<td>All Pagan alternatives would have a significant direct impact to historic properties.</td>
<td></td>
<td>Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.</td>
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<td>• <strong>Pagan Alternative 1</strong> would have a significant direct impact to 27 historic properties and resources of cultural importance in the range complexes and expeditionary area due to vegetation clearance, as well as 54 historic properties due to operations. These historic properties include Pre-Contact latte complexes, pre-World War II Japanese Administration sites, and World War II-era Japanese defensive sites.</td>
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<td>• <strong>Pagan Alternative 2</strong> would have a significant direct impact to 25 historic properties and resources of cultural importance in the range complexes and expeditionary area due to construction, as well as 50 historic properties due to operations. These historic properties include Pre-Contact latte complexes, pre-World War II Japanese Administration sites, and World War II-era Japanese defensive sites.</td>
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</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.

Note: Mitigation measures only change the significance of impacts where noted.
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Draft
Commonwealth of the Northern Mariana Islands
Joint Military Training
Environmental Impact Statement/
Overseas Environmental Impact Statement

Table of Contents

ABSTRACT ........................................................................................................................... A-1
READERS GUIDE ............................................................................................................... A-1
ACRONYMS AND ABBREVIATIONS ............................................................................... A-1
GLOSSARY ........................................................................................................................ A-1
EXECUTIVE SUMMARY .................................................................................................. ES-1

CHAPTER 1 INTRODUCTION .......................................................................................... 1-1

1.1 INTRODUCTION ........................................................................................................ 1-1

1.2 WHY AND HOW THE U.S. MILITARY TRAINS .................................................. 1-4
1.2.1 STATUTORY MISSION ......................................................................................... 1-4
1.2.2 WHY THE U.S. MILITARY TRAINS ................................................................ 1-5
1.2.3 HOW TRAINING IS CONDUCTED .................................................................... 1-6

1.3 PURPOSE OF AND NEED FOR THE PROPOSED ACTION .................................... 1-8
1.3.1 INSTITUTE FOR DEFENSE ANALYSES STUDY ............................................. 1-8
1.3.2 2010 QUADRENNIAL DEFENSE REVIEW ...................................................... 1-8
1.3.3 RE-BALANCE TO THE PACIFIC ..................................................................... 1-9
1.3.4 THE 2+2 STATEMENTS OF APRIL 2012 AND OCT 2013 ............................. 1-9
1.3.5 TRAINING NEEDS ASSESSMENT ................................................................. 1-10
1.3.6 TRAINING REQUIREMENTS AND SITING STUDY ...................................... 1-10
1.3.7 2014 QUADRENNIAL DEFENSE REVIEW ....................................................... 1-11

1.4 THE MARIANA ISLANDS ......................................................................................... 1-11
1.4.1 BACKGROUND .................................................................................................. 1-11
1.4.2 COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS MILITARY LEASE AREAS ........................................ 1-11
1.4.3 COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS MILITARY TRAINING ................................................................. 1-13

1.5 ENVIRONMENTAL REVIEW PROCESS AND PUBLIC INVOLVEMENT ......... 1-16
1.5.1 ENVIRONMENTAL REVIEW PROCESS ......................................................... 1-16
1.5.2 PUBLIC INVOLVEMENT .................................................................................... 1-16
1.5.2.1 Notice of Intent ............................................................................................ 1-16
1.5.2.2 Public Scoping Comment Period ................................................................ 1-17
1.5.2.3 Draft EIS/OEIS .......................................................................................... 1-18
1.5.2.4 Final EIS/OEIS .......................................................................................... 1-19
1.5.2.5 Record of Decision ..................................................................................... 1-19
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5.3 AGENCY AND STAKEHOLDER COORDINATION</td>
<td>1-19</td>
</tr>
<tr>
<td>1.5.3.1 Cooperating Agencies</td>
<td>1-19</td>
</tr>
<tr>
<td>1.5.3.2 Agency Consultation</td>
<td>1-21</td>
</tr>
<tr>
<td>1.5.3.3 Collaborative Stakeholder Coordination</td>
<td>1-21</td>
</tr>
<tr>
<td>1.5.3.4 Federal Actions</td>
<td>1-22</td>
</tr>
<tr>
<td><strong>CHAPTER 2 PROPOSED ACTION AND ALTERNATIVES</strong></td>
<td>2-1</td>
</tr>
<tr>
<td>2.1 OVERVIEW OF THE PROPOSED ACTION</td>
<td>2-1</td>
</tr>
<tr>
<td>2.2 UNIT AND COMBINED LEVEL TRAINING REQUIREMENTS, REPRESENTATIVE</td>
<td>2-4</td>
</tr>
<tr>
<td>TRAINING, WEAPONS, EQUIPMENT, PARTICIPANTS, AND TRAINING SCENARIOS</td>
<td></td>
</tr>
<tr>
<td>2.2.1 UNFILLED UNIT AND COMBINED LEVEL TRAINING REQUIREMENTS</td>
<td>2-4</td>
</tr>
<tr>
<td>2.2.2 REPRESENTATIVE TRAINING</td>
<td>2-6</td>
</tr>
<tr>
<td>2.2.3 REPRESENTATIVE WEAPONS AND EQUIPMENT</td>
<td>2-8</td>
</tr>
<tr>
<td>2.2.4 REPRESENTATIVE LIVE-FIRE TRAINING PARTICIPANTS AND SCENARIOS</td>
<td>2-13</td>
</tr>
<tr>
<td>2.2.4.1 Unit Level Training Participants</td>
<td>2-13</td>
</tr>
<tr>
<td>2.2.4.2 Unit Level Training Scenario</td>
<td>2-16</td>
</tr>
<tr>
<td>2.2.4.3 Combined Level Training Participants</td>
<td>2-18</td>
</tr>
<tr>
<td>2.2.4.4 Combined Level Training Scenario</td>
<td>2-20</td>
</tr>
<tr>
<td>2.3 ALTERNATIVES DEVELOPMENT</td>
<td>2-22</td>
</tr>
<tr>
<td>2.3.1 OPERATIONAL SITING CRITERIA</td>
<td></td>
</tr>
<tr>
<td>2.3.2 DEVELOPMENT OF UNIT LEVEL RANGE AND TRAINING AREA ALTERNATIVES ON</td>
<td>2-24</td>
</tr>
<tr>
<td>TINIAN</td>
<td></td>
</tr>
<tr>
<td>2.3.2.1 Initial Development of Tinian Unit Level Range and Training</td>
<td>2-25</td>
</tr>
<tr>
<td>Area Alternatives</td>
<td></td>
</tr>
<tr>
<td>2.3.2.2 Refinement of Tinian Unit Level Range and Training Area</td>
<td>2-26</td>
</tr>
<tr>
<td>Alternatives</td>
<td></td>
</tr>
<tr>
<td>2.3.3 DEVELOPMENT OF COMBINED LEVEL RANGE AND TRAINING AREA ALTERNATIVES</td>
<td>2-28</td>
</tr>
<tr>
<td>ON PAGAN</td>
<td></td>
</tr>
<tr>
<td>2.3.3.1 Initial Development of Pagan Combined Level Range and Training</td>
<td>2-28</td>
</tr>
<tr>
<td>Area Alternatives</td>
<td></td>
</tr>
<tr>
<td>2.3.3.2 Refinement of Pagan Combined Level Range and Training Area</td>
<td>2-29</td>
</tr>
<tr>
<td>Alternatives</td>
<td></td>
</tr>
<tr>
<td>2.3.4 ACTION ALTERNATIVES CARRIED FORWARD FOR ANALYSIS</td>
<td>2-30</td>
</tr>
<tr>
<td>2.4 TINIAN ALTERNATIVES</td>
<td>2-30</td>
</tr>
<tr>
<td>2.4.1 ELEMENTS COMMON TO ALL ACTION ALTERNATIVES</td>
<td>2-31</td>
</tr>
<tr>
<td>2.4.1.1 Land Use Agreements</td>
<td>2-33</td>
</tr>
<tr>
<td>2.4.1.2 Construction and Improvements</td>
<td>2-33</td>
</tr>
<tr>
<td>2.4.1.3 Training Operations</td>
<td>2-67</td>
</tr>
<tr>
<td>2.4.1.4 Operation and Management of Tinian Range and Training Area</td>
<td>2-74</td>
</tr>
<tr>
<td>2.4.1.5 Transportation</td>
<td>2-78</td>
</tr>
<tr>
<td>2.4.1.6 Munitions</td>
<td>2-79</td>
</tr>
<tr>
<td>2.4.1.7 Danger Zones</td>
<td>2-81</td>
</tr>
<tr>
<td>2.4.1.8 Airspace Requirements</td>
<td>2-81</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>2.4.1.9</td>
<td>Sea Space Requirements</td>
</tr>
<tr>
<td>2.4.2</td>
<td>Tinian Alternative 1</td>
</tr>
<tr>
<td>2.4.2.1</td>
<td>Construction and Improvements</td>
</tr>
<tr>
<td>2.4.2.2</td>
<td>Training</td>
</tr>
<tr>
<td>2.4.3</td>
<td>Tinian Alternative 2</td>
</tr>
<tr>
<td>2.4.3.1</td>
<td>Construction and Improvements</td>
</tr>
<tr>
<td>2.4.3.2</td>
<td>Training</td>
</tr>
<tr>
<td>2.4.4</td>
<td>Tinian Alternative 3</td>
</tr>
<tr>
<td>2.4.4.1</td>
<td>Construction and Improvements</td>
</tr>
<tr>
<td>2.4.4.2</td>
<td>Training</td>
</tr>
<tr>
<td>2.4.5</td>
<td>Tinian No-Action Alternative</td>
</tr>
<tr>
<td>2.4.5.1</td>
<td>Mariana Islands Range Complex</td>
</tr>
<tr>
<td>2.4.5.2</td>
<td>Current Training Operations on Tinian</td>
</tr>
<tr>
<td>2.4.5.3</td>
<td>Additional Ranges and Training</td>
</tr>
<tr>
<td>2.4.6</td>
<td>Summary Comparison of Tinian Alternatives</td>
</tr>
<tr>
<td>2.5</td>
<td>Pagan Alternatives</td>
</tr>
<tr>
<td>2.5.1</td>
<td>Elements Common to All Action Alternatives</td>
</tr>
<tr>
<td>2.5.1.1</td>
<td>Land Use Agreements</td>
</tr>
<tr>
<td>2.5.1.2</td>
<td>Construction and Improvements</td>
</tr>
<tr>
<td>2.5.1.3</td>
<td>Training Operations</td>
</tr>
<tr>
<td>2.5.1.4</td>
<td>Operation and Management of Pagan Range and Training Area</td>
</tr>
<tr>
<td>2.5.1.5</td>
<td>Transportation</td>
</tr>
<tr>
<td>2.5.1.6</td>
<td>Munitions</td>
</tr>
<tr>
<td>2.5.1.7</td>
<td>Danger Zones</td>
</tr>
<tr>
<td>2.5.1.8</td>
<td>Airspace Requirements</td>
</tr>
<tr>
<td>2.5.1.9</td>
<td>Sea Space Requirements</td>
</tr>
<tr>
<td>2.5.2</td>
<td>Pagan Alternative 1</td>
</tr>
<tr>
<td>2.5.2.1</td>
<td>Construction and Improvements</td>
</tr>
<tr>
<td>2.5.2.2</td>
<td>Training</td>
</tr>
<tr>
<td>2.5.3</td>
<td>Pagan Alternative 2</td>
</tr>
<tr>
<td>2.5.3.1</td>
<td>Construction and Improvements</td>
</tr>
<tr>
<td>2.5.3.2</td>
<td>Training</td>
</tr>
<tr>
<td>2.5.4</td>
<td>Pagan No-Action Alternative</td>
</tr>
<tr>
<td>2.5.5</td>
<td>Summary Comparison of Pagan Alternatives</td>
</tr>
<tr>
<td>2.6</td>
<td>Alternatives Considered But Eliminated from Detailed Analysis</td>
</tr>
<tr>
<td>2.6.1</td>
<td>Alternatives Outside of the CNMI</td>
</tr>
<tr>
<td>2.6.2</td>
<td>Alternatives with a Single Location Within the CNMI</td>
</tr>
<tr>
<td>2.7</td>
<td>Preferred Alternative</td>
</tr>
</tbody>
</table>

CHAPTER 3  
Affected Environment  

3.1  
Introduction  

3.2  
Geology and Soils  

iii
3.2.1 DEFINITION .................................................................................................................. 3-1
3.2.2 REGULATORY FRAMEWORK ..................................................................................... 3-2
   3.2.2.1 Federal Regulations and Codes ............................................................................. 3-2
   3.2.2.2 CNMI Regulation .................................................................................................. 3-2
3.2.3 METHODOLOGY .......................................................................................................... 3-3
3.2.4 REGIONAL GEOLOGIC SETTING ............................................................................... 3-3
3.2.5 TINIAN ......................................................................................................................... 3-5
   3.2.5.1 Topography ........................................................................................................... 3-5
   3.2.5.2 Geology ................................................................................................................ 3-7
   3.2.5.3 Soils ....................................................................................................................... 3-12
3.2.6 PAGAN ......................................................................................................................... 3-15
   3.2.6.1 Topography ........................................................................................................... 3-15
   3.2.6.2 Geology ................................................................................................................ 3-18
   3.2.6.3 Soils ....................................................................................................................... 3-23
3.3 WATER RESOURCES ..................................................................................................... 3-24
3.3.1 DEFINITION ............................................................................................................... 3-24
3.3.2 REGULATORY FRAMEWORK ..................................................................................... 3-25
   3.3.2.1 Federal Regulation ............................................................................................... 3-25
   3.3.2.2 CNMI Regulation .................................................................................................. 3-25
3.3.3 METHODOLOGY .......................................................................................................... 3-26
3.3.4 TINIAN ......................................................................................................................... 3-26
   3.3.4.1 Surface Water Resources ..................................................................................... 3-26
   3.3.4.2 Groundwater Resources ..................................................................................... 3-31
   3.3.4.3 Nearshore Waters ................................................................................................. 3-35
3.3.5 PAGAN ......................................................................................................................... 3-37
   3.3.5.1 Surface Water Resources ..................................................................................... 3-37
   3.3.5.2 Groundwater Resources ..................................................................................... 3-41
   3.3.5.3 Nearshore Waters ................................................................................................. 3-41
3.4 AIR QUALITY .................................................................................................................... 3-43
3.4.1 DEFINITION ............................................................................................................... 3-43
3.4.2 REGULATORY FRAMEWORK ..................................................................................... 3-43
3.4.3 METHODOLOGY .......................................................................................................... 3-44
3.4.4 TINIAN ......................................................................................................................... 3-44
3.4.5 PAGAN ......................................................................................................................... 3-45
3.5 NOISE .............................................................................................................................. 3-46
3.5.1 DEFINITION ............................................................................................................... 3-46
   3.5.1.1 Sound Level .......................................................................................................... 3-46
   3.5.1.2 Frequency Weighting (A and C Weighting) .......................................................... 3-47
   3.5.1.3 Noise Metrics ........................................................................................................ 3-47
   3.5.1.4 Noise Modeling ..................................................................................................... 3-48
   3.5.1.5 Noise Zones ......................................................................................................... 3-48
3.5.2 REGULATORY FRAMEWORK ................................................................. 3-48
3.5.3 METHODOLOGY .............................................................................. 3-51
3.5.4 TINIAN .............................................................................................. 3-51
  3.5.4.1 Ground-based Military Training Activities .................................. 3-52
  3.5.4.2 Aircraft and Airspace Activities .................................................. 3-52
  3.5.4.2.2 Tinian International Airport .................................................... 3-53
  3.5.4.3 Waterborne Activities ................................................................. 3-55
  3.5.4.4 Traffic ......................................................................................... 3-55
  3.5.4.5 Pagan ......................................................................................... 3-56

3.6 AIRSPACE .............................................................................................. 3-57
  3.6.1 DEFINITION ................................................................................... 3-58
  3.6.2 REGULATORY FRAMEWORK .......................................................... 3-62
  3.6.3 METHODOLOGY ............................................................................ 3-63
  3.6.4 TINIAN .............................................................................................. 3-63
    3.6.4.1 Tinian International Airport ....................................................... 3-64
    3.6.4.2 Tinian North Field ................................................................. 3-66
    3.6.4.3 Saipan International Airport .................................................... 3-66
    3.6.4.4 Airspace Designated for Military Use ...................................... 3-68
    3.6.4.5 Commercial Aviation Routes ................................................. 3-70
    3.6.4.6 Airspace Obstructions .............................................................. 3-71

3.6.5 PAGAN .............................................................................................. 3-73
  3.6.5.1 Airspace Designated for Military Use ......................................... 3-73
  3.6.5.2 Aviation Routes ......................................................................... 3-73
  3.6.5.3 Airspace Obstructions ................................................................. 3-74

3.7 LAND AND SUBMERGED LAND USE ................................................... 3-75
  3.7.1 DEFINITION ................................................................................... 3-75
  3.7.2 REGULATORY FRAMEWORK .......................................................... 3-77
    3.7.2.1 Federal Regulations .................................................................. 3-77
    3.7.2.2 CNMI Regulations ................................................................. 3-77
    3.7.2.3 U.S.-CNMI Covenant and Lease Agreements .......................... 3-78
  3.7.3 METHODOLOGY ............................................................................ 3-79
    3.7.3.1 The CNMI Coastal Resources Management Plan ...................... 3-79
    3.7.3.2 The CNMI Land Use Plans ..................................................... 3-80
    3.7.3.3 The CNMI Homestead Program .............................................. 3-80
  3.7.4 TINIAN .............................................................................................. 3-81
    3.7.4.1 Jurisdictional Control and Management ................................... 3-81
    3.7.4.2 Existing Land Use .................................................................... 3-87
    3.7.4.3 Existing Submerged Land Use ................................................ 3-90
    3.7.4.4 Tinian Land Use Plans ............................................................ 3-90
    3.7.4.5 Saipan Existing Land and Submerged Land Use ....................... 3-90
  3.7.5 PAGAN .............................................................................................. 3-91
    3.7.5.1 Land Jurisdictional Control and Management .......................... 3-91
    3.7.5.2 Existing Land Use .................................................................... 3-91
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.8.3</td>
<td>METHODOLOGY</td>
<td>3-95</td>
</tr>
<tr>
<td>3.8.4.1</td>
<td>Historic and Cultural Sites</td>
<td>3-95</td>
</tr>
<tr>
<td>3.8.4.2</td>
<td>Beaches and Parks</td>
<td>3-102</td>
</tr>
<tr>
<td>3.8.4.3</td>
<td>Ocean-based Resources</td>
<td>3-105</td>
</tr>
<tr>
<td>3.8.4.4</td>
<td>Scenic Points</td>
<td>3-107</td>
</tr>
<tr>
<td>3.8.4.5</td>
<td>Annual Events</td>
<td>3-107</td>
</tr>
<tr>
<td>3.9</td>
<td>TERRESTRIAL BIOLOGY</td>
<td>3-110</td>
</tr>
<tr>
<td>3.9.1.1</td>
<td>Vegetation Communities</td>
<td>3-110</td>
</tr>
<tr>
<td>3.9.1.2</td>
<td>Wildlife</td>
<td>3-110</td>
</tr>
<tr>
<td>3.9.1.3</td>
<td>Special-status Species</td>
<td>3-110</td>
</tr>
<tr>
<td>3.9.2</td>
<td>REGULATORY FRAMEWORK</td>
<td>3-111</td>
</tr>
<tr>
<td>3.9.3</td>
<td>METHODOLOGY</td>
<td>3-111</td>
</tr>
<tr>
<td>3.9.3.1</td>
<td>Study Areas</td>
<td>3-111</td>
</tr>
<tr>
<td>3.9.3.2</td>
<td>Data Sources and Surveys</td>
<td>3-111</td>
</tr>
<tr>
<td>3.9.4</td>
<td>TINIAN</td>
<td>3-112</td>
</tr>
<tr>
<td>3.9.4.1</td>
<td>Vegetation Communities</td>
<td>3-112</td>
</tr>
<tr>
<td>3.9.4.2</td>
<td>Native Wildlife</td>
<td>3-117</td>
</tr>
<tr>
<td>3.9.4.3</td>
<td>Non-native Wildlife</td>
<td>3-121</td>
</tr>
<tr>
<td>3.9.4.4</td>
<td>Special-status Species</td>
<td>3-123</td>
</tr>
<tr>
<td>3.9.5</td>
<td>PAGAN</td>
<td>3-133</td>
</tr>
<tr>
<td>3.9.5.1</td>
<td>Vegetation Communities</td>
<td>3-133</td>
</tr>
<tr>
<td>3.9.5.2</td>
<td>Native Wildlife</td>
<td>3-138</td>
</tr>
<tr>
<td>3.9.5.3</td>
<td>Non-native Wildlife</td>
<td>3-139</td>
</tr>
<tr>
<td>3.9.5.4</td>
<td>Special-status Species</td>
<td>3-140</td>
</tr>
<tr>
<td>3.10</td>
<td>MARINE BIOLOGY</td>
<td>3-144</td>
</tr>
<tr>
<td>3.10.1.1</td>
<td>Marine Habitat and Essential Fish Habitat</td>
<td>3-144</td>
</tr>
<tr>
<td>3.10.1.2</td>
<td>Marine Flora</td>
<td>3-146</td>
</tr>
<tr>
<td>3.10.1.3</td>
<td>Marine Invertebrates</td>
<td>3-147</td>
</tr>
<tr>
<td>3.10.1.4</td>
<td>Fish</td>
<td>3-148</td>
</tr>
<tr>
<td>3.10.1.5</td>
<td>Special-status Species</td>
<td>3-148</td>
</tr>
<tr>
<td>3.10.2</td>
<td>REGULATORY FRAMEWORK</td>
<td>3-149</td>
</tr>
<tr>
<td>3.10.2.1</td>
<td>Federal Regulations</td>
<td>3-149</td>
</tr>
<tr>
<td>3.10.3</td>
<td>METHODOLOGY</td>
<td>3-150</td>
</tr>
</tbody>
</table>
## Table of Contents

3.10.4 **TINIAN** .................................................................................................................. 3-150
- 3.10.4.1 Marine Habitat and Essential Fish Habitat .......................................................... 3-150
- 3.10.4.2 Marine Flora ........................................................................................................ 3-154
- 3.10.4.3 Marine Invertebrates ........................................................................................... 3-155
- 3.10.4.4 Fish ..................................................................................................................... 3-165
- 3.10.4.5 Special-status Species ......................................................................................... 3-166

3.10.5 **PAGAN** .................................................................................................................. 3-175
- 3.10.5.1 Marine Habitats ................................................................................................. 3-175
- 3.10.5.2 Marine Flora ........................................................................................................ 3-178
- 3.10.5.3 Marine Invertebrates ........................................................................................... 3-178
- 3.10.5.4 Fish ..................................................................................................................... 3-190
- 3.10.5.5 Special-status Species ......................................................................................... 3-190

### 3.11 CULTURAL RESOURCES ......................................................................................... 3-196
  - 3.11.1 **DEFINITION** ........................................................................................................ 3-196
  - 3.11.2 **REGULATORY FRAMEWORK** ........................................................................... 3-197
  - 3.11.3 **METHODOLOGY** ............................................................................................... 3-197
  - 3.11.4 **TINIAN** ................................................................................................................ 3-197
    - 3.11.4.1 Previous Cultural Resource Studies and Recorded Resources ......................... 3-199
  - 3.11.5 **PAGAN** ................................................................................................................ 3-201
    - 3.11.5.1 Previous Cultural Resource Studies and Recorded Resources ......................... 3-201

### 3.12 VISUAL RESOURCES ............................................................................................... 3-203
  - 3.12.1 **DEFINITION** ........................................................................................................ 3-203
  - 3.12.2 **REGULATORY FRAMEWORK** ........................................................................... 3-203
  - 3.12.3 **METHODOLOGY** ............................................................................................... 3-203
  - 3.12.4 **TINIAN** ................................................................................................................ 3-204
    - 3.12.4.1 Regional Visual Environment and Study Area ............................................... 3-204
    - 3.12.4.2 North Lowland ................................................................................................. 3-206
    - 3.12.4.3 West Tinian ...................................................................................................... 3-210
    - 3.12.4.4 East Tinian ...................................................................................................... 3-212
  - 3.12.5 **PAGAN** ................................................................................................................ 3-215
    - 3.12.5.1 North Pagan .................................................................................................... 3-215
    - 3.12.5.2 Central Pagan .................................................................................................. 3-218
    - 3.12.5.3 South Pagan .................................................................................................... 3-218

### 3.13 TRANSPORTATION ................................................................................................. 3-219
  - 3.13.1 **DEFINITION** ........................................................................................................ 3-219
  - 3.13.2 **REGULATORY FRAMEWORK** ........................................................................... 3-219
    - 3.13.2.1 Air Transportation ......................................................................................... 3-219
    - 3.13.2.2 Ground Transportation .................................................................................. 3-220
    - 3.13.2.3 Marine Transportation ................................................................................... 3-220
  - 3.13.3 **METHODOLOGY** ............................................................................................... 3-220
    - 3.13.3.1 Air Transportation ......................................................................................... 3-220
    - 3.13.3.2 Ground Transportation .................................................................................. 3-220
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.13.3</td>
<td>Marine Transportation</td>
<td>3-220</td>
</tr>
<tr>
<td>3.13.4</td>
<td>TIWNAN</td>
<td>3-221</td>
</tr>
<tr>
<td>3.13.4.1</td>
<td>Air Transportation</td>
<td>3-221</td>
</tr>
<tr>
<td>3.13.4.2</td>
<td>Ground Transportation</td>
<td>3-223</td>
</tr>
<tr>
<td>3.13.4.3</td>
<td>Marine Transportation</td>
<td>3-226</td>
</tr>
<tr>
<td>3.13.5</td>
<td>PAGAN</td>
<td>3-228</td>
</tr>
<tr>
<td>3.13.5.1</td>
<td>Air Transportation</td>
<td>3-228</td>
</tr>
<tr>
<td>3.13.5.2</td>
<td>Ground Transportation</td>
<td>3-228</td>
</tr>
<tr>
<td>3.13.5.3</td>
<td>Marine Transportation</td>
<td>3-228</td>
</tr>
<tr>
<td>3.14</td>
<td>UTILITIES</td>
<td>3-230</td>
</tr>
<tr>
<td>3.14.1</td>
<td>DEFINITION</td>
<td>3-230</td>
</tr>
<tr>
<td>3.14.2</td>
<td>REGULATORY FRAMEWORK</td>
<td>3-230</td>
</tr>
<tr>
<td>3.14.3</td>
<td>METHODOLOGY</td>
<td>3-231</td>
</tr>
<tr>
<td>3.14.4</td>
<td>TIWNAN</td>
<td>3-231</td>
</tr>
<tr>
<td>3.14.4.1</td>
<td>Electrical Power</td>
<td>3-231</td>
</tr>
<tr>
<td>3.14.4.2</td>
<td>Potable Water</td>
<td>3-234</td>
</tr>
<tr>
<td>3.14.4.3</td>
<td>Wastewater</td>
<td>3-237</td>
</tr>
<tr>
<td>3.14.4.4</td>
<td>Stormwater</td>
<td>3-239</td>
</tr>
<tr>
<td>3.14.4.5</td>
<td>Solid Waste</td>
<td>3-239</td>
</tr>
<tr>
<td>3.14.4.6</td>
<td>Information Technology/Communications</td>
<td>3-241</td>
</tr>
<tr>
<td>3.14.5</td>
<td>PAGAN</td>
<td>3-241</td>
</tr>
<tr>
<td>3.14.5.1</td>
<td>Electrical Power</td>
<td>3-241</td>
</tr>
<tr>
<td>3.14.5.2</td>
<td>Potable Water</td>
<td>3-241</td>
</tr>
<tr>
<td>3.14.5.3</td>
<td>Wastewater</td>
<td>3-242</td>
</tr>
<tr>
<td>3.14.5.4</td>
<td>Stormwater</td>
<td>3-242</td>
</tr>
<tr>
<td>3.14.5.5</td>
<td>Solid Waste</td>
<td>3-242</td>
</tr>
<tr>
<td>3.14.5.6</td>
<td>Information Technology/Communications</td>
<td>3-242</td>
</tr>
<tr>
<td>3.15</td>
<td>SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE</td>
<td>3-243</td>
</tr>
<tr>
<td>3.15.1</td>
<td>DEFINITION</td>
<td>3-243</td>
</tr>
<tr>
<td>3.15.2</td>
<td>REGULATORY FRAMEWORK</td>
<td>3-244</td>
</tr>
<tr>
<td>3.15.3</td>
<td>METHODOLOGY</td>
<td>3-244</td>
</tr>
<tr>
<td>3.15.4</td>
<td>SOCIOECONOMIC CONTEXT</td>
<td>3-245</td>
</tr>
<tr>
<td>3.15.4.1</td>
<td>Commonwealth of the Northern Mariana Islands</td>
<td>3-245</td>
</tr>
<tr>
<td>3.15.4.2</td>
<td>Tinian</td>
<td>3-246</td>
</tr>
<tr>
<td>3.15.4.3</td>
<td>Pagan</td>
<td>3-246</td>
</tr>
<tr>
<td>3.15.5</td>
<td>POPULATION CHARACTERISTICS</td>
<td>3-247</td>
</tr>
<tr>
<td>3.15.6</td>
<td>ECONOMIC CHARACTERISTICS</td>
<td>3-248</td>
</tr>
<tr>
<td>3.15.6.1</td>
<td>Employment and Income</td>
<td>3-248</td>
</tr>
<tr>
<td>3.15.6.2</td>
<td>Gross Domestic Product</td>
<td>3-250</td>
</tr>
<tr>
<td>3.15.6.3</td>
<td>Commonwealth Government Finances</td>
<td>3-250</td>
</tr>
<tr>
<td>3.15.6.4</td>
<td>Housing</td>
<td>3-251</td>
</tr>
<tr>
<td>3.15.6.5</td>
<td>Tourism</td>
<td>3-251</td>
</tr>
<tr>
<td>3.15.6.6</td>
<td>Commercial Agriculture</td>
<td>3-253</td>
</tr>
</tbody>
</table>
3.15.7 PUBLIC SERVICES................................................................. 3-259
  3.15.7.1 Education ................................................................. 3-259
  3.15.7.2 Emergency Services.............................................. 3-260
  3.15.7.3 Health................................................................. 3-261

3.15.8 SOCIAL AND COMMUNITY TOPICS.................................. 3-262
  3.15.8.1 CNMI ..................................................................... 3-262
  3.15.8.2 Tinian..................................................................... 3-263
  3.15.8.3 Pagan..................................................................... 3-264

3.15.9 ENVIRONMENTAL JUSTICE AND THE PROTECTION OF CHILDREN ................................................................. 3-265
  3.15.9.1 Minority Population Areas .................................... 3-265
  3.15.9.2 Low-income Population Areas ............................... 3-266
  3.15.9.3 Areas with High Concentration of Children  .......... 3-268

3.16 HAZARDOUS MATERIALS AND WASTE .................................. 3-271
  3.16.1 DEFINITIONS ................................................................. 3-271
  3.16.1.1 Hazardous Materials .............................................. 3-271
  3.16.1.2 Toxic Substances ................................................... 3-271
  3.16.1.3 Hazardous Waste ................................................... 3-272
  3.16.1.4 Contaminated Sites ............................................... 3-272

3.16.2 REGULATORY FRAMEWORK ............................................ 3-274
  3.16.2.1 Federal Regulations .............................................. 3-274
  3.16.2.2 CNMI Regulations .................................................. 3-275

3.16.3 METHODOLOGY............................................................... 3-275

3.16.4 TINIAN ................................................................. 3-275
  3.16.4.1 Hazardous Materials .............................................. 3-276
  3.16.4.2 Toxic Substances ................................................... 3-278
  3.16.4.3 Hazardous Waste ................................................... 3-280
  3.16.4.4 Potential and Confirmed Contaminated Sites .......... 3-281

3.16.5 PAGAN ................................................................. 3-291
  3.16.5.1 Hazardous Materials .............................................. 3-291
  3.16.5.2 Toxic Substances ................................................... 3-291
  3.16.5.3 Hazardous Waste ................................................... 3-291
  3.16.5.4 Potentially and Confirmed Contaminated Sites ....... 3-291

3.17 PUBLIC HEALTH AND SAFETY ............................................. 3-294
  3.17.1 DEFINITION ................................................................. 3-294

  3.17.2 REGULATORY FRAMEWORK ........................................... 3-294

  3.17.3 METHODOLOGY ........................................................... 3-295

  3.17.4 TINIAN ................................................................. 3-295
3.17.4.1 Aircraft Operations ........................................... 3-295
3.17.4.2 Ground Operations .......................................... 3-298
3.17.4.3 Marine Operations ......................................... 3-301
3.17.5 PAGAN .................................................................. 3-302
   3.17.5.1 Aircraft Operations ..................................... 3-302
   3.17.5.2 Ground Operations ....................................... 3-302
   3.17.5.3 Marine Operations ....................................... 3-303

CHAPTER 4  ENVIRONMENTAL CONSEQUENCES ................................................. 4-1

4.1  INTRODUCTION .................................................................. 4-1
  4.1.1 ENVIRONMENTAL RESOURCE SECTIONS ......................... 4-1
  4.1.2 APPROACH TO ANALYSIS ........................................... 4-1
  4.1.3 RESOURCE MANAGEMENT MEASURES .......................... 4-1
  4.1.4 ACTION ALTERNATIVES ............................................ 4-2
  4.1.5 CONSTRUCTION AND OPERATION IMPACTS ...................... 4-2
     4.1.5.1 Impact Determination ........................................... 4-2
     4.1.5.2 Potential Mitigation Measures ................................. 4-2
  4.1.6 NO-ACTION ALTERNATIVE .......................................... 4-3
  4.1.7 PROGRAMMATIC ANALYSIS .......................................... 4-3
  4.1.8 SECTION 4(f) EVALUATION ........................................ 4-3
  4.1.9 SUMMARY OF IMPACTS AND MITIGATIONS ...................... 4-3

4.2  GEOLOGY AND SOILS ............................................................. 4-4
  4.2.1 APPROACH TO ANALYSIS ........................................... 4-4
  4.2.2 RESOURCE MANAGEMENT MEASURES ........................ 4-5
     4.2.2.1 Avoidance and Minimization Measures ....................... 4-5
     4.2.2.2 Best Management Practices and Standard Operating Procedures .... 4-5
  4.2.3 TINIAN ....................................................................... 4-6
    4.2.3.1 Tinian Alternative 1 ............................................... 4-6
    4.2.3.2 Tinian Alternative 2 ............................................... 4-17
    4.2.3.3 Tinian Alternative 3 ............................................... 4-21
    4.2.3.4 Tinian No-Action Alternative .................................. 4-25
    4.2.3.5 Summary of Impacts for Tinian Alternatives .................. 4-26
  4.2.4 PAGAN ..................................................................... 4-27
    4.2.4.1 Pagan Alternative 1 ............................................. 4-27
    4.2.4.2 Pagan Alternative 2 ............................................. 4-33
    4.2.4.3 Pagan No-Action Alternative .................................. 4-35
    4.2.4.4 Summary of Impacts for Pagan Alternatives .................. 4-35

4.3  WATER RESOURCES ............................................................... 4-36
  4.3.1 APPROACH TO ANALYSIS ........................................... 4-36
     4.3.1.1 Surface Water ..................................................... 4-36
     4.3.1.2 Groundwater ..................................................... 4-36
     4.3.1.3 Nearshore Waters ............................................... 4-37
4.3.2 RESOURCE MANAGEMENT MEASURES .......................................................... 4-37
  4.3.2.1 Avoidance and Minimization Measures ............................................. 4-37
  4.3.2.2 Best Management Practices and Standard Operating Procedures ....... 4-38

4.3.3 TINIAN ........................................................................................................ 4-40
  4.3.3.1 Tinian Alternative 1 ............................................................................. 4-40
  4.3.3.2 Tinian Alternative 2 ........................................................................... 4-51
  4.3.3.3 Tinian Alternative 3 ........................................................................... 4-53
  4.3.3.4 Tinian No-Action Alternative ............................................................. 4-53
  4.3.3.5 Summary of Impacts for Tinian Alternatives .................................. 4-55

4.3.4 PAGAN ......................................................................................................... 4-56
  4.3.4.1 Pagan Alternative 1 ........................................................................... 4-56
  4.3.4.2 Pagan Alternative 2 ........................................................................... 4-62
  4.3.4.3 Pagan No-Action Alternative ............................................................. 4-62
  4.3.4.4 Summary of Impacts for Pagan Alternatives .................................. 4-64

4.4 AIR QUALITY .................................................................................................. 4-65
  4.4.1 APPROACH TO ANALYSIS ................................................................. 4-65
     4.4.1.1 Construction .................................................................................... 4-66
     4.4.1.2 Operation ....................................................................................... 4-67
  4.4.2 RESOURCE MANAGEMENT MEASURES ............................................. 4-68
  4.4.3 TINIAN ........................................................................................................ 4-69
     4.4.3.1 Tinian Alternative 1 ........................................................................ 4-69
     4.4.3.2 Tinian Alternative 2 ........................................................................ 4-71
     4.4.3.3 Tinian Alternative 3 ........................................................................ 4-71
     4.4.3.4 Tinian No-Action Alternative .......................................................... 4-72
     4.4.3.5 Summary of Impacts for Tinian Alternatives .................................. 4-73
  4.4.4 PAGAN ......................................................................................................... 4-74
     4.4.4.1 Pagan Alternative 1 ......................................................................... 4-74
     4.4.4.2 Pagan Alternative 2 ......................................................................... 4-75
     4.4.4.3 Pagan No-Action Alternative .......................................................... 4-76
     4.4.4.4 Summary of Impacts for Pagan Alternatives .................................. 4-76

4.5 NOISE ............................................................................................................... 4-77
  4.5.1 APPROACH TO ANALYSIS ................................................................. 4-77
     4.5.1.1 Construction .................................................................................... 4-77
     4.5.1.2 Operations ....................................................................................... 4-78
  4.5.2 RESOURCE MANAGEMENT MEASURES ............................................. 4-80
     4.5.2.1 Construction .................................................................................... 4-80
     4.5.2.2 Operation ....................................................................................... 4-80
  4.5.3 TINIAN ........................................................................................................ 4-81
     4.5.3.1 Tinian Alternative 1 ......................................................................... 4-81
     4.5.3.2 Tinian Alternative 2 ......................................................................... 4-109
     4.5.3.3 Tinian Alternative 3 ......................................................................... 4-112
     4.5.3.4 Tinian No-Action Alternative .......................................................... 4-115
     4.5.3.5 Summary of Impacts for Tinian Alternatives .................................. 4-116
4.5.4 PAGAN .............................................................................................................. 4-117
  4.5.4.1 Pagan Alternative 1 ................................................................. 4-117
  4.5.4.2 Pagan Alternative 2 ................................................................. 4-129
  4.5.4.3 Pagan No-Action Alternative .................................................. 4-130
  4.5.4.4 Summary of Impacts for Pagan Alternatives ...................... 4-131

4.6 AIRSPACE ........................................................................................................ 4-132
  4.6.1 APPROACH TO ANALYSIS .......................................................... 4-132
  4.6.2 RESOURCE MANAGEMENT MEASURES .................................. 4-135
  4.6.3 TINIAN ................................................................................................. 4-136
    4.6.3.1 Tinian Alternative 1 ................................................................. 4-136
    4.6.3.2 Tinian Alternative 2 ................................................................. 4-145
    4.6.3.3 Tinian Alternative 3 ................................................................. 4-146
    4.6.3.4 Tinian No-Action Alternative .............................................. 4-146
    4.6.3.5 Summary of Impacts for Tinian Alternatives ................. 4-147
    4.6.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives ... 4-148
  4.6.4 PAGAN .............................................................................................................. 4-150
    4.6.4.1 Pagan Alternative 1 ................................................................. 4-150
    4.6.4.2 Pagan Alternative 2 ................................................................. 4-152
    4.6.4.3 Pagan No-Action Alternative .................................................. 4-152
    4.6.4.4 Summary of Impacts for Pagan Alternatives ...................... 4-153

4.7 LAND AND SUBMERGED LAND USE ......................................................... 4-154
  4.7.1 APPROACH TO ANALYSIS .......................................................... 4-154
  4.7.2 RESOURCE MANAGEMENT MEASURES .................................. 4-155
  4.7.3 TINIAN ................................................................................................. 4-155
    4.7.3.1 Tinian Alternative 1 ................................................................. 4-155
    4.7.3.2 Tinian Alternative 2 ................................................................. 4-164
    4.7.3.3 Tinian Alternative 3 ................................................................. 4-165
    4.7.3.4 Tinian No-Action Alternative .............................................. 4-165
    4.7.3.5 Summary of Impacts for Tinian Alternatives ................. 4-166
    4.7.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives ... 4-167
  4.7.4 PAGAN .............................................................................................................. 4-168
    4.7.4.1 Pagan Alternative 1 ................................................................. 4-168
    4.7.4.2 Pagan Alternative 2 ................................................................. 4-171
    4.7.4.3 Pagan No-Action Alternative .................................................. 4-171
    4.7.4.4 Summary of Impacts for Pagan Alternatives ...................... 4-171

4.8 RECREATION ................................................................................................... 4-172
  4.8.1 APPROACH TO ANALYSIS .......................................................... 4-172
  4.8.2 RESOURCE MANAGEMENT MEASURES .................................. 4-173
  4.8.3 TINIAN ................................................................................................. 4-174
    4.8.3.1 Tinian Alternative 1 ................................................................. 4-174
    4.8.3.2 Tinian Alternative 2 ................................................................. 4-181
    4.8.3.3 Tinian Alternative 3 ................................................................. 4-181
    4.8.3.4 Tinian No-Action Alternative .................................................. 4-182
4.8.3.5 Summary of Impacts for Tinian Alternatives ........................................ 4-183
4.8.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives .... 4-184

4.8.4 PAGAN ........................................................................................................ 4-185
  4.8.4.1 Pagan Alternative 1 ............................................................................. 4-185
  4.8.4.2 Pagan Alternative 2 ............................................................................. 4-185
  4.8.4.3 Pagan No-Action Alternative ............................................................. 4-186
  4.8.4.4 Summary of Impacts for Pagan Alternatives .................................. 4-186

4.9 TERRESTRIAL BIOLOGY ............................................................................ 4-187
  4.9.1 APPROACH TO ANALYSIS ................................................................ 4-187
    4.9.1.1 Vegetation Communities ................................................................. 4-188
    4.9.1.2 Native Wildlife ............................................................................... 4-188
    4.9.1.3 Special-status Species .................................................................... 4-189
  4.9.2 RESOURCE MANAGEMENT MEASURES ............................................ 4-191
    4.9.2.1 Avoidance and Minimization Measures .......................................... 4-191
    4.9.2.2 Best Management Practices and Standard Operating Procedures ..... 4-192
  4.9.3 TINIAN ..................................................................................................... 4-193
    4.9.3.1 Tinian Alternative 1 .......................................................................... 4-193
    4.9.3.2 Tinian Alternative 2 .......................................................................... 4-217
    4.9.3.3 Tinian Alternative 3 .......................................................................... 4-227
    4.9.3.4 Tinian No-Action Alternative ........................................................... 4-237
    4.9.3.5 Summary of Impacts for Tinian Alternatives .................................. 4-238
    4.9.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives .... 4-239
  4.9.4 PAGAN ..................................................................................................... 4-244
    4.9.4.1 Pagan Alternative 1 .......................................................................... 4-244
    4.9.4.2 Pagan Alternative 2 .......................................................................... 4-255
    4.9.4.3 Pagan No-Action Alternative ........................................................... 4-261
    4.9.4.4 Summary of Impacts for Pagan Alternatives .................................. 4-261
    4.9.4.5 Summary of Potential Mitigation Measures for Pagan Alternatives .... 4-262

4.10 MARINE BIOLOGY ....................................................................................... 4-264
  4.10.1 APPROACH TO ANALYSIS ................................................................ 4-264
    4.10.1.1 Marine Habitat and Essential Fish Habitat ...................................... 4-265
    4.10.1.2 Marine Flora .................................................................................. 4-266
    4.10.1.3 Marine Invertebrates ..................................................................... 4-266
    4.10.1.4 Fish ................................................................................................. 4-266
    4.10.1.5 Special-status Species .................................................................... 4-266
  4.10.2 RESOURCE MANAGEMENT MEASURES ............................................ 4-267
    4.10.2.1 Avoidance and Minimization Measures .......................................... 4-267
    4.10.2.2 Best Management Practices and Standard Operating Procedures ..... 4-268
  4.10.3 TINIAN ..................................................................................................... 4-270
    4.10.3.1 Tinian Alternative 1 .......................................................................... 4-270
    4.10.3.2 Tinian Alternative 2 .......................................................................... 4-297
    4.10.3.3 Tinian Alternative 3 .......................................................................... 4-297
    4.10.3.4 Tinian No-Action Alternative ........................................................... 4-298
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.10.3.5</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-299</td>
</tr>
<tr>
<td>4.10.3.6</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
<td>4-300</td>
</tr>
<tr>
<td>4.10.4</td>
<td>PAGAN</td>
<td>4-302</td>
</tr>
<tr>
<td>4.10.4.1</td>
<td>Pagan Alternative 1</td>
<td>4-302</td>
</tr>
<tr>
<td>4.10.4.2</td>
<td>Pagan Alternative 2</td>
<td>4-324</td>
</tr>
<tr>
<td>4.10.4.3</td>
<td>Pagan No-Action Alternative</td>
<td>4-325</td>
</tr>
<tr>
<td>4.10.4.4</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-325</td>
</tr>
<tr>
<td>4.10.4.5</td>
<td>Summary of Potential Mitigation Measures for Pagan Alternatives</td>
<td>4-326</td>
</tr>
<tr>
<td>4.11</td>
<td>CULTURAL RESOURCES</td>
<td>4-327</td>
</tr>
<tr>
<td>4.11.1</td>
<td>APPROACH TO ANALYSIS</td>
<td>4-327</td>
</tr>
<tr>
<td>4.11.2</td>
<td>RESOURCE MANAGEMENT MEASURES</td>
<td>4-328</td>
</tr>
<tr>
<td>4.11.2.1</td>
<td>Avoidance and Minimization Measures</td>
<td>4-328</td>
</tr>
<tr>
<td>4.11.2.2</td>
<td>Best Management Practices and Standard Operating Procedures</td>
<td>4-329</td>
</tr>
<tr>
<td>4.11.3</td>
<td>TINIAN</td>
<td>4-329</td>
</tr>
<tr>
<td>4.11.3.1</td>
<td>Tinian Alternative 1</td>
<td>4-329</td>
</tr>
<tr>
<td>4.11.3.2</td>
<td>Tinian Alternative 2</td>
<td>4-337</td>
</tr>
<tr>
<td>4.11.3.3</td>
<td>Tinian Alternative 3</td>
<td>4-343</td>
</tr>
<tr>
<td>4.11.3.4</td>
<td>Tinian No-Action Alternative</td>
<td>4-349</td>
</tr>
<tr>
<td>4.11.3.5</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-350</td>
</tr>
<tr>
<td>4.11.3.6</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
<td>4-351</td>
</tr>
<tr>
<td>4.11.4</td>
<td>PAGAN</td>
<td>4-353</td>
</tr>
<tr>
<td>4.11.4.1</td>
<td>Pagan Alternative 1</td>
<td>4-353</td>
</tr>
<tr>
<td>4.11.4.2</td>
<td>Pagan Alternative 2</td>
<td>4-358</td>
</tr>
<tr>
<td>4.11.4.3</td>
<td>Pagan No-Action Alternative</td>
<td>4-362</td>
</tr>
<tr>
<td>4.11.4.4</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-362</td>
</tr>
<tr>
<td>4.11.4.5</td>
<td>Summary of Potential Mitigation Measures for Pagan Alternatives</td>
<td>4-363</td>
</tr>
<tr>
<td>4.12</td>
<td>VISUAL RESOURCES</td>
<td>4-364</td>
</tr>
<tr>
<td>4.12.1</td>
<td>APPROACH TO ANALYSIS</td>
<td>4-364</td>
</tr>
<tr>
<td>4.12.2</td>
<td>RESOURCE MANAGEMENT MEASURES</td>
<td>4-365</td>
</tr>
<tr>
<td>4.12.3</td>
<td>TINIAN</td>
<td>4-366</td>
</tr>
<tr>
<td>4.12.3.1</td>
<td>Tinian Alternative 1</td>
<td>4-366</td>
</tr>
<tr>
<td>4.12.3.2</td>
<td>Tinian Alternative 2</td>
<td>4-374</td>
</tr>
<tr>
<td>4.12.3.3</td>
<td>Tinian Alternative 3</td>
<td>4-376</td>
</tr>
<tr>
<td>4.12.3.4</td>
<td>Tinian No-Action Alternative</td>
<td>4-378</td>
</tr>
<tr>
<td>4.12.3.5</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-379</td>
</tr>
<tr>
<td>4.12.4</td>
<td>PAGAN</td>
<td>4-380</td>
</tr>
<tr>
<td>4.12.4.1</td>
<td>Pagan Alternative 1</td>
<td>4-380</td>
</tr>
<tr>
<td>4.12.4.2</td>
<td>Pagan Alternative 2</td>
<td>4-382</td>
</tr>
<tr>
<td>4.12.4.3</td>
<td>Pagan No-Action Alternative</td>
<td>4-382</td>
</tr>
<tr>
<td>4.12.4.4</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-384</td>
</tr>
<tr>
<td>4.13</td>
<td>TRANSPORTATION</td>
<td>4-385</td>
</tr>
<tr>
<td>4.13.1</td>
<td>APPROACH TO ANALYSIS</td>
<td>4-385</td>
</tr>
<tr>
<td>4.13.1.1</td>
<td>Air Transportation</td>
<td>4-385</td>
</tr>
</tbody>
</table>
4.13.1.2 Ground Transportation ................................................................. 4-386
4.13.1.3 Marine Transportation ................................................................. 4-386

4.13.2 RESOURCE MANAGEMENT MEASURES ........................................ 4-387
4.13.2.1 Air Transportation ........................................................................ 4-387
4.13.2.2 Ground Transportation ................................................................. 4-387
4.13.2.3 Marine Transportation ................................................................. 4-388

4.13.3 TINIAN ......................................................................................... 4-388
4.13.3.1 Tinian Alternative 1 ..................................................................... 4-388
4.13.3.2 Tinian Alternative 2 ..................................................................... 4-399
4.13.3.3 Tinian Alternative 3 ..................................................................... 4-401
4.13.3.4 Tinian No-Action Alternative ....................................................... 4-403
4.13.3.5 Summary of Impacts for Tinian Alternatives ................................. 4-404

4.13.4 PAGAN ......................................................................................... 4-405
4.13.4.1 Pagan Alternative 1 ..................................................................... 4-405
4.13.4.2 Pagan Alternative 2 ..................................................................... 4-407
4.13.4.3 Pagan No-Action Alternative ....................................................... 4-408
4.13.4.4 Summary of Impacts for Pagan Alternatives ................................. 4-409

4.14 UTILITIES ..................................................................................... 4-410

4.14.1 APPROACH TO ANALYSIS .......................................................... 4-410

4.14.2 RESOURCE MANAGEMENT MEASURES ...................................... 4-411

4.14.3 TINIAN ......................................................................................... 4-412
4.14.3.1 Tinian Alternative 1 ..................................................................... 4-412
4.14.3.2 Tinian Alternative 2 ..................................................................... 4-424
4.14.3.3 Tinian Alternative 3 ..................................................................... 4-426
4.14.3.4 Tinian No-Action Alternative ....................................................... 4-428
4.14.3.5 Summary of Impacts for Tinian Alternatives ................................. 4-429

4.14.4 PAGAN ......................................................................................... 4-430
4.14.4.1 Pagan Alternative 1 ..................................................................... 4-430
4.14.4.2 Pagan Alternative 2 ..................................................................... 4-431
4.14.4.3 Pagan No-Action Alternative ....................................................... 4-431
4.14.4.4 Summary of Impacts for Pagan Alternatives ................................. 4-432

4.15 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE ...................... 4-433

4.15.1 APPROACH TO ANALYSIS .......................................................... 4-433
4.15.1.1 Population .................................................................................. 4-434
4.15.1.2 Economic Conditions ................................................................. 4-435
4.15.1.3 Public Services ........................................................................... 4-437
4.15.1.4 Community and Social Topics .................................................... 4-438
4.15.1.5 Environmental Justice and Protection of Children ..................... 4-438

4.15.2 RESOURCE MANAGEMENT MEASURES ...................................... 4-439

4.15.3 TINIAN ......................................................................................... 4-439
4.15.3.1 Tinian Alternative 1 ..................................................................... 4-439
4.15.3.2 Tinian Alternative 2 ..................................................................... 4-451
4.15.3.3 Tinian Alternative 3 ..................................................................... 4-452
4.15.3.4 Tinian No-Action Alternative .................................................. 4-452
4.15.3.5 Summary of Impacts for Tinian Alternatives .......... 4-453
4.15.4 PAGAN ................................................................. 4-454
  4.15.4.1 Pagan Alternative 1 ................................................. 4-454
  4.15.4.2 Pagan Alternative 2 .............................................. 4-455
  4.15.4.3 Pagan No-Action Alternative .................................. 4-455
  4.15.4.4 Summary of Impacts for Pagan Alternatives .......... 4-455

4.16 HAZARDOUS MATERIALS AND WASTE ........................................ 4-457
  4.16.1 APPROACH TO ANALYSIS .............................................. 4-457
  4.16.2 RESOURCE MANAGEMENT MEASURES .................................. 4-458
    4.16.2.1 Avoidance and Minimization Measures ..................... 4-458
    4.16.2.2 Best Management Practices and Standard Operating Procedures .............................................. 4-458
  4.16.3 TINIAN ................................................................. 4-460
    4.16.3.1 Tinian Alternative 1 ............................................. 4-460
    4.16.3.2 Tinian Alternative 2 ............................................ 4-473
    4.16.3.3 Tinian Alternative 3 ............................................ 4-476
    4.16.3.4 Tinian No-Action Alternative ................................. 4-477
    4.16.3.5 Summary of Impacts for Tinian Alternatives ........... 4-478
  4.16.4 PAGAN ................................................................. 4-479
    4.16.4.1 Pagan Alternative 1 ............................................. 4-479
    4.16.4.2 Pagan Alternative 2 ............................................ 4-485
    4.16.4.3 Pagan No-Action Alternative .................................. 4-487
    4.16.4.4 Summary of Impacts for Pagan Alternatives .......... 4-488

4.17 PUBLIC HEALTH AND SAFETY ...................................................... 4-489
  4.17.1 APPROACH TO ANALYSIS .............................................. 4-490
  4.17.2 RESOURCE MANAGEMENT MEASURES .................................. 4-490
    4.17.2.1 Avoidance and Minimization Measures ..................... 4-490
    4.17.2.2 Best Management Practices and Standard Operating Procedures .............................................. 4-491
  4.17.3 TINIAN ................................................................. 4-492
    4.17.3.1 Tinian Alternative 1 ............................................. 4-492
    4.17.3.2 Tinian Alternative 2 ............................................ 4-496
    4.17.3.3 Tinian Alternative 3 ............................................ 4-497
    4.17.3.4 Tinian No-Action Alternative ................................. 4-497
    4.17.3.5 Summary of Impacts for Tinian Alternatives ........... 4-498
  4.17.4 PAGAN ................................................................. 4-499
    4.17.4.1 Pagan Alternative 1 ............................................. 4-499
    4.17.4.2 Pagan Alternative 2 ............................................ 4-501
    4.17.4.3 Pagan No-Action Alternative .................................. 4-501
    4.17.4.4 Summary of Impacts of Pagan Alternatives .......... 4-502

4.18 PROGRAMMATIC ANALYSIS OF FUTURE POTENTIAL PROJECT COMPONENTS .......... 4-503
  4.18.1 INTERNATIONAL BROADCASTING BUREAU PROGRAMMATIC ANALYSIS .......... 4-504
    4.18.1.1 Relocation Study ................................................. 4-504
### Table of Contents

**4.18.2** PAGAN DOCK AND BREAKWATER ....................................................... 4-521

4.18.1.2 Programmatic Analysis .................................................................... 4-509
4.18.2.1 Geology and Soils ........................................................................ 4-523
4.18.2.2 Water Resources ........................................................................ 4-523
4.18.2.3 Air Quality ................................................................................ 4-523
4.18.2.4 Noise ....................................................................................... 4-524
4.18.2.5 Airspace .................................................................................... 4-524
4.18.2.6 Land and Submerged Land Use .................................................. 4-524
4.18.2.7 Recreation ................................................................................. 4-525
4.18.2.8 Terrestrial Biology .................................................................... 4-526
4.18.2.9 Marine Biology ......................................................................... 4-527
4.18.2.10 Cultural Resources ................................................................. 4-533
4.18.2.11 Visual Resources ..................................................................... 4-534
4.18.2.12 Transportation ....................................................................... 4-534
4.18.2.13 Utilities ................................................................................. 4-534
4.18.2.14 Socioeconomics and Environmental Justice ............................ 4-535
4.18.2.15 Hazardous Materials and Waste ............................................. 4-535
4.18.2.16 Public Health and Safety ......................................................... 4-536

**4.19** SECTION 4(F) EVALUATION ..................................................................... 4-537

4.19.1 INTRODUCTION .................................................................................... 4-537
4.19.2 DESCRIPTION OF THE PROPOSED ACTION ...................................... 4-539
4.19.2.1 Need for Project ....................................................................... 4-539
4.19.2.2 Description of Alternatives ....................................................... 4-539

4.19.3 DESCRIPTION OF SECTION 4(F) PROPERTIES ..................................... 4-540
4.19.3.1 Japanese Third Farm District (IV) (Site SC-5043) ....................... 4-541
4.19.3.2 West Field (Site TN-6-0030) .................................................... 4-541

4.19.4 IMPACTS ON THE SECTION 4(F) PROPERTIES BY THE PROJECT .... 4-542
4.19.4.1 Japanese Third Farm District (IV) (Site SC-5043) ....................... 4-542
4.19.4.2 West Field (Site TN-6-0030) .................................................... 4-542

4.19.5 AVOIDANCE ALTERNATIVES .............................................................. 4-543
4.19.5.1 No-Action Alternative ............................................................... 4-543
4.19.5.2 Alternative 1. Locate Outside of the CNMI ................................. 4-543
4.19.5.3 Alternative 2. Locate at Single Location within the CNMI ......... 4-543
4.19.5.4 Alternative 3. Locate Airport Improvements at North Field ....... 4-544
4.19.5.5 Alternative 4. Alternative Options at Tinian International Airport .. 4-544

4.19.6 MEASURES TO MINIMIZE OR MITIGATE HARM ............................. 4-544
4.19.6.1 No-Action Alternative ............................................................... 4-544
4.19.6.2 Tinian Airport Improvements (All Tinian Alternatives) ............. 4-545

4.19.7 COORDINATION .................................................................................. 4-545
4.19.8 CONCLUDING STATEMENT ................................................................ 4-545

**4.20** SUMMARY OF IMPACTS AND POTENTIAL MITIGATIONS ..................... 4-546

4.20.1 SUMMARY OF IMPACTS FOR TINIAN ALTERNATIVES ..................... 4-547
4.20.2 SUMMARY OF IMPACTS FOR PAGAN ALTERNATIVES .................... 4-555
4.20.3  SUMMARY OF POTENTIAL MITIGATION MEASURES ............................................. 4-559

CHAPTER 5  CUMULATIVE IMPACTS .................................................................................. 5-1

5.1 METHODOLOGY ........................................................................................................... 5-1
  5.1.1 RESOURCES CONSIDERED IN THE CUMULATIVE IMPACT ANALYSIS ................. 5-2
  5.1.2 STUDY AREA AND HEALTH OF RESOURCES CONSIDERED .............................. 5-2
  5.1.3 CONCEPTUAL APPROACH TO ASSESSING CUMULATIVE IMPACTS RELATED TO PRESENT AND REASONABLY FORESEEABLE ACTIONS .................................................. 5-2

5.2 PRESENT AND REASONABLY FORESEEABLE ACTIONS ........................................... 5-3
  5.2.1 NON-FEDERAL ACTIONS ......................................................................................... 5-3
  5.2.2 FEDERAL ACTIONS ................................................................................................. 5-4
    5.2.2.1 Divert Activities and Exercises (Divert) ............................................................. 5-4
    5.2.2.2 Mariana Islands Training and Testing ............................................................... 5-4
    5.2.2.3 Mariana Islands Range Complex Airspace ..................................................... 5-5
  5.2.3 SUMMARY ............................................................................................................... 5-6

5.3 CUMULATIVE IMPACTS ANALYSIS ............................................................................ 5-13
  5.3.1 IMPACT SUMMARIES ............................................................................................. 5-13
    5.3.1.1 Impacts of Present and Reasonably Foreseeable Actions .............................. 5-13
    5.3.1.2 Impacts of the Proposed Action (Chapter 4) .................................................. 5-13
  5.3.2 GEOLOGY AND SOILS .......................................................................................... 5-17
    5.3.2.1 Tinian .............................................................................................................. 5-17
    5.3.2.2 Pagan ............................................................................................................. 5-19
  5.3.3 WATER RESOURCES ............................................................................................ 5-20
    5.3.3.1 Tinian .............................................................................................................. 5-20
    5.3.3.2 Pagan ............................................................................................................. 5-23
  5.3.4 AIR QUALITY .......................................................................................................... 5-24
    5.3.4.1 Tinian .............................................................................................................. 5-25
    5.3.4.2 Pagan ............................................................................................................. 5-27
  5.3.5 NOISE ..................................................................................................................... 5-28
    5.3.5.1 Tinian .............................................................................................................. 5-28
    5.3.5.2 Pagan ............................................................................................................. 5-29
  5.3.6 AIRSPACE .............................................................................................................. 5-30
    5.3.6.1 Tinian .............................................................................................................. 5-30
    5.3.6.2 Pagan ............................................................................................................. 5-34
  5.3.7 LAND AND SUBMERGED LAND USE .................................................................. 5-35
    5.3.7.1 Tinian .............................................................................................................. 5-35
    5.3.7.2 Pagan ............................................................................................................. 5-38
  5.3.8 RECREATION .......................................................................................................... 5-39
    5.3.8.1 Tinian .............................................................................................................. 5-39
    5.3.8.2 Pagan ............................................................................................................. 5-42
  5.3.9 TERRESTRIAL BIOLOGY ......................................................................................... 5-43
<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3.9.1 Tinian</td>
<td>5-43</td>
</tr>
<tr>
<td>5.3.9.2 Pagan</td>
<td>5-46</td>
</tr>
<tr>
<td>5.3.10 MARINE BIOLOGY</td>
<td>5-48</td>
</tr>
<tr>
<td>5.3.10.1 Tinian</td>
<td>5-48</td>
</tr>
<tr>
<td>5.3.10.2 Pagan</td>
<td>5-53</td>
</tr>
<tr>
<td>5.3.11 CULTURAL RESOURCES</td>
<td>5-55</td>
</tr>
<tr>
<td>5.3.11.1 Tinian</td>
<td>5-55</td>
</tr>
<tr>
<td>5.3.11.2 Pagan</td>
<td>5-59</td>
</tr>
<tr>
<td>5.3.12 VISUAL RESOURCES</td>
<td>5-60</td>
</tr>
<tr>
<td>5.3.12.1 Tinian</td>
<td>5-60</td>
</tr>
<tr>
<td>5.3.12.2 Pagan</td>
<td>5-62</td>
</tr>
<tr>
<td>5.3.13 TRANSPORTATION</td>
<td>5-63</td>
</tr>
<tr>
<td>5.3.13.1 Air Transportation</td>
<td>5-63</td>
</tr>
<tr>
<td>5.3.13.2 Ground Transportation</td>
<td>5-66</td>
</tr>
<tr>
<td>5.3.13.3 Marine Transportation</td>
<td>5-68</td>
</tr>
<tr>
<td>5.3.14 UTILITIES</td>
<td>5-70</td>
</tr>
<tr>
<td>5.3.14.1 Tinian</td>
<td>5-70</td>
</tr>
<tr>
<td>5.3.14.2 Pagan</td>
<td>5-75</td>
</tr>
<tr>
<td>5.3.15 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE</td>
<td>5-76</td>
</tr>
<tr>
<td>5.3.15.1 Tinian</td>
<td>5-76</td>
</tr>
<tr>
<td>5.3.15.2 Pagan</td>
<td>5-78</td>
</tr>
<tr>
<td>5.3.16 HAZARDOUS MATERIALS AND WASTE</td>
<td>5-80</td>
</tr>
<tr>
<td>5.3.16.1 Tinian</td>
<td>5-80</td>
</tr>
<tr>
<td>5.3.16.2 Pagan</td>
<td>5-82</td>
</tr>
<tr>
<td>5.3.17 PUBLIC HEALTH AND SAFETY</td>
<td>5-83</td>
</tr>
<tr>
<td>5.3.17.1 Tinian</td>
<td>5-83</td>
</tr>
<tr>
<td>5.3.17.2 Pagan</td>
<td>5-85</td>
</tr>
<tr>
<td>5.4 NEED FOR MITIGATION</td>
<td>5-86</td>
</tr>
<tr>
<td>CHAPTER 6 ADDITIONAL CONSIDERATIONS REQUIRED BY NEPA</td>
<td>6-1</td>
</tr>
<tr>
<td>6.1 INTRODUCTION</td>
<td>6-1</td>
</tr>
<tr>
<td>6.2 CONSISTENCY WITH OTHER FEDERAL, COMMONWEALTH, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS</td>
<td>6-1</td>
</tr>
<tr>
<td>6.2.1 FEDERAL PLANS</td>
<td>6-1</td>
</tr>
<tr>
<td>6.2.2 REGIONAL AND LOCAL LAND USE PLANS</td>
<td>6-2</td>
</tr>
<tr>
<td>6.2.2.1 Tinian</td>
<td>6-2</td>
</tr>
<tr>
<td>6.2.2.2 Pagan</td>
<td>6-2</td>
</tr>
<tr>
<td>6.2.3 APPLICABLE FEDERAL AND LOCAL REGULATIONS</td>
<td>6-3</td>
</tr>
<tr>
<td>6.3 UNAVOIDABLE SIGNIFICANT ADVERSE IMPACTS</td>
<td>6-3</td>
</tr>
<tr>
<td>6.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES</td>
<td>6-5</td>
</tr>
</tbody>
</table>
6.5 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY ......................................................... 6-6
  6.5.1 BENEFITS OF SHORT-TERM USE .......................................................... 6-7
  6.5.2 THE COST OF SHORT-TERM U.S. MILITARY TRAINING USE ............... 6-7
  6.5.3 TINIAN .................................................................................................. 6-8
  6.5.4 PAGAN .................................................................................................. 6-9

CHAPTER 7 REFERENCES .................................................................................. 7-1

ES.1 EXECUTIVE SUMMARY ............................................................................. 7-1

7.1 CHAPTER 1 .................................................................................................. 7-2

7.2 CHAPTER 2 .................................................................................................. 7-3

7.3 CHAPTER 3 .................................................................................................. 7-5
  7.3.1 INTRODUCTION .................................................................................. 7-5
  7.3.2 GEOLOGY AND SOILS ....................................................................... 7-5
  7.3.3 WATER RESOURCES ........................................................................ 7-7
  7.3.4 AIR QUALITY ..................................................................................... 7-9
  7.3.5 NOISE ............................................................................................... 7-9
  7.3.6 AIRSPACE ......................................................................................... 7-10
  7.3.7 LAND USE AND SUBMERGED LAND USE ........................................... 7-11
  7.3.8 RECREATION .................................................................................. 7-13
  7.3.9 TERRESTRIAL BIOLOGY .................................................................. 7-14
  7.3.10 MARINE BIOLOGY ......................................................................... 7-22
  7.3.11 CULTURAL RESOURCES ................................................................. 7-29
  7.3.12 VISUAL RESOURCES ...................................................................... 7-30
  7.3.13 TRANSPORTATION ........................................................................ 7-30
  7.3.14 UTILITIES ....................................................................................... 7-31
  7.3.15 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE ....................... 7-32
  7.3.16 HAZARDOUS MATERIALS AND WASTE ........................................... 7-34
  7.3.17 PUBLIC HEALTH AND SAFETY ..................................................... 7-36

7.4 CHAPTER 4 .................................................................................................. 7-37
  7.4.1 INTRODUCTION .................................................................................. 7-37
  7.4.2 GEOLOGY AND SOILS ....................................................................... 7-37
  7.4.3 WATER RESOURCES ........................................................................ 7-38
  7.4.4 AIR QUALITY .................................................................................. 7-39
  7.4.5 NOISE ............................................................................................. 7-40
  7.4.6 AIRSPACE ....................................................................................... 7-41
  7.4.7 LAND USE AND SUBMERGED LAND USE ........................................... 7-42
  7.4.8 RECREATION .................................................................................. 7-42
  7.4.9 TERRESTRIAL BIOLOGY ................................................................. 7-43
7.4.10 MARINE BIOLOGY ........................................................................................................... 7-46
7.4.11 CULTURAL RESOURCES ............................................................................................... 7-50
7.4.12 VISUAL RESOURCES ..................................................................................................... 7-51
7.4.13 TRANSPORTATION ........................................................................................................ 7-51
7.4.14 UTILITIES ....................................................................................................................... 7-52
7.4.15 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE ............................................... 7-52
7.4.16 HAZARDOUS MATERIALS AND WASTE ...................................................................... 7-53
7.4.17 PUBLIC HEALTH AND SAFETY ..................................................................................... 7-54
7.4.18 IBB PROGRAMMATIC ANALYSIS ............................................................................... 7-54
7.4.19 SECTION 4(f) EVALUATION ......................................................................................... 7-57

7.5 CHAPTER 5 .......................................................................................................................... 7-57
7.6 CHAPTER 6 .......................................................................................................................... 7-60

CHAPTER 8 LIST OF PREPARERS ......................................................................................... 8-1

8.1 GOVERNMENT CONTRIBUTORS ....................................................................................... 8-1
8.1.1 MARINE CORPS (MARINE FORCES, PACIFIC AND HEADQUARTERS MARINE CORPS) .................................................................................................................. 8-1
8.1.2 NAVFAC .......................................................................................................................... 8-1
8.1.3 FEDERAL AVIATION ADMINISTRATION ....................................................................... 8-2

8.2 CARDNO TEC-AECOM PACIFIC JOINT VENTURE .......................................................... 8-2
8.2.1 MANAGEMENT ............................................................................................................... 8-2
8.2.2 NEPA ANALYSIS TEAM ............................................................................................... 8-2

CHAPTER 9 DISTRIBUTION .................................................................................................. 9-1

9.1 PARTIES RECEIVING NOTICE OF AVAILABILITY OF DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT .................. 9-1
9.1.1 ELECTED OFFICIALS – CNMI ...................................................................................... 9-1
9.1.2 ELECTED OFFICIALS – CNMI LOCAL ........................................................................ 9-1
9.1.3 FEDERAL AGENCIES .................................................................................................... 9-1
9.1.4 CNMI AGENCIES ......................................................................................................... 9-3
9.1.5 HAWAII AGENCIES ..................................................................................................... 9-3
9.1.6 LIBRARIES RECEIVING HARD COPY AND ELECTRONIC COPY ON COMPACT DISK .................................................................................................................. 9-4
9.1.7 CNMI INTEREST GROUPS ............................................................................................. 9-4
9.1.8 NATIONAL/INTERNATIONAL ENVIRONMENTAL INTEREST GROUPS .................... 9-4
List of Figures

ES-1 U.S. Pacific Command Area of Responsibility .......................................................... ES-2
ES-2 Tinian All Action Alternatives Military Lease Area-wide Training Assets ................ ES-3
ES-3 Tinian All Action Alternatives Military Lease Area-wide Training Assets ................ ES-3
ES-4 Tinian All Action Alternatives Surface Danger Zones ........................................... ES-25
ES-5 Tinian All Action Alternatives Special Use Airspace: Two-Dimensional Perspective .... ES-29
ES-6 Tinian All Action Alternatives Base Camp ............................................................. ES-30
ES-7 Tinian All Action Alternatives Munitions Storage Area ......................................... ES-31
ES-8 Tinian All Action Alternatives Airport Improvements ............................................ ES-32
ES-9 Tinian All Action Alternatives Port Improvements and Supply Route ................. ES-33
ES-10 Tinian All Action Alternatives Range Access Improvements, Fence Lines, and Gates.................................................................................................................. ES-35
ES-11 Tinian All Action Alternatives Utility Improvements ............................................. ES-37
ES-12 Unai Chulu Tactical Amphibious Beach Landing Dredging and Construction ........ ES-38
ES-13 Unai Chulu Tactical Amphibious Beach Landing Operations .............................. ES-39
ES-14 Pagan Alternative 1 Range Complexes .................................................................. ES-45
ES-15 Pagan Alternative 2 Range Complexes .................................................................. ES-46
ES-16 Pagan All Action Alternatives Surface Danger Zones .......................................... ES-47
1.1-1 U.S. Pacific Command Area of Responsibility ...................................................... 1-2
1.1-2 Mariana Islands Regional Map ................................................................................ 1-3
1.2-1 Building Block Approach to Military Training ......................................................... 1-7
1.4-1 Mariana Islands Range Complex Extent .................................................................. 1-14
1.5-1 NEPA Public Involvement Process ......................................................................... 1-16
2.2-1 Representative Marine Corps Battalion Landing Team ....................................... 2-6
2.4-1 Tinian Location Map ............................................................................................... 2-32
2.4-2 Tinian All Action Alternatives Base Camp ............................................................ 2-35
2.4-3 Tinian All Action Alternatives Munitions Storage Area ........................................ 2-36
2.4-4 Tinian All Action Alternatives Airport Improvements ............................................ 2-38
2.4-5 Tinian All Action Alternatives Port Improvements and Supply Route .................. 2-39
2.4-6 Tinian All Action Alternatives Range Access Improvements, Fence Lines, and Gates.................................................................................................................. 2-41
2.4-7 Tinian All Action Alternatives Utility Improvements ............................................. 2-51
2.4-8 Tinian Range Complexes ....................................................................................... 2-54
2.4-9 Tinian All Action Alternatives Range Complex A ................................................ 2-55
2.4-10 Tinian All Action Alternatives Range Complex B ................................................. 2-57
2.4-11 Tinian All Action Alternatives Range Complex C ................................................ 2-59
2.4-12 Tinian All Action Alternatives Range Complex D ................................................ 2-60
2.4-13 Tinian All Action Alternatives Military Lease Area-wide Training Assets ........... 2-61
2.4-14 Tinian Tactical Amphibious Beach Landing Laydown Area and Access .............. 2-63
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4-15</td>
<td>Unai Chulu Tactical Amphibious Beach Landing Dredging and Construction</td>
<td>2-64</td>
</tr>
<tr>
<td>2.4-16</td>
<td>Unai Chulu Tactical Amphibious Beach Landing Operations</td>
<td>2-65</td>
</tr>
<tr>
<td>2.4-17</td>
<td>Tinian All Action Alternatives Surface Danger Zones</td>
<td>2-83</td>
</tr>
<tr>
<td>2.4-18</td>
<td>Tinian All Action Alternatives Special Use Airspace: Two-Dimensional Perspective</td>
<td>2-85</td>
</tr>
<tr>
<td>2.4-19</td>
<td>Tinian All Action Alternatives Special Use Airspace: Three-Dimensional Perspective</td>
<td>2-86</td>
</tr>
<tr>
<td>2.4-20</td>
<td>Tinian All Action Alternatives Danger Zones</td>
<td>2-88</td>
</tr>
<tr>
<td>2.4-21</td>
<td>Tinian Alternative 1 Range Complexes</td>
<td>2-91</td>
</tr>
<tr>
<td>2.4-22</td>
<td>Tinian Alternatives 1 and 2 Range Complex D</td>
<td>2-93</td>
</tr>
<tr>
<td>2.4-23</td>
<td>Tinian Alternative 1 Convoy Course</td>
<td>2-94</td>
</tr>
<tr>
<td>2.4-24</td>
<td>Tinian Alternative 2 Range Complexes</td>
<td>2-96</td>
</tr>
<tr>
<td>2.4-25</td>
<td>Tinian Alternatives 2 and 3 Range Complex C</td>
<td>2-97</td>
</tr>
<tr>
<td>2.4-26</td>
<td>Tinian Alternatives 2 and 3 Convoy Course</td>
<td>2-98</td>
</tr>
<tr>
<td>2.4-27</td>
<td>Tinian Alternative 3 Range Complexes</td>
<td>2-101</td>
</tr>
<tr>
<td>2.4-28</td>
<td>Tinian No-Action Alternative</td>
<td>2-106</td>
</tr>
<tr>
<td>2.5-1</td>
<td>Pagan Location Map</td>
<td>2-114</td>
</tr>
<tr>
<td>2.5-2</td>
<td>Pagan All Action Alternatives Bivouac Area, Munitions Storage, and Airfield Improvements</td>
<td>2-116</td>
</tr>
<tr>
<td>2.5-3</td>
<td>Pagan All Action Alternatives Military Training Trail Improvements</td>
<td>2-119</td>
</tr>
<tr>
<td>2.5-4</td>
<td>Pagan All Action Alternatives Surface Danger Zones</td>
<td>2-133</td>
</tr>
<tr>
<td>2.5-5</td>
<td>Pagan All Action Alternatives Special Use Airspace: Two-Dimensional Perspective</td>
<td>2-135</td>
</tr>
<tr>
<td>2.5-6</td>
<td>Pagan All Action Alternatives Danger Zones</td>
<td>2-136</td>
</tr>
<tr>
<td>2.5-7</td>
<td>Pagan Alternative 1 Range Complexes</td>
<td>2-138</td>
</tr>
<tr>
<td>2.5-8</td>
<td>Pagan Alternative 1 North Range Complex</td>
<td>2-139</td>
</tr>
<tr>
<td>2.5-9</td>
<td>Pagan Alternative 1 South Range Complex</td>
<td>2-140</td>
</tr>
<tr>
<td>2.5-10</td>
<td>Pagan Alternative 2 Range Complexes</td>
<td>2-142</td>
</tr>
<tr>
<td>2.5-11</td>
<td>Pagan Alternative 2 North Range Complex</td>
<td>2-143</td>
</tr>
<tr>
<td>2.5-12</td>
<td>Pagan Alternative 2 South Range Complex</td>
<td>2-144</td>
</tr>
<tr>
<td>3.2-1</td>
<td>Regional Geologic Map of the Mariana Islands</td>
<td>3-4</td>
</tr>
<tr>
<td>3.2-2</td>
<td>Tinian Physiographic and Topographic Map</td>
<td>3-6</td>
</tr>
<tr>
<td>3.2-3</td>
<td>Tinian Geologic Units</td>
<td>3-8</td>
</tr>
<tr>
<td>3.2-4</td>
<td>Proposed Amphibious Training Beaches on Tinian</td>
<td>3-10</td>
</tr>
<tr>
<td>3.2-5</td>
<td>Tinian Soil Classes Associated with the Affected Environment</td>
<td>3-13</td>
</tr>
<tr>
<td>3.2-6</td>
<td>Tinian Prime Farmland Soil Classes Associated with the Affected Environment</td>
<td>3-16</td>
</tr>
<tr>
<td>3.2-7</td>
<td>Pagan Topographic Map</td>
<td>3-17</td>
</tr>
<tr>
<td>3.2-8</td>
<td>Pagan Generalized Geologic Map</td>
<td>3-19</td>
</tr>
<tr>
<td>3.2-9</td>
<td>Pagan Pozzolan Deposits</td>
<td>3-20</td>
</tr>
<tr>
<td>3.3-1</td>
<td>Tinian Surface Waters and Flood Zones</td>
<td>3-28</td>
</tr>
<tr>
<td>3.3-2</td>
<td>Graphic Depiction of a Freshwater Lens above a Saltwater Wedge – Standard, Vertical Pumping Well</td>
<td>3-32</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>3.3-3</td>
<td>Graphic Depiction of a Freshwater Lens above Saltwater Wedge – Horizontal, Maui-Type Pumping Well</td>
<td>3-32</td>
</tr>
<tr>
<td>3.3-4</td>
<td>Tinian Groundwater Wells, Elevation, and Flow Direction</td>
<td>3-33</td>
</tr>
<tr>
<td>3.3-5</td>
<td>Pagan Surface Waters and Groundwater Well Locations</td>
<td>3-38</td>
</tr>
<tr>
<td>3.5-1</td>
<td>Sensitive Noise Receptor Locations – Tinian and Saipan</td>
<td>3-49</td>
</tr>
<tr>
<td>3.5-2</td>
<td>Baseline Noise Contours at Tinian International Airport</td>
<td>3-54</td>
</tr>
<tr>
<td>3.6-1</td>
<td>Cross Section of Airspace Classes and Relationships</td>
<td>3-60</td>
</tr>
<tr>
<td>3.6-2</td>
<td>Special Use and Other Airspace Designated for Military Use</td>
<td>3-61</td>
</tr>
<tr>
<td>3.6-3</td>
<td>Commuter Flight Routes</td>
<td>3-65</td>
</tr>
<tr>
<td>3.6-4</td>
<td>Annual Airport Operations at Tinian International Airport</td>
<td>3-66</td>
</tr>
<tr>
<td>3.6-5</td>
<td>Tinian and Saipan Regional Airspace</td>
<td>3-67</td>
</tr>
<tr>
<td>3.6-6</td>
<td>Annual Operations at Saipan International Airport</td>
<td>3-68</td>
</tr>
<tr>
<td>3.6-7</td>
<td>Existing Mariana Islands Airspace Designated for Military Use</td>
<td>3-69</td>
</tr>
<tr>
<td>3.6-8</td>
<td>Regional Airports and Commercial Aviation Routes</td>
<td>3-72</td>
</tr>
<tr>
<td>3.7-1</td>
<td>Region of Influence for Land and Submerged Land Use</td>
<td>3-76</td>
</tr>
<tr>
<td>3.7-2</td>
<td>Tinian Land Jurisdictional Control</td>
<td>3-82</td>
</tr>
<tr>
<td>3.7-3</td>
<td>Tinian Land Jurisdictional Control and Management</td>
<td>3-83</td>
</tr>
<tr>
<td>3.7-4</td>
<td>Tinian CNMI Areas of Particular Concern</td>
<td>3-85</td>
</tr>
<tr>
<td>3.7-5</td>
<td>Tinian and Saipan Existing Land Use</td>
<td>3-86</td>
</tr>
<tr>
<td>3.7-6</td>
<td>Military Land Use on Tinian</td>
<td>3-88</td>
</tr>
<tr>
<td>3.7-7</td>
<td>Pagan CNMI Areas of Particular Concern</td>
<td>3-92</td>
</tr>
<tr>
<td>3.8-1</td>
<td>Tinian Recreation Resources and Places of Interest</td>
<td>3-96</td>
</tr>
<tr>
<td>3.9-1</td>
<td>Vegetation Communities – Tinian Military Lease Area</td>
<td>3-114</td>
</tr>
<tr>
<td>3.9-2</td>
<td>Estimated Tinian Monarch Population (1982 – 2013)</td>
<td>3-120</td>
</tr>
<tr>
<td>3.9-3</td>
<td>Occurrence of Special-status Species - Tinian Military Lease Area</td>
<td>3-125</td>
</tr>
<tr>
<td>3.9-4</td>
<td>Past and Current Occurrences of Mariana Common Moorhen within the Military Lease Area</td>
<td>3-127</td>
</tr>
<tr>
<td>3.9-5</td>
<td>Vegetation Communities – Pagan</td>
<td>3-135</td>
</tr>
<tr>
<td>3.9-6</td>
<td>Occurrence of Special-status Species – Pagan</td>
<td>3-141</td>
</tr>
<tr>
<td>3.10-1</td>
<td>Typical Reef Zonation</td>
<td>3-148</td>
</tr>
<tr>
<td>3.10-2</td>
<td>Tinian Marine Habitat Overview</td>
<td>3-152</td>
</tr>
<tr>
<td>3.10-3</td>
<td>Unai Chulu Coral Cover</td>
<td>3-158</td>
</tr>
<tr>
<td>3.10-4</td>
<td>Unai Babui Coral Cover</td>
<td>3-160</td>
</tr>
<tr>
<td>3.10-5</td>
<td>Unai Lam Lam Coral Cover</td>
<td>3-162</td>
</tr>
<tr>
<td>3.10-6</td>
<td>Unai Masalok Coral Cover</td>
<td>3-164</td>
</tr>
<tr>
<td>3.10-7</td>
<td>Pagan Marine Habitat Overview</td>
<td>3-176</td>
</tr>
<tr>
<td>3.10-8</td>
<td>Green Beach Coral Cover</td>
<td>3-180</td>
</tr>
<tr>
<td>3.10-9</td>
<td>Red Beach Coral Cover</td>
<td>3-182</td>
</tr>
<tr>
<td>3.10-10</td>
<td>Blue Beach Coral Cover</td>
<td>3-184</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>3.10-11</td>
<td>South Beach Coral Cover</td>
<td>3-187</td>
</tr>
<tr>
<td>3.10-12</td>
<td>Gold Beach Coral Cover</td>
<td>3-189</td>
</tr>
<tr>
<td>3.11-1</td>
<td>Major Historic Events for Tinian and Pagan</td>
<td>3-198</td>
</tr>
<tr>
<td>3.11-2</td>
<td>North Field National Historic Landmark</td>
<td>3-200</td>
</tr>
<tr>
<td>3.12-1</td>
<td>Tinian Key Observation Points</td>
<td>3-205</td>
</tr>
<tr>
<td>3.12-2</td>
<td>Pagan Visual Resources</td>
<td>3-216</td>
</tr>
<tr>
<td>3.13-1</td>
<td>Tinian International Airport Facilities</td>
<td>3-222</td>
</tr>
<tr>
<td>3.13-2</td>
<td>Tinian Existing Roads and Average Daily Traffic</td>
<td>3-224</td>
</tr>
<tr>
<td>3.13-3</td>
<td>Port of Tinian Cargo Tonnage Handled</td>
<td>3-227</td>
</tr>
<tr>
<td>3.14-1</td>
<td>Tinian Power Distribution</td>
<td>3-233</td>
</tr>
<tr>
<td>3.14-2</td>
<td>Tinian Potable Water Distribution</td>
<td>3-236</td>
</tr>
<tr>
<td>3.14-3</td>
<td>Tinian Wastewater Systems</td>
<td>3-238</td>
</tr>
<tr>
<td>3.14-4</td>
<td>Tinian Solid Waste Facility</td>
<td>3-240</td>
</tr>
<tr>
<td>3.15-2</td>
<td>Compensation and Gross Domestic Product</td>
<td>3-250</td>
</tr>
<tr>
<td>3.15-3</td>
<td>CNMI Total Visitors, 2000-2013</td>
<td>3-252</td>
</tr>
<tr>
<td>3.15-4</td>
<td>Percent Change in Total Visitors to the CNMI, 2000-2013</td>
<td>3-252</td>
</tr>
<tr>
<td>3.15-5</td>
<td>Tinian Fishing Areas and Type of Fishing</td>
<td>3-256</td>
</tr>
<tr>
<td>3.15-6</td>
<td>Minority and Low-income Population Areas</td>
<td>3-267</td>
</tr>
<tr>
<td>3.15-7</td>
<td>Schools and Highly Populated Areas</td>
<td>3-270</td>
</tr>
<tr>
<td>3.16-1</td>
<td>Tinian Areas of Potential Environmental Concern and Military Munitions Response Program Sites</td>
<td>3-279</td>
</tr>
<tr>
<td>3.16-2</td>
<td>Probable Munitions Presence Locations</td>
<td>3-293</td>
</tr>
<tr>
<td>3.17-1</td>
<td>Tinian Military Lease Area</td>
<td>3-296</td>
</tr>
<tr>
<td>4.2-1</td>
<td>Tinian Ground Disturbance and Geologic Map for Alternatives 1 and 2</td>
<td>4-12</td>
</tr>
<tr>
<td>4.2-2</td>
<td>Tinian Ground Disturbance and Geologic Map for Alternatives 1 and 3</td>
<td>4-24</td>
</tr>
<tr>
<td>4.3-1</td>
<td>Tinian Alternative 1 Surface Waters and Flood Zones</td>
<td>4-43</td>
</tr>
<tr>
<td>4.3-2</td>
<td>Tinian Alternative 1 Groundwater Wells, Elevation, and Flow Direction</td>
<td>4-45</td>
</tr>
<tr>
<td>4.3-3</td>
<td>Tinian Alternative 2 Surface Waters</td>
<td>4-52</td>
</tr>
<tr>
<td>4.3-4</td>
<td>Tinian Alternative 3 Surface Waters</td>
<td>4-54</td>
</tr>
<tr>
<td>4.3-5</td>
<td>Pagan Alternative 1 Surface Waters</td>
<td>4-58</td>
</tr>
<tr>
<td>4.3-6</td>
<td>Pagan Alternative 2 Surface Waters</td>
<td>4-63</td>
</tr>
<tr>
<td>4.5-1</td>
<td>All Tinian Alternatives Small-caliber Weapons Noise Levels (A-weighted)</td>
<td>4-85</td>
</tr>
<tr>
<td>4.5-2</td>
<td>All Tinian Alternatives Small-caliber Weapons Noise Levels (Peak)</td>
<td>4-87</td>
</tr>
<tr>
<td>4.5-3</td>
<td>All Tinian Alternatives Large-caliber Weapons Noise Levels (C-weighted)</td>
<td>4-91</td>
</tr>
<tr>
<td>4.5-4</td>
<td>All Tinian Alternatives Large-caliber Noise Levels under Neutral Weather Conditions (Peak)</td>
<td>4-93</td>
</tr>
<tr>
<td>4.5-5</td>
<td>All Tinian Alternatives Large-caliber Noise Levels under Unfavorable Weather Conditions (Peak)</td>
<td>4-95</td>
</tr>
<tr>
<td>4.5-6</td>
<td>Airfield and Airspace Noise Levels for All Tinian Alternatives (A-weighted)</td>
<td>4-103</td>
</tr>
<tr>
<td>Chapter</td>
<td>Section</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>4.5-7</td>
<td>All Pagan Alternatives Small-caliber Weapons Noise Levels (A-weighted)</td>
<td>4-118</td>
</tr>
<tr>
<td>4.5-8</td>
<td>All Pagan Alternatives Small-caliber Weapons Noise Levels (Peak)</td>
<td>4-119</td>
</tr>
<tr>
<td>4.5-9</td>
<td>All Pagan Alternatives Large-caliber Weapons Noise Levels (C-weighted)</td>
<td>4-122</td>
</tr>
<tr>
<td>4.5-10</td>
<td>All Pagan Alternatives Large-caliber Noise Levels under Neutral Weather Conditions (Peak)</td>
<td>4-123</td>
</tr>
<tr>
<td>4.5-11</td>
<td>All Pagan Alternatives Large-caliber Noise Levels under Unfavorable Weather Conditions (Peak)</td>
<td>4-124</td>
</tr>
<tr>
<td>4.5-12</td>
<td>All Pagan Alternatives Airfield and Airspace Noise Levels (A-weighted)</td>
<td>4-127</td>
</tr>
<tr>
<td>4.6-1</td>
<td>Airspace Region of Influence</td>
<td>4-133</td>
</tr>
<tr>
<td>4.6-2</td>
<td>Commuter Flight Routes</td>
<td>4-139</td>
</tr>
<tr>
<td>4.7-1</td>
<td>Tinian Proposed Land Acquisition</td>
<td>4-157</td>
</tr>
<tr>
<td>4.7-2</td>
<td>Tinian Potential Agricultural Use in the Military Lease Area</td>
<td>4-160</td>
</tr>
<tr>
<td>4.7-3</td>
<td>Tinian All Action Alternatives Areas of Particular Concern</td>
<td>4-163</td>
</tr>
<tr>
<td>4.7-4</td>
<td>Pagan All Action Alternatives Areas of Particular Concern</td>
<td>4-170</td>
</tr>
<tr>
<td>4.9-1a</td>
<td>Northern Military Lease Area – Tinian Alternative 1, Vegetation Communities</td>
<td>4-195</td>
</tr>
<tr>
<td>4.9-1b</td>
<td>Southern Military Lease Area – Tinian Alternative 1, Vegetation Communities</td>
<td>4-196</td>
</tr>
<tr>
<td>4.9-2</td>
<td>Potential Mitigation Areas with Implementation of Tinian Alternatives 1, 2 or 3</td>
<td>4-199</td>
</tr>
<tr>
<td>4.9-3a</td>
<td>Northern Military Lease Area – Tinian Alternative 1, Occurrence of Special-status Species</td>
<td>4-202</td>
</tr>
<tr>
<td>4.9-3b</td>
<td>Southern Military Lease Area – Tinian Alternative 1, Occurrence of Special-status Species</td>
<td>4-203</td>
</tr>
<tr>
<td>4.9-4a</td>
<td>Northern Military Lease Area – Tinian Alternative 2, Vegetation Communities</td>
<td>4-218</td>
</tr>
<tr>
<td>4.9-4b</td>
<td>Southern Military Lease Area – Tinian Alternative 2, Vegetation Communities</td>
<td>4-219</td>
</tr>
<tr>
<td>4.9-5a</td>
<td>Northern Military Lease Area – Tinian Alternative 2, Occurrence of Special-status Species</td>
<td>4-223</td>
</tr>
<tr>
<td>4.9-5b</td>
<td>Southern Military Lease Area – Tinian Alternative 2, Occurrence of Special-status Species</td>
<td>4-224</td>
</tr>
<tr>
<td>4.9-6a</td>
<td>Northern Military Lease Area – Tinian Alternative 3, Vegetation Communities</td>
<td>4-228</td>
</tr>
<tr>
<td>4.9-6b</td>
<td>Southern Military Lease Area – Tinian Alternative 3, Vegetation Communities</td>
<td>4-229</td>
</tr>
<tr>
<td>4.9-7a</td>
<td>Northern Military Lease Area – Tinian Alternative 3, Occurrence of Special-status Species</td>
<td>4-233</td>
</tr>
<tr>
<td>4.9-7b</td>
<td>Southern Military Lease Area – Tinian Alternative 3, Occurrence of Special-status Species</td>
<td>4-234</td>
</tr>
<tr>
<td>4.9-8</td>
<td>Pagan Alternative 1, Vegetation Communities</td>
<td>4-245</td>
</tr>
<tr>
<td>4.9-9</td>
<td>Pagan Alternative 1, Occurrence of Special-status Species</td>
<td>4-247</td>
</tr>
<tr>
<td>4.9-10</td>
<td>Pagan Alternative 2, Vegetation Communities</td>
<td>4-256</td>
</tr>
<tr>
<td>4.9-11</td>
<td>Pagan Alternative 2, Occurrence of Special-status Species</td>
<td>4-258</td>
</tr>
<tr>
<td>4.10-1</td>
<td>Unai Chulu Training Impact Area- Depth</td>
<td>4-272</td>
</tr>
<tr>
<td>4.10-2</td>
<td>Unai Chulu Training Impact Area- Coral Cover</td>
<td>4-273</td>
</tr>
<tr>
<td>4.10-3</td>
<td>Unai Babui Training Impact Area-Depth</td>
<td>4-284</td>
</tr>
<tr>
<td>4.10-4</td>
<td>Unai Babui Training Impact Area-Coral Cover</td>
<td>4-285</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.10-5</td>
<td>Unai Lam Lam Training Impact Area-Depth</td>
<td>4-286</td>
</tr>
<tr>
<td>4.10-6</td>
<td>Unai Lam Lam Training Impact Area-Coral Cover</td>
<td>4-287</td>
</tr>
<tr>
<td>4.10-7</td>
<td>Unai Masalok Training Impact Area-Depth</td>
<td>4-288</td>
</tr>
<tr>
<td>4.10-8</td>
<td>Unai Masalok Training Impact Area-Coral Cover</td>
<td>4-289</td>
</tr>
<tr>
<td>4.10-9</td>
<td>Green Beach Training Impact Area-Depth</td>
<td>4-308</td>
</tr>
<tr>
<td>4.10-10</td>
<td>Green Beach Training Impact Area-Coral Cover</td>
<td>4-309</td>
</tr>
<tr>
<td>4.10-11</td>
<td>Red Beach Training Impact Area-Depth</td>
<td>4-310</td>
</tr>
<tr>
<td>4.10-12</td>
<td>Red Beach Training Impact Area-Coral Cover</td>
<td>4-311</td>
</tr>
<tr>
<td>4.10-13</td>
<td>Blue Beach Training Impact Area-Depth</td>
<td>4-312</td>
</tr>
<tr>
<td>4.10-14</td>
<td>Blue Beach Training Impact Area-Coral Cover</td>
<td>4-313</td>
</tr>
<tr>
<td>4.10-15</td>
<td>South Beach Training Impact Area Depth</td>
<td>4-314</td>
</tr>
<tr>
<td>4.10-16</td>
<td>South Beach Training Impact Area Coral Cover</td>
<td>4-315</td>
</tr>
<tr>
<td>4.10-17</td>
<td>North Beach Training Impact Area-Depth</td>
<td>4-316</td>
</tr>
<tr>
<td>4.10-18</td>
<td>Gold Beach Training Impact Area-Depth</td>
<td>4-318</td>
</tr>
<tr>
<td>4.10-19</td>
<td>Gold Beach Training Impact Area-Coral Cover</td>
<td>4-319</td>
</tr>
<tr>
<td>4.12-1</td>
<td>Tinian Alternative 1 Key Observation Points</td>
<td>4-367</td>
</tr>
<tr>
<td>4.12-2</td>
<td>Tinian Alternative 2 Key Observation Points</td>
<td>4-375</td>
</tr>
<tr>
<td>4.12-3</td>
<td>Tinian Alternative 3 Key Observation Points</td>
<td>4-377</td>
</tr>
<tr>
<td>4.12-4</td>
<td>Pagan Alternative 1 Visual Resources</td>
<td>4-381</td>
</tr>
<tr>
<td>4.12-5</td>
<td>Pagan Alternative 2 Visual Resources</td>
<td>4-383</td>
</tr>
<tr>
<td>4.13-1</td>
<td>Ground Transportation Improvements</td>
<td>4-391</td>
</tr>
<tr>
<td>4.16-1</td>
<td>Tinian All Action Alternatives Hazardous Materials/Waste Use and Storage Areas and Contaminated Sites for Range Training Area</td>
<td>4-461</td>
</tr>
<tr>
<td>4.16-2</td>
<td>Tinian All Action Alternatives Hazardous Materials/Waste Use and Storage Areas, Base Camp Munitions Storage, and Airport Improvements</td>
<td>4-462</td>
</tr>
<tr>
<td>4.16-3</td>
<td>Tinian All Action Alternatives Hazardous Materials/Waste Use and Storage Areas for Tinian Port and Supply Route</td>
<td>4-463</td>
</tr>
<tr>
<td>4.16-4</td>
<td>Pagan Alternative 1 Hazardous Materials/Waste Use and Storage Area</td>
<td>4-482</td>
</tr>
<tr>
<td>4.16-5</td>
<td>Pagan Alternative 2 Hazardous Materials/Waste Use and Storage Area</td>
<td>4-486</td>
</tr>
<tr>
<td>4.18-1</td>
<td>Potential Rota Site</td>
<td>4-506</td>
</tr>
<tr>
<td>4.18-2</td>
<td>Potential Saipan Site</td>
<td>4-507</td>
</tr>
<tr>
<td>4.18-3</td>
<td>Potential Tinian Site</td>
<td>4-508</td>
</tr>
<tr>
<td>4.18-4</td>
<td>Potential Guam Site</td>
<td>4-510</td>
</tr>
<tr>
<td>4.18-5</td>
<td>Proposed Pagan Pier and Breakwater</td>
<td>4-522</td>
</tr>
<tr>
<td>5.2-1</td>
<td>Tinian and Pagan Present and Reasonably Foreseeable Actions</td>
<td>5-12</td>
</tr>
</tbody>
</table>
## List of Tables

<table>
<thead>
<tr>
<th>Table Number</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES-1</td>
<td>Summary of No-Action Alternative Training on Tinian Exclusive Military Use Area by U.S. Air Force, Army, Marine Corps, Navy, and Guam National Guard/Reserve</td>
<td>ES-17</td>
</tr>
<tr>
<td>ES-2</td>
<td>Summary Comparison of Action Tinian Alternatives</td>
<td>ES-19</td>
</tr>
<tr>
<td>ES-3</td>
<td>Summary Comparison of Pagan Alternatives</td>
<td>ES-42</td>
</tr>
<tr>
<td>ES-4</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>ES-51</td>
</tr>
<tr>
<td>ES-5</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>ES-58</td>
</tr>
<tr>
<td>ES-6</td>
<td>Summary of Potential Mitigation Measures</td>
<td>ES-62</td>
</tr>
<tr>
<td>1.5-1</td>
<td>Dates of Newspaper Notification Announcements for Public Scoping Meetings</td>
<td>1-17</td>
</tr>
<tr>
<td>1.5-2</td>
<td>Federal Aviation Administration Resource Impact Categories</td>
<td>1-20</td>
</tr>
<tr>
<td>2.2-1</td>
<td>Pacific Command Service Components’ Unfilled Training Requirements in the CNMI</td>
<td>2-5</td>
</tr>
<tr>
<td>2.2-2</td>
<td>Representative Weaponry and Equipment</td>
<td>2-9</td>
</tr>
<tr>
<td>2.2-3</td>
<td>Unit Level Training and Exercises, Duration, and Personnel</td>
<td>2-15</td>
</tr>
<tr>
<td>2.2-4</td>
<td>Combined Level Training and Exercises, Duration, and Personnel</td>
<td>2-19</td>
</tr>
<tr>
<td>2.3-1</td>
<td>Requirements and Siting Study – Operational Siting Criteria</td>
<td>2-23</td>
</tr>
<tr>
<td>2.3-2</td>
<td>RTA Siting Criteria for Islands in the CNMI</td>
<td>2-24</td>
</tr>
<tr>
<td>2.4-1</td>
<td>Proposed Tinian Unit Level RTA Road Improvements</td>
<td>2-45</td>
</tr>
<tr>
<td>2.4-2</td>
<td>All Tinian Action Alternatives Proposed Annual Amphibious Operations</td>
<td>2-71</td>
</tr>
<tr>
<td>2.4-3</td>
<td>Tinian All Alternatives Proposed Annual Airfield Military Operations</td>
<td>2-73</td>
</tr>
<tr>
<td>2.4-4</td>
<td>All Tinian Action Alternatives Proposed Typical Annual Landing Zone Operations</td>
<td>2-73</td>
</tr>
<tr>
<td>2.4-5</td>
<td>Proposed Tinian RTA Representative Annual Munitions Expenditures: All Tinian Action Alternatives</td>
<td>2-80</td>
</tr>
<tr>
<td>2.4-6</td>
<td>All Tinian Action Alternatives Proposed Annual Operations in Special Use Airspace</td>
<td>2-89</td>
</tr>
<tr>
<td>2.4-7</td>
<td>Summary of No-Action Alternative Training on Tinian Exclusive Military Use Area by U.S. Air Force, Army, Marine Corps, Navy, and Guam National Guard/Reserve</td>
<td>2-102</td>
</tr>
<tr>
<td>2.4-8</td>
<td>Summary Comparison of Action Tinian Alternatives</td>
<td>2-108</td>
</tr>
<tr>
<td>2.5-1</td>
<td>All Pagan Action Alternatives Proposed Amphibious Operations</td>
<td>2-124</td>
</tr>
<tr>
<td>2.5-2</td>
<td>All Pagan Alternatives Proposed Annual Airfield Military Operations</td>
<td>2-124</td>
</tr>
<tr>
<td>2.5-3</td>
<td>All Pagan Action Alternatives Proposed Typical Annual Landing Zone Operations</td>
<td>2-125</td>
</tr>
<tr>
<td>2.5-4</td>
<td>All Pagan Action Alternatives Proposed Representative Annual Munitions Expenditures</td>
<td>2-129</td>
</tr>
<tr>
<td>2.5-5</td>
<td>All Pagan Action Alternatives Aircraft Operations Proposed in Special Use Airspace</td>
<td>2-132</td>
</tr>
<tr>
<td>2.5-6</td>
<td>Summary Comparison of Pagan Alternatives</td>
<td>2-146</td>
</tr>
<tr>
<td>3.2-1</td>
<td>Soil Classifications Associated with the Affected Environment</td>
<td>3-14</td>
</tr>
<tr>
<td>3.3-1</td>
<td>Tinian Surface Water Features</td>
<td>3-27</td>
</tr>
<tr>
<td>3.3-2</td>
<td>Summary of Potential Wetlands of the Bateha and Mahalang Complexes</td>
<td>3-29</td>
</tr>
<tr>
<td>3.3-3</td>
<td>Tinian – Tinian Municipal Well Water Quality</td>
<td>3-35</td>
</tr>
<tr>
<td>Page</td>
<td>Title</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>3.3-4</td>
<td>Tinian Impaired Coastal Waters</td>
<td></td>
</tr>
<tr>
<td>3.3-5</td>
<td>Pagan Surface Water Quality Data Summary</td>
<td></td>
</tr>
<tr>
<td>3.3-6</td>
<td>Pagan Surface Water Quality Sample Report</td>
<td></td>
</tr>
<tr>
<td>3.5-1</td>
<td>Noise Zones and Sensitive Land Use Compatibility</td>
<td></td>
</tr>
<tr>
<td>3.5-2</td>
<td>General Land Use Compatibility by Noise Zone</td>
<td></td>
</tr>
<tr>
<td>3.5-3</td>
<td>Large-caliber Weapons and Explosives Risk of Complaints Levels</td>
<td></td>
</tr>
<tr>
<td>3.5-4</td>
<td>Baseline Noise Levels at Representative Points of Interest</td>
<td></td>
</tr>
<tr>
<td>3.6-1</td>
<td>Current Use of Air Traffic Control Assigned Airspace</td>
<td></td>
</tr>
<tr>
<td>3.9-1</td>
<td>Terrestrial Biology Field Studies on Tinian and Pagan</td>
<td></td>
</tr>
<tr>
<td>3.9-2</td>
<td>Tinian Vegetation Communities (acres)</td>
<td></td>
</tr>
<tr>
<td>3.9-3</td>
<td>Occurrence of Federally Endangered Species Act-Listed and Proposed Species and CNMI-Listed Species on Tinian</td>
<td></td>
</tr>
<tr>
<td>3.9-4</td>
<td>Bird Species Observed on Tinian and Protected under the Migratory Bird Treaty Act</td>
<td></td>
</tr>
<tr>
<td>3.9-5</td>
<td>Vegetation Communities – Pagan</td>
<td></td>
</tr>
<tr>
<td>3.9-6</td>
<td>Occurrence of Federally Endangered Species Act-Listed and Proposed Species and CNMI-Listed Species on Pagan</td>
<td></td>
</tr>
<tr>
<td>3.9-7</td>
<td>Bird Species Occurring on Pagan and Protected under the Migratory Bird Treaty Act</td>
<td></td>
</tr>
<tr>
<td>3.10-1</td>
<td>Estimates of Select Total Physical Features Compared to Tinian</td>
<td></td>
</tr>
<tr>
<td>3.10-2</td>
<td>Essential Fish Habitat and Habitat Areas of Particular Concern for Management Unit Species of the Western Pacific Region</td>
<td></td>
</tr>
<tr>
<td>3.10-3</td>
<td>CNMI Marine Invertebrate Species of Special Conservation Need of Tinian</td>
<td></td>
</tr>
<tr>
<td>3.10-4</td>
<td>Special-status Coral Species of Tinian</td>
<td></td>
</tr>
<tr>
<td>3.10-5</td>
<td>Special-status Fish Species of Tinian</td>
<td></td>
</tr>
<tr>
<td>3.10-6</td>
<td>Special-status Sea Turtle Species of Tinian</td>
<td></td>
</tr>
<tr>
<td>3.10-7</td>
<td>Marine Mammals Species with Reported Occurrence in the Region of Influence Surrounding Tinian</td>
<td></td>
</tr>
<tr>
<td>3.10-8</td>
<td>Estimates of Select Total Physical Characteristics Compared to Pagan</td>
<td></td>
</tr>
<tr>
<td>3.10-9</td>
<td>Marine Invertebrates Identified by the CNMI Division of Fish and Wildlife Marine Species of Special Conservation Need in Pagan</td>
<td></td>
</tr>
<tr>
<td>3.10-10</td>
<td>Special-status Coral Species of Pagan</td>
<td></td>
</tr>
<tr>
<td>3.10-11</td>
<td>Special-status Sea Turtle Species of Pagan</td>
<td></td>
</tr>
<tr>
<td>3.11-1</td>
<td>Contributing Features to the North Field National Historic Landmark</td>
<td></td>
</tr>
<tr>
<td>3.15-1</td>
<td>CNMI Labor Force, Employment, and Unemployment, 2010</td>
<td></td>
</tr>
<tr>
<td>3.15-2</td>
<td>Employment by Industry, 2010</td>
<td></td>
</tr>
<tr>
<td>3.15-3</td>
<td>CNMI Income by Occupation, 2011</td>
<td></td>
</tr>
<tr>
<td>3.15-4</td>
<td>CNMI Government Revenues by Source, 2002-2009 (Millions of $’s)</td>
<td></td>
</tr>
<tr>
<td>3.15-5</td>
<td>Farms, Land in Farms, and Land Use by Municipality, 2002 and 2007</td>
<td></td>
</tr>
<tr>
<td>3.15-6</td>
<td>Tinian Cattle Ranching Data, December 2012-February 2013</td>
<td></td>
</tr>
</tbody>
</table>
3.15-7 Tinian Fishing Areas and Type of Fishing ........................................................................................................... 3-255
3.15-8 Minority Population Areas (> 50%) by Census Tract ......................................................................................... 3-266
3.15-9 Low-income Population Areas (>20%) by Census Tract ................................................................................... 3-268
3.15-10 Children in the CNMI and Tinian, 2010 .............................................................................................................. 3-268
3.15-11 Percentage of Children Below the Poverty Line .............................................................................................. 3-269
3.16-1 Sites of Potential Environmental Concern Associated with Agricultural Activities within the Tinian Military Lease Area ............................................................................................................ 3-284
3.16-2 Sites of Potential Environmental Concern Associated with World War II Activities within the Tinian Military Lease Area ........................................................................................................... 3-286
3.16-3 Sites of Potential Environmental Concern within the Tinian Military Lease Area ........................................... 3-290
3.16-4 Potential Historical Hazardous Waste Sites and Munitions and Explosives of Concern Areas on Pagan .......................................................................................................................... 3-292
3.17-1 CNMI Five Year (2008-2012) Collision Summary ............................................................................................... 3-299
4.2-1 Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 1 .......................................................................................................................... 4-7
4.2-2 Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 2 ................................................................................................. 4-18
4.2-3 Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 3 ................................................................................................. 4-22
4.2-4 Summary of Impacts for Tinian Alternatives ........................................................................................................ 4-26
4.2-5 Summary of Ground Disturbance, Slope, Geologic Units and Geologic Hazards Associated with Construction under Pagan Alternative 1 .................................................................................................................. 4-28
4.2-6 Summary of Ground Disturbance, Slope, Geologic Units and Geologic Hazards Associated with Construction under Pagan Alternative 2 ........................................................................................................... 4-34
4.2-7 Summary of Impacts for Pagan Alternatives ........................................................................................................ 4-35
4.3-1 Summary of Impacts for Tinian Alternatives ........................................................................................................ 4-55
4.3-2 Summary of Impacts for Pagan Alternatives ........................................................................................................ 4-64
4.4-1 Annual Average Construction Emissions – Tinian Alternative 1 ........................................................................... 4-69
4.4-2 Operational Training Annual Emissions – Tinian Alternatives 1, 2, and 3 ...................................................... 4-70
4.4-3 Annual Average Construction Emissions – Tinian Alternative 2 ....................................................................... 4-71
4.4-4 Annual Average Construction Emissions – Tinian Alternative 3 ....................................................................... 4-71
4.4-5 Summary of Impacts for Tinian Alternatives ........................................................................................................ 4-73
4.4-6 Annual Construction Emissions – Pagan Alternative 1 ......................................................................................... 4-74
4.4-7 Operational Training Activity Annual Emissions – Pagan Alternative 1 ............................................................ 4-75
4.4-8 Annual Construction Emissions – Pagan Alternative 2 ......................................................................................... 4-76
4.4-9 Summary of Impacts for Pagan Alternatives ........................................................................................................ 4-76
4.5-1 Area and Population on Tinian Affected by Small-caliber Weapons Noise for All Tinian Alternatives(A-weighted) ............................................................................................................................. 4-84
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5-2</td>
<td>Area and Population on Tinian Affected by Small-caliber Weapons Noise for All Tinian Alternatives (Peak)</td>
<td>4-84</td>
</tr>
<tr>
<td>4.5-3</td>
<td>Tinian Alternative 1 Representative Points of Interest on Tinian Affected by Small-caliber Weapons Noise (A-weighted and Peak)</td>
<td>4-89</td>
</tr>
<tr>
<td>4.5-4</td>
<td>Area and Population on Tinian and Saipan Affected by Large-caliber Weapons Noise for All Tinian Alternatives (C-weighted)</td>
<td>4-90</td>
</tr>
<tr>
<td>4.5-5</td>
<td>Area and Population on Tinian and Saipan Affected by Large-caliber Weapons Noise - Risk Complaint Neutral Weather for All Tinian Alternatives (Peak)</td>
<td>4-97</td>
</tr>
<tr>
<td>4.5-6</td>
<td>Area and Population on Tinian and Saipan Affected by Large-caliber Weapons Noise - Risk Complaint Unfavorable Weather for All Tinian Alternatives (Peak)</td>
<td>4-97</td>
</tr>
<tr>
<td>4.5-7</td>
<td>Representative Points of Interest on Tinian Affected by Large-caliber Weapons Noise under All Tinian Alternatives (C-weighted)</td>
<td>4-98</td>
</tr>
<tr>
<td>4.5-8</td>
<td>Representative Points of Interest on Saipan Affected by Large-caliber Weapons Noise under All Tinian Alternatives (C-weighted)</td>
<td>4-99</td>
</tr>
<tr>
<td>4.5-9</td>
<td>Representative Points of Interest on Tinian Affected by Large-caliber Weapons Noise for All Tinian Alternatives (Peak)</td>
<td>4-100</td>
</tr>
<tr>
<td>4.5-10</td>
<td>Representative Points of Interest on Saipan Affected by Large-caliber Weapons Noise for All Tinian Alternatives (Peak)</td>
<td>4-101</td>
</tr>
<tr>
<td>4.5-11</td>
<td>Annual Airfield Operations at Tinian International Airport and North Field for All Tinian Alternatives</td>
<td>4-102</td>
</tr>
<tr>
<td>4.5-12</td>
<td>Noise Area and Population Generated by Aircraft Operations for All Tinian Alternatives Compared to Baseline (2012) Levels (A-weighted)</td>
<td>4-104</td>
</tr>
<tr>
<td>4.5-13</td>
<td>All Tinian Alternatives Points of Interest Noise Level Exposure Generated by Aircraft Operations (A-weighted)</td>
<td>4-106</td>
</tr>
<tr>
<td>4.5-14</td>
<td>Representative Unit Level Vehicle Requirements</td>
<td>4-107</td>
</tr>
<tr>
<td>4.5-15</td>
<td>All Tinian Alternatives Proposed Base Vehicles</td>
<td>4-107</td>
</tr>
<tr>
<td>4.5-16</td>
<td>Tinian Alternative 2 Representative Points of Interest Affected by Small-caliber Weapons Noise on Tinian (A-weighted and Peak)</td>
<td>4-110</td>
</tr>
<tr>
<td>4.5-17</td>
<td>Tinian Alternative 3 Representative Points of Interest Affected by Small-caliber Weapons Noise on Tinian (A-weighted and Peak)</td>
<td>4-113</td>
</tr>
<tr>
<td>4.5-18</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-116</td>
</tr>
<tr>
<td>4.5-19</td>
<td>All Pagan Alternatives Affected by Small-caliber Weapons Noise (A-weighted and Peak)</td>
<td>4-120</td>
</tr>
<tr>
<td>4.5-20</td>
<td>All Pagan Alternatives Area Affected by Large-caliber Weapons Noise (C-weighted and Peak)</td>
<td>4-121</td>
</tr>
<tr>
<td>4.5-21</td>
<td>All Pagan Alternatives Points of Interest from Large-caliber Weapon Activity (C-weighted)</td>
<td>4-125</td>
</tr>
<tr>
<td>4.5-22</td>
<td>All Pagan Alternatives Representative Points of Interest Affected by Large-caliber Weapons Noise (Peak)</td>
<td>4-126</td>
</tr>
<tr>
<td>4.5-23</td>
<td>All Pagan Alternatives Noise Exposure Area at and Around the Airfield (A-weighted)</td>
<td>4-126</td>
</tr>
<tr>
<td>4.5-24</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-131</td>
</tr>
<tr>
<td>4.6-1</td>
<td>Change in Tinian International Airport Annual Airport Operations</td>
<td>4-137</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.6-2</td>
<td>Distances between Saipan and Tinian</td>
<td>4-140</td>
</tr>
<tr>
<td>4.6-3</td>
<td>North Field Annual Operations</td>
<td>4-142</td>
</tr>
<tr>
<td>4.6-4</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-147</td>
</tr>
<tr>
<td>4.6-5</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
<td>4-148</td>
</tr>
<tr>
<td>4.6-6</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-153</td>
</tr>
<tr>
<td>4.7-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-166</td>
</tr>
<tr>
<td>4.7-2</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
<td>4-167</td>
</tr>
<tr>
<td>4.7-3</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-171</td>
</tr>
<tr>
<td>4.8-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-183</td>
</tr>
<tr>
<td>4.8-2</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
<td>4-184</td>
</tr>
<tr>
<td>4.8-3</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-186</td>
</tr>
<tr>
<td>4.9-1</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Tinian Alternative 1</td>
<td>4-194</td>
</tr>
<tr>
<td>4.9-2</td>
<td>Potential Direct and Permanent Impacts to Five Native Bird Species from Proposed Construction Activities under Tinian Alternative 1</td>
<td>4-198</td>
</tr>
<tr>
<td>4.9-3</td>
<td>Potential Direct and Permanent Impacts to Three Migratory Bird Treaty Act-listed Species from Proposed Construction Activities under Tinian Alternative 1</td>
<td>4-206</td>
</tr>
<tr>
<td>4.9-4</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Tinian Alternative 2</td>
<td>4-220</td>
</tr>
<tr>
<td>4.9-5</td>
<td>Potential Direct and Permanent Impacts to Five Native Bird Species from Proposed Construction Activities under Tinian Alternative 2</td>
<td>4-221</td>
</tr>
<tr>
<td>4.9-6</td>
<td>Potential Direct and Permanent Impacts to Three Migratory Bird Treaty Act-listed Species from Proposed Construction Activities under Tinian Alternative 2</td>
<td>4-225</td>
</tr>
<tr>
<td>4.9-7</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Tinian Alternative 3</td>
<td>4-230</td>
</tr>
<tr>
<td>4.9-8</td>
<td>Potential Direct and Permanent Impacts to Five Native Bird Species from Proposed Construction Activities under Tinian Alternative 3</td>
<td>4-231</td>
</tr>
<tr>
<td>4.9-9</td>
<td>Potential Direct and Permanent Impacts to Three Migratory Bird Treaty Act-listed Species from Proposed Construction Activities under Tinian Alternative 3</td>
<td>4-235</td>
</tr>
<tr>
<td>4.9-10</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-238</td>
</tr>
<tr>
<td>4.9-11</td>
<td>Summary of Mitigation Measures for Tinian Alternatives</td>
<td>4-239</td>
</tr>
<tr>
<td>4.9-12</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Pagan Alternative 1</td>
<td>4-244</td>
</tr>
<tr>
<td>4.9-13</td>
<td>Modeled Weapons and Aircraft Noise Levels at Mariana Fruit Bat Colonies on Pagan under Alternative 1</td>
<td>4-252</td>
</tr>
<tr>
<td>4.9-14</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Pagan Alternative 2</td>
<td>4-257</td>
</tr>
<tr>
<td>4.9-15</td>
<td>Modeled Weapons and Aircraft Noise Levels at Mariana Fruit Bat Colonies on Pagan under Alternative 2</td>
<td>4-260</td>
</tr>
<tr>
<td>4.10-1</td>
<td>Summary of Potential Direct and Indirect Impacts to Marine Habitat at Unai Chulu</td>
<td>4-274</td>
</tr>
<tr>
<td>4.10-2</td>
<td>Potential Impacts to Acropora globiceps at Unai Chulu During Construction</td>
<td>4-280</td>
</tr>
</tbody>
</table>

xxxii
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.10-3</td>
<td>Tinian Beach Activity Overview</td>
<td>4-283</td>
</tr>
<tr>
<td>4.10-4</td>
<td>Summary of Potential Direct and Indirect Impacts to Marine Habitat on Tinian</td>
<td>4-291</td>
</tr>
<tr>
<td>4.10-5</td>
<td>Potential Impacts to Acropora globiceps at Unai Chulu, Unai Babui, Unai Masalok, and Unai Lam Lam During Operation/Training Activities</td>
<td>4-294</td>
</tr>
<tr>
<td>4.10-6</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-299</td>
</tr>
<tr>
<td>4.10-7</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
<td>4-300</td>
</tr>
<tr>
<td>4.10-8</td>
<td>Pagan Beach Activity Overview</td>
<td>4-302</td>
</tr>
<tr>
<td>4.10-9</td>
<td>Summary of Potential Direct and Indirect Impacts to Marine Habitat on Pagan</td>
<td>4-304</td>
</tr>
<tr>
<td>4.10-10</td>
<td>Potential Impacts to Acropora globiceps at Green, Red, Blue, South, Gold, and North Beach on Pagan</td>
<td>4-321</td>
</tr>
<tr>
<td>4.10-11</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-325</td>
</tr>
<tr>
<td>4.10-12</td>
<td>Summary of Potential Mitigation Measures for Pagan Alternatives</td>
<td>4-326</td>
</tr>
<tr>
<td>4.11-1</td>
<td>Tinian Alternative 1: Summary of Significant Direct Impacts on Historic Properties from Construction</td>
<td>4-330</td>
</tr>
<tr>
<td>4.11-2</td>
<td>Tinian Alternative 1 Summary of Significant Direct Impacts on Historic Properties from Operations</td>
<td>4-335</td>
</tr>
<tr>
<td>4.11-3</td>
<td>Tinian Alternative 2 Summary of Significant Direct Impacts on Historic Properties from Construction</td>
<td>4-338</td>
</tr>
<tr>
<td>4.11-4</td>
<td>Tinian Alternative 2 Summary of Significant Direct Impacts on Historic Properties from Operations</td>
<td>4-341</td>
</tr>
<tr>
<td>4.11-5</td>
<td>Tinian Alternative 3 Summary of Significant Direct Impacts on Historic Properties from Construction</td>
<td>4-344</td>
</tr>
<tr>
<td>4.11-6</td>
<td>Tinian Alternative 3 Summary of Significant Direct Impacts on Historic Properties from Operations</td>
<td>4-347</td>
</tr>
<tr>
<td>4.11-7</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-350</td>
</tr>
<tr>
<td>4.11-8</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
<td>4-351</td>
</tr>
<tr>
<td>4.11-9</td>
<td>Pagan Alternative 1 Summary of Significant Direct Impacts on Historic Properties from Construction</td>
<td>4-353</td>
</tr>
<tr>
<td>4.11-10</td>
<td>Pagan Alternative 1 Summary of Significant Direct Impacts on Historic Properties from Operations</td>
<td>4-356</td>
</tr>
<tr>
<td>4.11-11</td>
<td>Pagan Alternative 2: Summary of Significant Direct Impacts on Historic Properties from Construction</td>
<td>4-358</td>
</tr>
<tr>
<td>4.11-12</td>
<td>Pagan Alternative 2: Summary of Significant Direct Impacts on Historic Properties from Operations</td>
<td>4-360</td>
</tr>
<tr>
<td>4.11-13</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-362</td>
</tr>
<tr>
<td>4.11-14</td>
<td>Summary of Potential Mitigation Measures for Pagan Alternatives</td>
<td>4-363</td>
</tr>
<tr>
<td>4.12-1</td>
<td>Degree of Visual Contrast Defined</td>
<td>4-364</td>
</tr>
<tr>
<td>4.12-2</td>
<td>Degree of Visual Impact Defined</td>
<td>4-365</td>
</tr>
<tr>
<td>4.12-3</td>
<td>Tinian Alternative 1 Summary of Visual Impacts</td>
<td>4-373</td>
</tr>
<tr>
<td>4.12-4</td>
<td>Tinian Alternative 2 Summary of Visual Impacts</td>
<td>4-376</td>
</tr>
<tr>
<td>4.12-5</td>
<td>Tinian Alternative 3 Summary of Visual Impacts</td>
<td>4-378</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.12-6</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-379</td>
</tr>
<tr>
<td>4.12-7</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-384</td>
</tr>
<tr>
<td>4.13-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-404</td>
</tr>
<tr>
<td>4.13-2</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-404</td>
</tr>
<tr>
<td>4.14-1</td>
<td>Total Estimated Change to Tinian Population</td>
<td>4-409</td>
</tr>
<tr>
<td>4.14-2</td>
<td>Tinian Alternative 1 Projected Construction Waste</td>
<td>4-417</td>
</tr>
<tr>
<td>4.14-3</td>
<td>Tinian Future Proposed Plan Electrical Power Demand Forecast</td>
<td>4-419</td>
</tr>
<tr>
<td>4.14-4</td>
<td>Estimated Potable Water Demand for Proposed Tinian Range Training Area System</td>
<td>4-419</td>
</tr>
<tr>
<td>4.14-5</td>
<td>Estimated Wastewater Flows generated by Military Personnel</td>
<td>4-420</td>
</tr>
<tr>
<td>4.14-6</td>
<td>CNMI Secondary Treated Effluent Requirements (Base Camp)</td>
<td>4-421</td>
</tr>
<tr>
<td>4.14-7</td>
<td>Estimated Influent Loading (Base Camp)</td>
<td>4-421</td>
</tr>
<tr>
<td>4.14-8</td>
<td>Estimated Total Solid Waste Generation</td>
<td>4-423</td>
</tr>
<tr>
<td>4.14-9</td>
<td>Tinian Alternative 2 Projected Construction Waste</td>
<td>4-425</td>
</tr>
<tr>
<td>4.14-10</td>
<td>Tinian Alternative 3 Projected Construction Waste</td>
<td>4-427</td>
</tr>
<tr>
<td>4.14-11</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-429</td>
</tr>
<tr>
<td>4.14-12</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-432</td>
</tr>
<tr>
<td>4.15-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-453</td>
</tr>
<tr>
<td>4.15-2</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-456</td>
</tr>
<tr>
<td>4.16-1</td>
<td>Potentially Contaminated Sites Within or Near Training Areas Under Alternative 1</td>
<td>4-471</td>
</tr>
<tr>
<td>4.16-2</td>
<td>Potentially Contaminated Sites Within or Near Training Areas Under Alternative 2</td>
<td>4-475</td>
</tr>
<tr>
<td>4.16-3</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-478</td>
</tr>
<tr>
<td>4.16-4</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-488</td>
</tr>
<tr>
<td>4.17-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-498</td>
</tr>
<tr>
<td>4.17-2</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-502</td>
</tr>
<tr>
<td>4.18-1</td>
<td>Density Estimates for Species Potentially Occurring in the Project Area</td>
<td>4-532</td>
</tr>
<tr>
<td>4.20-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-547</td>
</tr>
<tr>
<td>4.20-2</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-555</td>
</tr>
<tr>
<td>4.20-3</td>
<td>Summary of Potential Mitigation Measures</td>
<td>4-559</td>
</tr>
<tr>
<td>5.2-1</td>
<td>Mariana Islands Training and Testing EIS/OEIS Proposed Training Activities that Could Occur on Tinian</td>
<td>5-5</td>
</tr>
<tr>
<td>5.2-2</td>
<td>Warning Area 13 Proposed Use and Characteristics</td>
<td>5-6</td>
</tr>
<tr>
<td>5.2-3</td>
<td>CNMI: Present and Reasonably Foreseeable Actions</td>
<td>5-7</td>
</tr>
<tr>
<td>5.2-4</td>
<td>Tinian: Present and Reasonably Foreseeable Actions</td>
<td>5-8</td>
</tr>
<tr>
<td>5.2-5</td>
<td>Pagan: Present and Reasonably Foreseeable Actions</td>
<td>5-11</td>
</tr>
<tr>
<td>5.3-1</td>
<td>Tinian: Potential for Cumulative Impact</td>
<td>5-15</td>
</tr>
<tr>
<td>5.3-2</td>
<td>Pagan: Potential for Cumulative Impact</td>
<td>5-16</td>
</tr>
<tr>
<td>5.3-3</td>
<td>Existing CNMI Airspace Available for U.S. Military Training</td>
<td>5-31</td>
</tr>
<tr>
<td>6.3-1</td>
<td>Unavoidable and Irreversible Significant Adverse Impacts</td>
<td>6-4</td>
</tr>
</tbody>
</table>
APPENDICES

Table of Contents

Appendix A – Agency and Elected Official Correspondence
   1. Cooperating Agency Correspondence
   2. Public Notices

Appendix B – Final Scoping Summary Report

Appendix C – Unconstrained Training Concept for Tinian and Pagan

Appendix D – Best Management Practices

Appendix E – Applicable Federal and Local Regulations

Appendix F – Geology and Soils Technical Memo

Appendix G – Air Quality Technical Memo

Appendix H – Noise Study

Appendix I – Airspace Technical Memo

Appendix J – Amphibious Beach Landing Site Engineering and Coastal Processes Analyses
   1. Tinian AAV Landing Site Engineering Investigations
   2. Engineering Analysis Evaluation
   3. Coastal Processes Report

Appendix K – Summary of Historical Land Use Agreements between the U.S. and the CNMI

Appendix L – Biological Resources Supporting Documentation
   1. Terrestrial and Marine Species List
   2. Terrestrial and Marine Species Profiles
   3. Terrestrial Biological Surveys on Tinian
   4. Wetland Survey Report
   5. Biosecurity

Appendix M – Marine Biological Resources Technical Memo and Survey Reports
   1. Marine Biological Resources Technical Memo
   2. Coral Marine Resources Survey Report
   4. Sea Turtle Marine Resources Survey Report

Appendix N – Cultural Resources Technical Memo

Appendix O – Transportation Study

Appendix P – Utilities Study

Appendix Q – Socioeconomic Impact Assessment Study

Appendix R – Hazardous Materials and Waste Technical Memo

Appendix S – Draft Engineering Drawing of Airport Layout Plan
This page intentionally left blank.
# CHAPTER 1
## INTRODUCTION

<table>
<thead>
<tr>
<th>Table of Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAPTER 1</td>
</tr>
<tr>
<td>ACRONYMS AND ABBREVIATIONS</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.2</td>
</tr>
<tr>
<td>1.3</td>
</tr>
<tr>
<td>1.4</td>
</tr>
<tr>
<td>1.5</td>
</tr>
</tbody>
</table>

**List of Figures**

| 1.1-1          | U.S. Pacific Command Area of Responsibility ........................................ | 1-2 |
| 1.1-2          | Mariana Islands Regional Map .................................................................. | 1-3 |
| 1.2-1          | Building Block Approach to Military Training ......................................... | 1-7 |
| 1.4-1          | Mariana Islands Range ComplexExtent ..................................................... | 1-14 |
| 1.5-1          | NEPA Public Involvement Process ................................................................ | 1-16 |

**List of Tables**

| 1.5-1          | Dates of Newspaper Notification Announcements for Scoping Meetings ............ | 1-17 |
| 1.5-2          | Federal Aviation Administration Resource Impact Categories ........................ | 1-20 |
## Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>percent</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CJMT</td>
<td>Commonwealth of the Northern Mariana Islands Joint Military Training</td>
</tr>
<tr>
<td>CNMI</td>
<td>Commonwealth of the Northern Mariana Islands</td>
</tr>
<tr>
<td>DoN</td>
<td>Department of the Navy</td>
</tr>
<tr>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>OEA</td>
<td>Overseas EA</td>
</tr>
<tr>
<td>OEIS</td>
<td>Overseas EIS</td>
</tr>
<tr>
<td>QDR</td>
<td>Quadrennial Defense Review</td>
</tr>
<tr>
<td>RTA</td>
<td>Range and Training Area</td>
</tr>
<tr>
<td>U.S.</td>
<td>United States</td>
</tr>
</tbody>
</table>
CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION

The National Environmental Policy Act (NEPA) requires federal agencies to examine the potential effects of their proposed actions on the human environment. The human environment includes the natural and physical environment and the relationship of people with that environment. An Environmental Impact Statement (EIS) is a detailed public document that complies with the requirements of NEPA by assessing the potential effects that a major federal action may have on the human environment.

The proposed action is to establish a series of live-fire ranges, training courses, and maneuver areas within the Commonwealth of the Northern Mariana Islands (CNMI) to reduce existing joint service training deficiencies and meet the United States (U.S.) Pacific Command Service Components’ unfilled unit level and combined level training requirements in the Western Pacific. The Western Pacific stretches over a vast area, from China in the north and west, to New Zealand in the south, and French Polynesia in the east. Under the proposed action, unit level training would occur on the island of Tinian and combined level training would occur on the island of Pagan. Use of both islands is required to meet the purpose and need for the proposed action. The proposed action includes: construction of a series of live-fire ranges, training courses, and maneuver areas; range management; expanded training and operations (to include combined arms, live-fire, and maneuver training at the unit and combined level); establishment of danger zones; designation of Special Use Airspace; and interest in land to support simultaneous and integrated training.

An Overseas EIS (OEIS) is required per Executive Order 12114 when a proposed action has the potential to significantly harm the environment of the U.S. Exclusive Economic Zone, the global commons, or a foreign nation’s Exclusive Economic Zone, territorial sea, or land mass. An OEIS is warranted for the proposed action described in this document because of proposed changes to international airspace past 12 nautical miles (22 kilometers). To reduce duplication the EIS and OEIS are combined into one document. This EIS/OEIS identifies the proposed action, along with a preferred alternative, and evaluates the potential environmental effects associated with a variety of reasonable alternatives. Each of the action alternatives, as well as the no-action alternative, is described in Chapter 2. Several studies, reports, assessments, and international agreements have documented the need for additional training capabilities in the U.S. Pacific Command’s Area of Responsibility in the Western Pacific (Figure 1.1-1). Relevant documents are summarized in Section 1.3, Purpose of and Need for the Proposed Action.

Within the Western Pacific, the greatest need and potential opportunity for increased training capacity and capability occurs in the Mariana Islands, specifically the CNMI which is comprised of 14 islands north of Guam (Figure 1.1-2).

\(^1\)In accordance with the NEPA of 1969 (42 U.S. Code 4321, as amended), as implemented by Council on Environmental Quality’s implementing regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508).
Figure 1.1-1
U.S. Pacific Command Area of Responsibility
Figure 1.1-2
Mariana Islands Regional Map
The U.S. Marine Corps Forces Pacific is the Executive Agent overseeing preparation of this EIS/OEIS on behalf of U.S. Pacific Command; the action proponent. This EIS/OEIS is a joint services document that addresses existing joint services training deficiencies for all U.S. Pacific Command’s Service Components: the Air Force, Army, Navy, Marine Corps, and Special Operations Command.

This proposed action has independent utility from the relocation of Marines from Japan to Guam (i.e., the Guam and CNMI Military Relocation EIS and Supplemental EIS); the Pacific Air Force’s proposal to improve existing airport(s) for periodic divert landings, joint military exercises, humanitarian assistance, and disaster relief efforts (i.e., the Divert Activities and Exercises EIS); and the Navy’s ongoing and projected training needs in the CNMI (i.e., the Mariana Islands Training and Testing EIS/OEIS).

## 1.2 WHY AND HOW THE U.S. MILITARY TRAINS

### 1.2.1 Statutory Mission

The U.S. military has a statutory mission under U.S. Code Title 10 to organize, train, and equip the Service Components to be capable of multiple functions. These functions include:

1. Preserve the peace and security, and provide for the defense of the U.S., the Commonwealths and possessions, and any areas occupied by the U.S.
2. Support the national policies
3. Implement the national objectives
4. Overcome any nations responsible for aggressive acts that imperil the peace and security of the U.S.

Fulfillment of this mission requires ranges, training areas, airspace, and sea space to accommodate continual training opportunities for all the major elements of the U.S. military. Modern military actions require teamwork and simultaneous coordination of these elements to successfully accomplish the combat mission. Major elements of the U.S. military Service Components include:

- **Command and control** – provides the leadership, intelligence, communications, and coordination necessary for effective planning and execution of force operations.
- **Ground combat** – conducts offensive and defensive ground operations to support the overall combat mission that include, but are not limited to, infantry, tanks, combat engineers, amphibious, reconnaissance, mortar, and artillery units.
- **Aviation combat** – performs offensive and defensive air operations required to support air-to-ground and air-to-air combat missions that include fixed- and rotary-wing aircraft, as well as unmanned aerial systems of various types.
- **Naval combat** – performs offensive and defensive sea operations to support naval and ship-to-shore combat missions that include aircraft carriers, amphibious assault ships, cruisers, littoral combat ships, destroyers, amphibious assault vehicles, and various types of landing craft.
- **Logistics** – provides the full array of functions that include, but are not limited to, communications, engineers, motor transport, medical, supply, and maintenance support.
Realistic and integrated training is the only effective approach to allow these elements to exercise simultaneous coordination. The ability of the U.S. Pacific Command and its Service Components to train for missions in the Western Pacific is a key component to U.S. military readiness to support international commitments. These training capabilities must be able to support ongoing operational requirements, adapt to changing U.S. force structure and geographic positioning of forces, support our training relationships with allied nations, and be available on an exclusive, continuous, and uninterrupted schedule.

1.2.2 Why the U.S. Military Trains

Modern warfare and security operations are complex, multidisciplinary events that rely on increasingly complicated maneuvers and actions while using sophisticated weapons and techniques. The only way military personnel can gain the level of experience needed to succeed in this sophisticated combat environment is through high quality, realistic training. The Service Components follow a “come as you are” and “train as you fight” philosophy placing high value on training that closely replicates real-world battle conditions. Essential to achieving this is:

- Live-Fire Weaponry – to provide realistic training by replicating combat
- Combined Arms Training – integrating ground, air, and naval forces in a maneuver environment
- Joint Services Training – training with multiple units within the same, or across Service Components
- Bilateral/Multilateral Training – training with allied foreign nations

This training serves to teach core competencies and test unit capabilities. It also allows individuals and units to learn collectively from the experiences of battlefield events, high tempo of operations, limited resources, long distances, complex communications, and challenging decision situations. Simulation and/or virtual training methods are useful in early training phases; however, they are not a substitute for live-fire field training.

Realistic training requires: sufficient land to support tactical maneuvering (i.e., moving from point “a” to point “b” via aircraft, tracked or wheeled vehicles [mounted], or on foot [dismounted] in a tactical formation to gain advantage over an enemy); realistic targets and objectives to hone firing skills; opposition that creates a realistic enemy and threat environment; and range instrumentation to help simulate integrated realistic training to assess effectiveness of the units and weapons systems, simulating responses to actions taken, and tracking activity and results for after action report debriefing (i.e., range control). Integrated live-fire training means having enough land (both coastal and interior), airspace, and sea space to support simultaneous maneuver of ground personnel to achieve their combat objectives with aircraft and naval vessels to achieve their air-to-ground and ship-to-shore operations, respectively.

Land-based training assets include a variety of ranges, convoy and tracked vehicle courses (or training courses), mounted and dismounted maneuver areas, as well as associated surface danger zones over land, Special Use Airspace, and danger zones over sea space. Coastal training assets involve beaches and adjacent waters capable of supporting amphibious landings and ship-to-shore operations. Surface danger zones are assigned in these land areas and adjacent waters to ensure safe ship-to-shore operation, safe air and ground training, and to protect both military personnel and the public from
hazardous activities. Airspace training assets include designated Special Use Airspace, including restricted airspace and warning areas where hazardous operations, such as air-to-ground weapons employment, can be achieved. Other Special Use Airspace includes military operations areas where aircraft can fly and train for defensive and counter-defensive air-to-air maneuvering tactics.

1.2.3 How Training is Conducted

Military training progresses along a crawl-walk-run continuum (Figure 1.2-1). This starts with teaching basic and specialized individual military skills (i.e., crawl); progresses to intermediate skills or small unit training (i.e., walk); and advances to integrated training events that culminate in joint exercises or pre-combat deployment certification (i.e., run). In unit level training, generally only one unit type trains together towards a single training objective, whereas combined level training allows various units or unit types to train simultaneously towards an objective. Military training at both the unit and combined level is conducted in a group of ranges, training courses and maneuver areas, airspace, and sea space. This group is referred to collectively as a Range and Training Area (RTA). A unit or combined level RTA includes designated land, airspace, and/or sea space, as well as support facilities set aside, managed, and used to train military personnel. An RTA varies in size depending on the type of training desired and the number of personnel undertaking the training. Under the proposed action, both a unit level RTA and a combined level RTA are proposed.

In general, an RTA consists of the following:

- **Ranges.** Ranges are areas reserved or normally equipped for weapons firing at various targets. Examples include: combat pistol range, field artillery fire range, anti-armor tracking range, mortar range, grenade launcher range, battle sight zero range (used for calibrating rifles), and close air support range (used for training the integration of ground and air forces in close proximity to one another). Live-fire munitions that may produce dudded ordnance (e.g., a mortar round that fails to detonate properly) are expended within a range area called a High Hazard Impact Area.

- **Training Courses and Maneuver Areas.** Training courses and maneuver areas are areas for tactical maneuver training on foot or in vehicles, including: aerial drop and landing zones, tracked and wheeled vehicle driving courses, movement and firing areas, and amphibious training beaches.

- **Danger Zones, Special Use Airspace, Surface Danger Zones.** Many RTAs have additional safety zones designated to further separate hazardous military activities from non-participating military personnel and the public for maximum safety. Danger zones coincide with sea space being used for live-fire training. Special Use Airspace contains hazardous activities generated by ground-based, air-to-ground, and ship-to-shore munitions, as well as to encompass aircraft air-to-air and flight activities. Surface danger zones are three-dimensional areas that delineate portions of the earth’s surface and the overlying airspace in which personnel and/or equipment may be endangered by ground weapons firing or detonation activities because of ricochet or fragmentation hazard.
- **Support Facilities.** These facilities provide various mission support functions and include Observation Posts to monitor training events and provide scoring feedback; buildings for range maintenance equipment and vehicles; storage for munitions, bulk fuel, vehicles, and equipment; and a base camp, airfield, port, utilities, and infrastructure for logistical support.

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**Figure 1.2-1**  Building Block Approach to Military Training
1.3 **PURPOSE OF AND NEED FOR THE PROPOSED ACTION**

The purpose of the proposed action is to reduce joint training deficiencies for military services in the Western Pacific. Existing U.S. military live-fire, unit and combined level training ranges, training areas, and support facilities are insufficient to support U.S. Pacific Command Service Components’ training requirements in the Western Pacific, specifically in the Mariana Islands. The proposed action is needed to enable U.S. Pacific Command forces to meet their U.S. Code Title 10 requirements to maintain, equip, and train combat and humanitarian forces in the Western Pacific. The proposed action assists in correcting these training deficiencies by establishing live-fire unit and combined level RTAs in the CNMI. Establishing unit and combined level RTAs in the CNMI would support ongoing operational requirements, changes to U.S. force structure, geographic repositioning of forces, and U.S. training relationships with allied nations.

The following studies, reports, assessments, and international statements and agreements summarized in Sections 1.3.1, Institute for Defense Analyses Study, through 1.3.7, 2014 Quadrennial Defense Review, document the need for additional training capabilities in the Western Pacific, and specifically in the CNMI.

**1.3.1 Institute for Defense Analyses Study**

The 2009 Institute for Defense Analyses Study assessed the ability of the Service Components to meet training requirements in the U.S. Pacific Command’s Area of Responsibility (Institute for Defense Analysis 2009). This area extends from Hawaii in the east to India in the west, north to Mongolia and south to New Zealand (see Figure 1.1-1). The study analyzed several potential solutions to meet specific training deficiencies in the Western Pacific. The conclusion was that CNMI’s and Guam’s strategic location made them a prime location to support forces throughout the region, particularly those forces on the Western Pacific Rim that are most reliant on access to foreign nations’ RTAs. The study also found that the greatest number of training deficiencies were in the Mariana Islands. Accordingly, to meet Service Component-identified deficiencies, the study recommended that an EIS be prepared to analyze the environmental impact of constructing new or expanding existing ranges and training areas in the Mariana Islands.²

**1.3.2 2010 Quadrennial Defense Review**

In 2010, the Quadrennial Defense Review (hereafter “2010 QDR”) evaluated global U.S. military strategy and priorities (Department of Defense 2010, www.CNMIJointMilitaryTrainingEIS.com). The 2010 QDR recognized that historical treaty alliances provide the foundation for the U.S. military presence in the

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²Existing and proposed training on Guam is discussed in the 2006 Intelligence, Surveillance, Reconnaissance, and Strike EIS (Pacific Air Forces 2006); the 2010 Mariana Islands Range Complex EIS/OEIS (DoN 2010a); the 2010 Guam and CNMI Marine Relocation EIS (DoN 2010b); and the April 2014 Guam and the CNMI Military Relocation Draft Supplemental EIS (DoN 2014).
Pacific and that “these alliances have helped maintain peace and stability for more than 60 years, particularly through the continued presence of capable U.S. forces in the region.” The 2010 QDR further acknowledged that the current regional and global security environments are more complex.

The 2010 QDR discussed how the presence of U.S. Services in the Western Pacific could be adapted or augmented to sustain and strengthen Asia-Pacific alliances and partnerships to ensure regional peace and security. It concluded that this emerging security landscape requires a more widely distributed U.S. presence in Asia. As such, forward-stationed and forward-deployed forces are highly valuable, particularly when considering the Western Pacific’s vast distances and the low regional density of U.S. basing and infrastructure.

The 2010 QDR called for development of additional training capabilities for unit, combined, and joint forces in the Western Pacific. This would assure readiness of U.S. forces to carry out military operations as well as humanitarian assistance, disaster relief, and maritime security to maintain regional stability. It would also provide opportunities for U.S. and allied forces to jointly train together, build security relationships, and develop operational capacity among allied nations’ forces.

1.3.3 Re-balance to the Pacific

In November 2011, President Obama underlined the Asia Pacific’s regional importance in his speech to the Australian parliament. In it he recognized that “… the U.S. is turning our attention to the vast potential of the Asia Pacific region … As President, I have, therefore, made a deliberate and strategic decision- [that] as a Pacific nation, the U.S. will play a larger and long-term role in shaping this region and its future, by upholding core principles and in close partnership with our allies and friends” (Obama 2011). President Obama’s November 2014 speech at the University of Queensland reiterated the importance of the region: “The United States will continue to modernize our defense posture across the region. We’ll deploy more of our most advanced military capabilities to keep the peace and deter aggression. Our presence will be more distributed, including in Southeast Asia with partners like Singapore. And we increase military training and education, including working with the military partners we have in this region around the respect for human rights by military and police. And by the end of this decade, a majority of our Navy and Air Force Fleets will be based out of the Pacific, because the United States is, and will always be, a Pacific Power” (Obama 2014).”

1.3.4 The 2+2 Statements of April 2012 and Oct 2013

The bilateral Realignment Roadmap agreement between the U.S. and Japan calls for transforming Guam and the CNMI into a hub for security activities in the region (Security Consultative Committee 2012, see www.CNMIJointMilitaryTrainingEIS.com). This important relationship was further reinforced by a joint statement (known as the 2+2 U.S. Japan Joint Statement, hereafter the “2012 Statement”) reaffirming the indispensable role the two countries play in maintaining international peace and security in the Asia-Pacific region (Security Consultative Committee 2013). Additionally, both countries agreed in the 2013 Statement that facilities to be constructed jointly by U.S. and Japan “may include training ranges in Guam and the Commonwealth of the Northern Mariana Islands.”
1.3.5 Training Needs Assessment

In 2013, the Training Needs Assessment: An Assessment of Current Training Ranges and Supporting Facilities in the U.S. Pacific Command Area of Responsibility (hereafter the “Assessment”) identified and validated unfilled training requirements for units/commands in the U.S. Pacific Command Area of Responsibility (Department of the Navy [DoN] 2013a, see www.CNMIJointMilitaryTrainingEIS.com). Based on established design criteria, each of the U.S. Pacific Command Service Components identified current conditions of ranges, training areas, and facilities used by U.S. forces in the Western Pacific. This process provided an initial list of 62 unfilled training requirements, with all Service Components identifying unfilled training needs in the Western Pacific. The Assessment established that the greatest number of training deficiencies existed in the Mariana Islands (i.e., Guam and the CNMI). The Assessment was based on existing force posture, but accounted for contemplated changes in force posture throughout the U.S. Pacific Command Area of Responsibility. Another criterion considered in the identification of the Mariana Islands to meet unfilled training requirements was that of assured access. Assured access would provide use of a permanent system of ranges to address training requirements without undue restrictions. Unrestricted access to foreign nations’ training areas is not guaranteed. The Marianas hub has a relatively unencumbered area on U.S. territory for potential training activities that would meet the U.S. Pacific Command’s need for assured access.

1.3.6 Training Requirements and Siting Study

The 2013 CNMI Joint Military Training Requirements and Siting Study (DoN 2013b, see www.CNMIJointMilitaryTrainingEIS.com) (hereafter referred to as “the Siting Study”) refined the analysis of unfilled training requirements in the Mariana Islands that was identified in the 2013 Training Needs Assessment. The Siting Study concluded that within the Mariana Islands, Guam training opportunities are limited to the existing activities plus future individual skills training for the Marine Corps forces relocating from Japan and that there is no additional capacity to address the U.S. Pacific Command’s unfilled training requirements. Therefore, land, sea, and airspace on and around Guam were excluded from further consideration in meeting the identified unfilled training requirements. The initial 62 requirements were refined by the Executive Agent (U.S. Marine Corps Forces Pacific) working collaboratively with each of the Service Components to review previously identified Pacific-wide unfilled training requirements for those that could potentially be filled in the CNMI. In addition, it was determined that some of the 62 requirements were being met through other planning efforts. This resulted in reducing the number of unfilled training requirements carried forward into this Siting Study from 62 to 42. The study identified that these 42 unfilled training requirements could be achieved at the unit and combined levels in the CNMI. Operational siting criteria (see Section 2.3, Alternatives Development) were applied to screen the 14 CNMI islands. Of the 14 CNMI islands, only a combination of Tinian and Pagan met unit level and combined level screening criteria, and could satisfy the majority of unfilled training requirements. Further detail on the 42 unfilled training requirements is provided in Section 2.2, Unit and Combined Level Training Requirements, Representative Training, Weapons, Equipment, Participants, and Training Scenarios. These 42 unfilled training requirements served as the basis for developing the proposed action and alternatives in this EIS/OEIS.
1.3.7 2014 Quadrennial Defense Review

In 2014, the Quadrennial Defense Review (hereafter “2014 QDR”) re-evaluated global U.S. military strategy and priorities (Department of Defense 2014, www.CNMUJointMilitaryTrainingEIS.com). The 2014 QDR confirmed the U.S. military’s continued commitment to rebalance the Asia-Pacific region, which is increasingly central to U.S. political, economic and security interests.

The 2014 QDR stated that the Department of Defense’s engagements in the Asia-Pacific region will continue to promote regional peace and security through expansion of multilateral organizational networks, including support of trilateral engagements and exercises. By 2020, the U.S. Navy plans to have 60 percent (%) of its assets stationed in the Pacific. Other plans in the region include increasing military presence in Guam (Navy, Marine Corps, and Air Force) and creating a rotational presence of Marine Corps forces in Darwin, Australia.

The 2014 QDR further states that many of the U.S. forces returning from combat in Iraq and Afghanistan will return to assigned home stations in the Asia-Pacific region, rebalancing the forces and providing readiness to support other missions. These forces will resume bilateral and multilateral training exercises and pursue increased training opportunities, among other efforts, to support the stability of the region.

1.4 THE MARIANA ISLANDS

1.4.1 Background

The Mariana Islands include Guam and the CNMI (see Figure 1.1-2), both of which are sovereign (self-governing) territories of the U.S., pursuant to Article 2 of the U.S. Constitution. Guam was annexed to the U.S. as a result of the 1898 Treaty of Paris and since then has been administered as a U.S. territory. Fourteen islands (including Tinian and Pagan) and the territorial waters immediately north of Guam comprise the CNMI. The CNMI was administered by the U.S. as part of the United Nations Trust Territory of the Pacific Islands from 1945 to 1972. In 1972, negotiations with the U.S. began for territorial status of the CNMI. In 1975, a covenant establishing a commonwealth was approved by Mariana Islands residents, and in 1976 they entered into a union with the U.S. This union resulted in of The Covenant to Establish a Commonwealth of the Northern Mariana Islands in Political Union with the United States of America (hereinafter “the 1976 Covenant”), which was approved and became effective on March 24, 1976 (Northern Mariana Islands 1975a). The CNMI Government adopted its own constitution in 1977, and the constitutional government took office in January 1978.

1.4.2 Commonwealth of the Northern Mariana Islands Military Lease Areas

The 1976 Covenant defined the relationship between the CNMI and the U.S. and recognized U.S. sovereignty and applicability of U.S. federal law (48 U.S. Code Chapter 17). Article VIII of the 1976 Covenant specifies certain property rights and addresses property leases between the CNMI and the U.S. Government. Section 802 of the 1976 Covenant makes areas in the CNMI available to the U.S. via lease to carry out its defense responsibilities. These original leased areas include approximately 17,799
acres (7,203 hectares) of land and the waters immediately adjacent on Tinian, 177 acres (72 hectares) at Tanapag Harbor on Saipan, and 206 acres (83 hectares) encompassing the entirety of Farallon de Medinilla and the waters immediately adjacent. Signed in 1983 for an initial term of 50 years, the U.S. retains the option of renewing these leases for all or part of such property for another term of 50 years (Section 803(a)). Additionally, according to Section 806(a) of the 1976 Covenant:

The United States will continue to recognize and respect the scarcity and special importance of land in the Northern Mariana Islands. If the United States must acquire any interest in real property not transferred to it under this Covenant, it will follow the policy of seeking to acquire only the minimum area necessary to accomplish the public purpose for which the real property is required, of seeking only the minimum interest in real property necessary to support such public purpose, acquiring title only if the public purpose cannot be accomplished if a lesser interest is obtained, and of seeking first to satisfy its requirement by acquiring an interest in public rather than private real property.

In this context, the intent of the proposed action is to maximize use of U.S. government-controlled lands before acquiring an interest in the CNMI public or private lands for potential military training. Below are descriptions of the military leases held by the U.S. military in the CNMI.

**Tinian.** Nearly two-thirds of northern Tinian is leased by the U.S. military and is known as the Military Lease Area (see Figure 1.1-2). It currently comprises approximately 15,353 acres (6,213 hectares) because 2,446 acres (990 hectares) of the original 17,799 acres (7,203 hectares) were returned to Tinian between 1994 and 1999.

Within the Military Lease Area, the U.S. has sublet land back to the CNMI in an area called the Lease Back Area. The Lease Back Area, originally leased for agricultural use and cattle grazing, now primarily supports cattle grazing. Current military activities in the Lease Back Area are typically troop movements and maneuvers, which are more compatible with cattle grazing than with farming.

Another 777 acres (314 hectares) of the Military Lease Area are used by the International Broadcasting Bureau under a separate agreement (see Figure 1.1-2). This area has an administrative facility and broadcasting equipment. The Bureau is an independent U.S. government agency that supports day-to-day operations of the Voice of America and provides transmission and technical support to non-military U.S. broadcasting services.

The remaining portion of the Military Lease Area is set aside as an exclusive use area for military activities; however, the North Field National Historic Landmark is contained within the exclusive military use area and military training activities occur there in accordance with a Programmatic Agreement.

A separate Technical Agreement, implemented by the 1984 lease agreement and its amendments, contains terms relating to the shared use of Tinian's harbor and airport, use of the CNMI property by the U.S. and the principles that govern the real property relations between the U.S. military and the CNMI authorities. The lease agreement has been amended to contain terms relating to the use of Tinian's harbor and airport most recently in 1993 and 1999 respectively (Technical Agreement Regarding Use of Land to Be Leased by the United States in the Northern Mariana Islands) (Northern Mariana Islands 1975b). See Appendix K, Summary of Historical Land Use Agreements between the U.S. and the CNMI, for more information regarding historical land use agreements between the U.S. and the CNMI.
Saipan. The U.S. military leases 177 acres (72 hectares) on Saipan, which includes wharf space at Tanapag Harbor, to support U.S. military training activities (see Appendix K, *Summary of Historical Land Use Agreements between the U.S. and the CNMI*).

Farallon de Medinilla. The island and waters immediately adjacent are U.S. military-controlled and used for live-fire ship-to-shore naval gunfire and air-to-ground aircraft munitions training per the lease dated January 6, 1983.

### 1.4.3 Commonwealth of the Northern Mariana Islands Military Training

The U.S. military has transited through and trained within the CNMI, utilizing the islands’ strategic Pacific location, intermittently for over 100 years. Since 1999, the U.S. military has evaluated use and training within the CNMI in several different NEPA documents. The following is a brief description of the NEPA documentation and the associated actions.

- **Military Training in the Marianas Final Environmental Impact Statement and Record of Decision** (Department of Defense 1999). Published June 1999, the EIS addressed the continued use of suitable Department of Defense-controlled lands in the Mariana Islands to support the training activities of multi-service forces. The Record of Decision was published in the Federal Register on August 18, 1999. The EIS and Record of Decision identified continued use of Farallon De Medinilla for naval and aerial bombardment, Navy and Air Force Bases on Guam, and the Military Lease Area on Tinian. On Tinian, there would be continued use of beaches for landing craft, North Field runways for airborne exercises, and Tinian airport and harbor for support activities. Live-fire training on Tinian would be limited to training in the urban environment using World War II structures.

- **Mariana Islands Range Complex Final Environmental Impact Statement/Overseas Environmental Impact Statement** (DoN 2010a). Published May 2010, the EIS evaluated impacts associated with the military services conducting training in the Mariana Islands (inclusive of Guam and the CNMI). The Record of Decision supports conducting current, emerging, and future military training and Research, Development, Test, and Evaluation activities in the Mariana Islands Range Complex, while enhancing training resources through investment in the Mariana Islands Range Complex (DoN 2010a). Training, including non-live-fire, within the Mariana Islands Range Complex involves ranges, training areas, facilities, and Special Use Airspace over Tinian, Saipan, Farallon de Medinilla, and Rota, as well as Guam (Figure 1.4-1).

- **Guam and CNMI Military Relocation Final Environmental Impact Statement: Relocating Marines from Okinawa, Visiting Aircraft Carrier Berthing, and Army Air and Missile Defense Task Force Volume 3** (DoN 2010b). The EIS was published in July 2010 and the Record of Decision was signed in September 2010. The EIS addressed impacts of relocating Marines from Okinawa to Guam, the construction of four ranges (three small arms ranges and an infantry platoon battle course) on Tinian, and conducting training operations on Tinian.
Figure 1.4-1
Mariana Islands Range Complex Extent
- **Mariana Islands Range Complex Airspace Environmental Assessment/Overseas Environmental Assessment** (DoN 2013c). Published in June 2013, the Environmental Assessment (EA)/Overseas EA (OEA) analyzed potential environmental impacts relevant to the proposed modifications to training airspace and sea space in the Mariana Islands Range Complex. The proposed action is to maximize public awareness of hazardous military training activities, and to optimize safety and training efficiency through the establishment of new Special Use Airspace throughout the Mariana Islands Range Complex and the modification of existing Special Use Airspace and the establishment of a new surface Danger Zone at Farallon de Medinilla.

The following is a brief description of U.S. military training that is currently undertaken and approved in the CNMI.

**Tinian.** Training in the Military Lease Area on Tinian currently includes ground-based surveillance and reconnaissance, military operations in urban terrain, evacuation operations, command and control, logistics, bivouac, land navigation, convoy training, non-combatant evacuation operations, administrative amphibious landings, and other non-live-fire field activities. Aviation training on Tinian includes rotary- and tilt-wing operations at North Field. North Field is also used for command and control, air traffic control, logistics, temporary fuel and armament replenishing points, rapid runway repair, and other expeditionary airfield related training. Military activities in the Lease Back Area include troop movements and maneuvers. Live-fire training within the Military Lease Area is limited to sniper fire into bullet traps.

**Saipan.** Military training assets on Saipan include several facilities. The Army Reserve Center supports armory, classrooms, administrative areas, maintenance facilities, bivouac, and headquarters activities. On the east side of northern Saipan, the Army Reserve conducts land navigation training on non-U.S. leased lands. The Army Reserve can also practice with small-caliber weapons at the CNMI Department of Public Safety firing range. The Commonwealth Ports Authority allows the Navy access to wharf space in accordance with the 1983 Technical Agreement.

**Farallon de Medinilla.** Farallon de Medinilla (see Figure 1.1-2) and the nearshore waters are leased to the U.S. military for naval and air strike live-fire training. The island, nearshore waters, and overlying airspace are off-limits to the public because of the hazardous conditions. Very limited ground-based training is allowed on portions of the island. These activities include tactical air controllers and naval shore bombardment observers as well as ground-based units firing small arms and crew-served weapons into impact areas on the island. Ground-based units can, and do, fire small arms and crew served weapons into Farallon de Medinilla impact areas.

**Other Islands of the CNMI.** The Navy uses Angyuta Island (a small island off the coast of Rota, see Figure 1.1-2) for forward staging, an overnight bivouac site, and for boat refueling and maintenance. On Rota, the West Harbor and Rota airfield support night-vision goggle operations for rotary-wing aircraft, and ground, marine, and air special warfare training activities with local law enforcement. Other types of special warfare training are conducted with local law enforcement and include hostage rescue, evacuation operations, and military operations in urban terrain. With prior approval from the CNMI Department of Public Lands, temporary U.S. military training such as aircraft landings and search and rescue missions has occurred on other islands (e.g., Pagan and Anatahan) and places outside specifically leased lands.
1.5 **ENVIRONMENTAL REVIEW PROCESS AND PUBLIC INVOLVEMENT**

1.5.1 Environmental Review Process

When preparing an EIS/OEIS, a federal agency is required to invite review and involvement from other federal, state, and local agencies and the public per Council on Environmental Quality regulations. Environmental review is the process by which an agency identifies potential environmental impacts that may result from a proposed action as well as alternatives that could avoid, minimize, or mitigate those impacts. Identification of project alternatives is an important part of the EIS process. According to NEPA, an EIS must explore and objectively evaluate a range of reasonable alternatives to the proposed action, including a “no-action alternative.” A thorough discussion of the environmental consequences of each alternative is provided in the EIS so decision makers have a clear basis for choosing the “preferred alternative” among the options (40 Code of Federal Regulations [CFR] 1502.14). Stages of the NEPA public involvement process are summarized in Figure 1.5-1.

1.5.2 Public Involvement

According to Council on Environmental Quality regulations (40 CFR 1500.1(b)), public scrutiny is essential to implementing NEPA. For this reason, federal agencies encourage and facilitate public participation in agency decisions that affect the quality of the human environment (40 CFR 1500.2(d)) and in preparing and implementing their NEPA procedures (40 CFR 1506.6(a)). Sections 1.5.2.1, *Notice of Intent*, through 1.5.2.5, *Record of Decision*, describe the public involvement process associated with this EIS/OEIS.

1.5.2.1 Notice of Intent

A Notice of Intent announces the agency’s intent to prepare an EIS/OEIS. The notice is published in the Federal Register and local newspapers in the area affected by the proposed action, and formally initiates the public scoping process. For this EIS/OEIS, the notice was published in the Federal Register on March 14, 2013 (Volume 78, Number 50, pages 16257-16259). Prior to the publication of the Notice of Intent, 25 letters were sent on February 27, 2013 to elected and government officials, federal agency representatives, and one non-governmental organization informing them of the upcoming Notice of Intent announcement.
Three local newspapers were used to notify the public of the public scoping meetings: (1) Pacific Daily News, (2) Marianas Variety, and (3) Saipan Tribune. As indicated in Table 1.5-1, the announcements were first published in print and then posted online the same week that the Notice of Intent appeared in the Federal Register. The second round of announcements ran the week of the public scoping meetings in the Marianas Variety and Saipan Tribune.

<table>
<thead>
<tr>
<th>Newspaper</th>
<th>Notice of Intent Announcement Date</th>
<th>Notice of Intent Announcement Date Online Version</th>
<th>Scoping Period Extension Announcement Date Print Version</th>
<th>Scoping Period Extension Announcement Date Online Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific Daily News</td>
<td>March 15 and 16, 2013 (Friday and Saturday)</td>
<td>March 15-21, 2013 (Friday-Thursday)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Marianas Variety</td>
<td>March 15 and 18, 2013 (Friday and Monday) and April 9, 2013 (Tuesday)</td>
<td>March 15-21, 2013 (Friday-Thursday) and April 5-12, 2013 (Friday-Friday)</td>
<td>April 23, 2013 (Tuesday)</td>
<td>April 23-29, 2013 (Tuesday-Monday)</td>
</tr>
<tr>
<td>Saipan Tribune</td>
<td>March 15 and 18, 2013 (Friday and Monday) and April 9, 2013 (Tuesday)</td>
<td>March 18-24, 2013 (Monday-Sunday) and April 5-12, 2013 (Friday-Friday)</td>
<td>April 23, 2013 (Tuesday)</td>
<td>April 23-29, 2013 (Tuesday-Monday)</td>
</tr>
</tbody>
</table>

The public was notified of the scoping period extension in the Marianas Variety and Saipan Tribune. Announcements were published in print on the same day that the Notice of Extension appeared in the Federal Register and posted to the two newspapers’ websites the same week.

The letter and newspaper notices provided the dates, locations, and times of the public scoping meetings, as well as the multiple venues through which to submit comments: in writing at the meetings, electronically through the project website ([www.CNMIJointMilitaryTrainingEIS.com](http://www.CNMIJointMilitaryTrainingEIS.com)), and by written comments through the mail. Contact information and the 45-day scoping period closing date were also identified.

### 1.5.2.2 Public Scoping Comment Period

The public scoping comment period is an early and open process for assisting the action proponent in determining the scope of environmental issues and alternatives related to the proposed action. This process informs the public and provides opportunities for them to comment on the proposed action and alternatives and issues to be addressed in the EIS/OEIS analysis. Prior to the Notice of Intent and Public scoping meetings, the Executive Agent for this EIS/OEIS (U.S. Marine Corps Forces Pacific) met with federal, regional, and local agency representatives with the goal of sharing information about the Notice of Intent and the public scoping meetings. The 45-day public scoping comment period began with publication of the Notice of Intent. On April 23, 2013, a 14-day scoping comment period extension was announced in the Federal Register (Volume 78, Number 78, page 23920), and the official scoping comment period ended on May 13, 2013. Three public scoping meetings were held April 10-12, 2013 in Dandan, Saipan; San Jose, Tinian; and Garapan, Saipan, respectively. The public scoping process and
results are briefly described below. For more detail, the Final Scoping Summary Report is included as Appendix B and can be found on the project website: www.CNMIJointMilitaryTrainingEIS.com.

During the public scoping comment period, 198 unique comment submittals were received from the CNMI and federal government agencies, elected officials, business and commercial entities, interest groups, and individual citizens. A single comment submittal often touched on multiple topics, such as the proposed action, marine biology, and historic properties. Collectively, 1,363 comments on 24 topics were submitted. The six topics that received the most comments (more than half of all comments) were the proposed use of Tinian and Pagan (198), socioeconomics (119), land use (109), indirect/cumulative impacts (95), environmental justice (93), and biological effects (91). Additionally, comments questioned the need for live-fire training given computer simulation and the availability of existing training ranges on Farallon de Medinilla, Guam, and Hawaii (DoN 2013d).

1.5.2.3 Draft EIS/OEIS

The Draft EIS/OEIS takes into consideration comments made during scoping and other public outreach and presents baseline conditions and potential environmental consequences of implementing the proposed action and alternatives. The Draft EIS/OEIS is supported by detailed technical studies (e.g., noise, utilities, and socioeconomics). Federal, state, and local agencies and members of the public are invited to provide comments on the Draft EIS/OEIS. Copies were sent to regulatory agencies, municipalities, elected officials, and to individuals who requested copies during scoping.

The Notice of Availability of the Draft EIS/OEIS was published in the Federal Register, local newspapers, and on the project website on April 3, 2015. The Notice provided locations (e.g., public libraries) where the Draft EIS/OEIS can be reviewed, the dates of the 60-day public review and comment period, how comments can be submitted (i.e., mailing address, website submittal), and the date, time and location of the public meetings. This information is also provided in the inset box. The public meetings provide an opportunity for interested parties to comment on the content of this Draft EIS/OEIS and provide new information that will inform the Final EIS/OEIS. Oral comments made at public meetings are recorded by a stenographer. Written and electronically submitted comments are also accepted throughout this period. Community accessible public meeting locations were chosen to encourage public participation.

HOW CAN I LEARN MORE ABOUT THE PROJECT AND COMMENT ON THIS DRAFT EIS/OEIS?

There are several ways you can learn more about the project and submit your comments on this EIS/OEIS:

- **Attend public meetings:** You are invited to attend the meetings listed below.
  
  **Meeting 1**
  
  Date: April 29, 2015  
  Location: Saipan Southern High School, Saipan  
  Time: 5 p.m. – 8 p.m.

  **Meeting 2**
  
  Date: April 30, 2015  
  Location: Tinian Junior Senior High School, Tinian  
  Time: 5 p.m. – 8 p.m.

  **Meeting 3**
  
  Date: May 1, 2015  
  Location: Garapan Elementary School, Saipan  
  Time: 5 p.m. – 8 p.m.

- **Submit comments:** You may submit your comments on this document electronically, in writing, or in person at the public meetings.

  **Electrically:**
  
  www.CNMIJointMilitaryTrainingEIS.com

  **In Writing:**
  
  Naval Facilities Engineering Command, Pacific  
  Attn: 09PA, Public Affairs Office  
  258 Makalapa Drive, Suite 100  
  JBPHH, HI 96860-3134

Your comments on the EIS/OEIS must be postmarked by June 2, 2015 HST (June 3, 2015 ChST). Additional information can be found online at:

www.CNMIJointMilitaryTrainingEIS.com.
1.5.2.4 Final EIS/OEIS

The Final EIS/OEIS will include the comments received on the Draft EIS/OEIS and a response to all comments. The Final EIS/OEIS may include modified alternatives, changes to the analysis, or factual and typographical corrections. The Final EIS/OEIS is circulated in the same manner as this Draft EIS/OEIS. A formal notice is published in the Federal Register by the Executive Agent (U.S. Marine Corps Forces Pacific) and advertisements placed in local newspapers to announce that the Final EIS/OEIS is available for public review. This is followed by a 30-day wait period on the Final EIS/OEIS.

1.5.2.5 Record of Decision

After issuance of the Final EIS/OEIS and the 30-day wait period, a Record of Decision will be released reflecting the final decision on the proposed action, the rationale behind that decision, and any commitments to monitoring and mitigation. A formal notice is published in the Federal Register by the U.S. Environmental Protection Agency and advertisements are placed in local newspapers to announce that the Record of Decision is available to the public.

If the Record of Decision reflects the decision to select an alternative that includes a federal interest in land, funding to purchase or acquire an interest in the lands at fair market value would be requested and the required steps taken to prepare the property. If the Record of Decision reflects the determination that Special Use Airspace should be established, the Federal Aviation Administration will conduct their rulemaking procedures (pursuant to Federal Aviation Administration Order 7400.2) establishing new Special Use Airspace (Federal Aviation Administration 2012). Additionally, if the Record of Decision determines that maritime danger zones are required along the coastlines adjacent to U.S. military-controlled property, the U.S. Army Corps of Engineers will undertake their rulemaking procedures to create danger zones.

The Federal Aviation Administration would also need to prepare a Record of Decision for approval of federal actions under its jurisdiction. A formal notice of the availability of the Lead Agency’s decision will be placed in the Federal Register and in local newspapers for where the Final EIS/OEIS was published. The Federal Aviation Administration and the DoN will issue their own separate Record of Decision, as appropriate, pending the decision of the DoN for the proposed project.

1.5.3 Agency and Stakeholder Coordination

1.5.3.1 Cooperating Agencies

As defined by 40 CFR § 1508.5, a cooperating agency is “any federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major federal actions significantly affecting the quality of the human environment.” A cooperating agency’s responsibilities include participating in the NEPA process; assuming responsibility, upon request, for developing information and preparing analyses on issues for which they have special expertise; and making staff available for interdisciplinary reviews. Under 40 CFR § 1501.6, federal agencies with jurisdiction by law shall be cooperating agencies if requested by the lead agency. Numerous agencies were invited to serve as cooperating agencies for this EIS/OEIS. The following agencies agreed to be cooperating agencies: Department of Interior, Office of Insular Affairs; Federal Aviation Administration; International Broadcasting Bureau; National Marine
Fisheries Service; U.S. Army Corps of Engineers, Honolulu District; and the U.S. Air Force. The U.S. Fish and Wildlife Service declined to serve as a cooperating agency due to staffing and workload constraints, but they agreed to work collaboratively with the Executive Agent (U.S. Marine Corps Forces Pacific) throughout the EIS/OEIS process. In addition, the Executive Agent signed a Memorandum of Understanding with the following Pacific Command Service Components: U.S. Air Force, U.S. Army, and U.S. Special Operations Command. These Service Components operate in the same capacity as cooperating agencies.

As a Cooperating Agency on this EIS/OEIS, the Federal Aviation Administration will use this EIS/OEIS documentation to comply with its own requirements under the National Environmental Policy Act (NEPA). The EIS/OEIS will include information that addresses resource impacts per Federal Aviation Administration Order 1050.1E – Environmental Impacts: Policies and Procedures and Federal Aviation Administration Order 5050.4B – National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions (Federal Aviation Administration 2006a, 2006b). Table 1.5-2 provides the resource impact categories required for analysis by the Federal Aviation Administration and the corresponding sections of this EIS/OEIS that discuss that specific resource. Additional supporting analysis is presented in Sections 3.6 and 4.6, Airspace; Appendix I, Airspace Technical Memo; and Appendix O, Transportation Study.

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<tr>
<td>Fish, Wildlife, and Plants (Marine)</td>
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<td>Floodplains</td>
<td>3.3/4.3</td>
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<tr>
<td>Hazardous Materials, Pollution Prevention, and Solid Waste</td>
<td>3.16/4.16</td>
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<tr>
<td>Historical, Architectural, Archeological, and Cultural Resources</td>
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<tr>
<td>Natural Resources and Energy Supply</td>
<td>3.2/4.2</td>
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<tr>
<td>Wild and Scenic Rivers</td>
<td>Not Applicable*</td>
</tr>
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Source: Federal Aviation Administration 2006a.
Note: *There are no Wild and Scenic Rivers located on Tinian and Pagan.

The Commonwealth Ports Authority owns and manages the civilian airports in the CNMI and the Marine Corps has worked closely with Commonwealth Ports Authority regarding the proposed airport development at Tinian International Airport. The Commonwealth Ports Authority shows the proposed military airport changes on their official Airport Layout Plan for Tinian International Airport (see Appendix S, Draft Engineering Drawing of Airport Layout Plan), which must undergo Federal Aviation
Administration review, because the Federal Aviation Administration has statutory authority for review and approval of proposed development at civilian airports. The Federal Aviation Administration must also comply with NEPA, prior to making a decision regarding the changes to the Airport Layout Plan. Once the Federal Aviation Administration determines that the EIS adequately addresses the proposed airport development, it may adopt the EIS/OEIS for its own NEPA compliance purposes pursuant to 40 CFR §1506.3. The Federal Aviation Administration may also decide to supplement the EIS with additional information that may be needed to address Federal Aviation Administration requirements.

### 1.5.3.2 Agency Consultation

The proposed action is subject to federal and CNMI regulatory requirements in addition to NEPA. Agency reviews must be conducted and procedures followed before starting construction activities or initiating operations. Appropriate consultations with regulatory entities will be completed as part of the EIS/OEIS process, and relevant information will be included in the EIS/OEIS as applicable. A list of Executive Orders, Federal Regulations and CNMI Regulations is provided in Appendix E, *Applicable Federal and Local Regulations*. Various agency consultations are underway as part of this EIS/OEIS process and as applicable will be summarized in the Final EIS/OEIS. Agency consultations include:

- Endangered Species Act, Section 7: U.S. Fish and Wildlife Service and National Marine Fisheries Service
- Marine Mammal Protection Act: National Marine Fisheries Service
- Magnuson-Stevens Fishery Conservation and Management Act: National Marine Fisheries Service
- Coastal Zone Management Act: CNMI Bureau of Environmental and Coastal Quality
- Section 404 of the Clean Water Act, U.S. Army Corps of Engineers

### 1.5.3.3 Collaborative Stakeholder Coordination

The Council on Environmental Quality regulations (40 CFR 1500.1 (b)) provide that public input and scrutiny are essential to implementing NEPA. For this reason, the Executive Agent (U.S. Marine Corps Forces Pacific) has implemented a collaborative coordination approach with the CNMI government agencies, local organizations, and individual stakeholders for this EIS/OEIS including but not limited to:

- The CNMI Governor’s Office
- The CNMI agencies: Bureau of Environmental and Coastal Quality, Capital Improvements Projects Office, Commonwealth Ports Authority, Military Integration Management Committee, Department of Public Works
- Tinian Mayor’s Office
- Tinian Cattlemen’s Association and other cattle ranchers
- Northern Islands Mayor’s Office representatives
The U.S. Marine Corps Forces Pacific has implemented proactive discussions of key issues and ensuring regular communication with stakeholders about the CNMI Joint Military Training (CJMT) project. Specifically, this communication has developed and shaped the alternatives presented in the Draft EIS/OEIS, proposed solutions to perplexing issues, and developed collaborative mitigations for potential environmental issues. In particular, the collaborative coordination with stakeholders has helped minimize potential effects to the economic affects to local farmers and ranchers, has minimized effects on commercial air traffic, has minimized the effects to vehicular traffic on Tinian, and has promoted improved environmental awareness to the local community while improving the community involvement with the NEPA process. This is an ongoing process. The Executive Agent (U.S. Marine Corps Forces Pacific) will continue to dialogue with the CNMI agencies and local organizations to discuss a variety of issues associated with the proposed action, including those identified during and after public scoping. Information obtained during these meetings will be included in preparation of this EIS/OEIS as appropriate.

1.5.3.4 Federal Actions

This section discusses agencies and their decision-making responsibilities associated with the proposed action of this EIS/OEIS. The Pacific Command Service Components may use all or portions of this document to support any decisions the components may need to make on actions within the scope of the analysis contained in this EIS/OEIS.

Federal Aviation Administration

1. Unconditional approval of an Airport Layout Plan to depict the proposed construction and operation of the associated development pursuant to 49 U.S. Code § 40103(b) and 47107(a)(16).

2. Determination of the effects of the proposed airport project upon the safe and efficient use of navigable airspace pursuant to 14 CFR Part 77, Objects Affecting Navigable Airspace. The Federal Aviation Administration must determine if the proposed development is consistent with the existing airspace utilization and procedures.

3. Determination under 49 U.S. Code § 44502(b) that the airport development is reasonably necessary for use in air commerce or in the interests of national defense.

4. Approval of construction of the new taxiways, aircraft parking aprons, and other associated development that meet Federal Aviation Administration Design Standards.

5. Development of air traffic control and airspace management procedures designed to ensure the safe and efficient use of navigable airspace.

6. Approval of an airport certification manual, to maintain aviation and airfield safety during construction pursuant to 14 CFR Part 139 (49 U.S. Code § 44706).

7. Approval of the proposed establishment of Special Use Airspace at Tinian and Pagan in accordance with Federal Aviation Administration Joint Order 7400.2.

8. Approval of a reduction in the exclusionary airspace surrounding Tinian International Airport.

Army Corp of Engineers

1. 33 CFR, Section 10 and Section 404 permit authorization for in-water construction and dredge/fill in waters of the U.S. for in-water construction.

2. Rulemaking for over water safety danger zones from Tinian and Pagan.
National Marine Fisheries Service

1. Consultation under the Marine Mammal Protection Act related in-water construction and amphibious landing training on Tinian.

2. Consultation under Section 7 of Endangered Species Act for potential effects on special-status marine species.

3. Consultation under Magnuson-Stevens Fishery Conservation and Management Act related to marine fisheries management.

U.S. Fish and Wildlife Service

1. Consultation under Section 7 of Endangered Species Act for potential adverse effects on special-status terrestrial species.

U.S. Environmental Protection Agency

1. Delegated authority from Clean Water Act to the CNMI agencies for permits related to water quality impacts; stormwater management; and wastewater discharge.

The CNMI State Historic Preservation Office

1. Responsibility and coordination with relevant federal agencies related to protection of cultural resources on Tinian and Pagan per Section 106 of the National Historic Preservation Act.
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CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

Table of Contents

CHAPTER 2 PROPOSED ACTION AND ALTERNATIVES ......................................................... I
ACRONYMS AND ABBREVIATIONS ........................................................................ IV

2.1 OVERVIEW OF THE PROPOSED ACTION ............................................................ 2-1
2.2 UNIT AND COMBINED LEVEL TRAINING REQUIREMENTS, REPRESENTATIVE
TRAINING, WEAPONS, EQUIPMENT, PARTICIPANTS, AND TRAINING SCENARIOS ........ 2-4
2.3 ALTERNATIVES DEVELOPMENT ......................................................................... 2-22
2.4 TINIAN ALTERNATIVES ....................................................................................... 2-30
2.5 PAGAN ALTERNATIVES ....................................................................................... 2-113
2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS ........ 2-149
2.7 PREFERRED ALTERNATIVE ............................................................................... 2-149

List of Figures

2.2-1 Representative Marine Corps Battalion Landing Team ......................................... 2-6
2.4-1 Tinian Location Map .......................................................................................... 2-32
2.4-2 Tinian All Action Alternatives Base Camp ......................................................... 2-35
2.4-3 Tinian All Action Alternatives Munitions Storage Area ..................................... 2-36
2.4-4 Tinian All Action Alternatives Airport Improvements ......................................... 2-38
2.4-5 Tinian All Action Alternatives Port Improvements and Supply Route ................ 2-39
2.4-6 Tinian All Action Alternatives Range Access Improvements, Fence Lines, and Gates 2-41
2.4-7 Tinian All Action Alternatives Utility Improvements ......................................... 2-51
2.4-8 Tinian Range Complexes .................................................................................. 2-54
2.4-9 Tinian All Action Alternatives Range Complex A .............................................. 2-55
2.4-10 Tinian All Action Alternatives Range Complex B ............................................. 2-57
2.4-11 Tinian All Action Alternatives Range Complex C ............................................ 2-59
2.4-12 Tinian All Action Alternatives Range Complex D ............................................ 2-60
2.4-13 Tinian All Action Alternatives Military Lease Area-wide Training Assets ........ 2-61
2.4-14 Tinian Tactical Amphibious Beach Landing Laydown Area and Access ............. 2-63
2.4-15 Unai Chulu Tactical Amphibious Beach Landing Dredging and Construction ..... 2-64
2.4-16 Unai Chulu Tactical Amphibious Beach Landing Operations ....................... 2-65
2.4-17 Tinian All Action Alternatives Surface Danger Zones .................................. 2-83
2.4-18 Tinian All Action Alternatives Special Use Airspace: Two-Dimensional Perspective .......... 2-85
2.4-19 Tinian All Action Alternatives Special Use Airspace: Three-Dimensional Perspective .......... 2-86
2.4-20 Tinian All Action Alternatives Danger Zones ........................................................................ 2-88
2.4-21 Tinian Alternative 1 Range Complexes .............................................................................. 2-91
2.4-22 Tinian Alternatives 1 and 2 Range Complex D ................................................................. 2-93
2.4-23 Tinian Alternative 1 Convoy Course ................................................................................. 2-94
2.4-24 Tinian Alternative 2 Range Complexes ............................................................................. 2-96
2.4-25 Tinian Alternatives 2 and 3 Range Complex C ................................................................. 2-97
2.4-26 Tinian Alternatives 2 and 3 Convoy Course .................................................................. 2-98
2.4-27 Tinian Alternative 3 Range Complexes ............................................................................ 2-101
2.4-28 Tinian No-Action Alternative ......................................................................................... 2-106
2.5-1 Pagan Location Map ........................................................................................................... 2-114
2.5-2 Pagan All Action Alternatives Bivouac Area, Munitions Storage, and Airfield Improvements .................................................................................................................. 2-116
2.5-3 Pagan All Action Alternatives Military Training Trail Improvements ................................................................. 2-119
2.5-4 Pagan All Action Alternatives Surface Danger Zones .......................................................... 2-133
2.5-5 Pagan All Action Alternatives Special Use Airspace: Two-Dimensional Perspective .......... 2-135
2.5-6 Pagan All Action Alternatives Danger Zones ..................................................................... 2-136
2.5-7 Pagan Alternative 1 Range Complexes ............................................................................. 2-138
2.5-8 Pagan Alternative 1 North Range Complex ..................................................................... 2-139
2.5-9 Pagan Alternative 1 South Range Complex ..................................................................... 2-140
2.5-10 Pagan Alternative 2 Range Complexes ......................................................................... 2-142
2.5-11 Pagan Alternative 2 North Range Complex .................................................................... 2-143
2.5-12 Pagan Alternative 2 South Range Complex ................................................................... 2-144

List of Tables
2.2-1 Pacific Command Service Components' Unfilled Training Requirements in the CNMI .......... 2-5
2.2-2 Representative Weaponry and Equipment .......................................................................... 2-9
2.2-3 Unit Level Training and Exercises, Duration, and Personnel ............................................. 2-15
2.2-4 Combined Level Training and Exercises, Duration, and Personnel .................................. 2-19
2.3-1 Requirements and Siting Study – Operational Siting Criteria ........................................... 2-23
2.3-2 RTA Siting Criteria for Islands in the CNMI ....................................................................... 2-24
2.4-1 Proposed Tinian Unit Level RTA Road Improvements ..................................................... 2-45
2.4-2 All Tinian Action Alternatives Proposed Annual Amphibious Operations ..................... 2-71
2.4-3 Tinian All Alternatives Proposed Annual Airfield Military Operations .......................... 2-73
2.4-4 All Tinian Action Alternatives Proposed Typical Annual Landing Zone Operations ........ 2-73
2.4-5 Proposed Tinian RTA Representative Annual Munitions Expenditures: All Tinian Action Alternatives* ................................................................................................................................. 2-80
2.4-6 All Tinian Action Alternatives Proposed Annual Operations in Special Use Airspace ........ 2-89
2.4-7 Summary of No-Action Alternative Training on Tinian Exclusive Military Use Area by U.S. Air Force, Army, Marine Corps, Navy, and Guam National Guard/Reserve .................. 2-102
2.4-8 Summary Comparison of Action Tinian Alternatives ........................................................................ 2-108
2.5-1 All Pagan Action Alternatives Proposed Amphibious Operations .................................................. 2-124
2.5-2 All Pagan Alternatives Proposed Annual Airfield Military Operations ........................................... 2-124
2.5-3 All Pagan Action Alternatives Proposed Typical Annual Landing Zone Operations .................. 2-125
2.5-4 All Pagan Action Alternatives Proposed Representative Annual Munitions Expenditures.................................................................................... 2-129
2.5-5 All Pagan Action Alternatives Aircraft Operations Proposed in Special Use Airspace .......... 2-132
2.5-6 Summary Comparison of Pagan Alternatives.................................................................................. 2-146
### Acronyms and Abbreviations

<table>
<thead>
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<th>Meaning</th>
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<td>%</td>
<td>percent</td>
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<tr>
<td>cal</td>
<td>caliber</td>
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<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CJMT</td>
<td>Commonwealth of the Northern Mariana Islands Joint Military Training</td>
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<td>HE</td>
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CHAPTER 2 PROPOSED ACTION AND ALTERNATIVES

This chapter identifies the proposed action and a range of reasonable alternatives that meet the purpose and need for the Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT) proposed action. Per Council on Environmental Quality regulations, an Environmental Impact Statement (EIS) is to provide a thorough discussion of the environmental impacts of the proposed action and a range of reasonable alternatives, including a no-action alternative. The no-action alternative represents the continuation of approved training activities in the CNMI. This chapter is designed to assist decision makers by presenting options to avoid or minimize adverse impacts to the environment and to identify with a preferred alternative (40 Code of Federal Regulations [CFR] 1502). The preferred alternative is the alternative that the lead agency prefers, and it may be based on a variety of factors in addition to impacts to the environment, to include agency needs, agency mission requirements, legislative or executive direction, and cost.

This chapter describes three action alternatives for Tinian, two action alternatives for Pagan, and the no-action alternative. In compliance with National Environmental Policy Act (NEPA), the no-action alternative is carried forward for analysis even though it does not satisfy the purpose and need for the action.

Section 2.1 provides an overview of the proposed action.

Section 2.2 describes the training requirements, representative training, the associated weaponry and equipment, and training participants and scenarios that would be related with the proposed action and alternatives.

Section 2.3 focuses on alternative development and the criteria used to identify the alternatives.

Section 2.4 describes the three Tinian unit level Range and Training Area (RTA) alternatives and the no-action alternative for Tinian.

Section 2.5 presents the two Pagan combined level RTA alternatives and the no-action alternative for Pagan.

Section 2.6 discusses alternatives considered but eliminated from further analysis.

Section 2.7 identifies the preferred alternative.

2.1 OVERVIEW OF THE PROPOSED ACTION

The proposed action is to establish a series of live-fire ranges, training courses, and maneuver areas within the CNMI to reduce existing joint service training deficiencies and meet the United States (U.S.) Pacific Command Service Components’ unfilled unit level and combined level training requirements in the Western Pacific. An RTA refers to live-fire ranges, training courses, maneuver areas, and associated support facilities, collectively, that are located in close proximity to each other. Under the proposed action, a unit level RTA is proposed on Tinian and a combined level RTA is proposed on Pagan. Establishing a unit level RTA and combined level RTA in the CNMI would support joint Service training requirements, ongoing operational requirements, changes to U.S. force structure, and geographic repositioning of forces in the Western Pacific.
As described in detail later in the chapter, three alternatives are identified for the Tinian unit level RTA and two alternatives for the Pagan combined level RTA; a combination of one Tinian unit level alternative and one Pagan combined level alternative meets the purpose and need for fulfilling the unfilled training requirements. The alternatives include several common elements:

- **Land Use Agreements** to provide land area necessary to support simultaneous and integrated training as appropriate (including amendments to existing agreements).
- **Construction** to support RTA development and associated infrastructure.
- **Range Management** to sustain RTA training capabilities in an environmentally responsible manner.
- **Expanded Training and Operations** to include combined arms, live-fire, amphibious landings, and maneuver training.
- **Danger Zones** to establish safe separation of non-participating military personnel and the public from live-fire training over water (i.e., sea space). Danger zones may be closed to the public on a full-time or intermittent basis (Title 33 CFR Part 334). Danger zones are established pursuant to statutory authority of the Secretary of the Army and are administered by the Army Corps of Engineers. Surface danger zones are three-dimensional areas that delineate portions of the earth’s surface and the overlying airspace in which personnel and/or equipment may be endangered by ground weapons firing or detonation activities because of ricochet or fragmentation hazard.
- **Designation of Special Use Airspace** to identify areas to which activities must be confined because of their nature, or where limitations are imposed upon aircraft that are not part of those activities, or both. Special Use Airspace is geographically defined by vertical and horizontal limits over a portion of the earth’s surface. The Federal Aviation Administration is the agency responsible for regulatory oversight and implementation of Special Use Airspace.

Construction would occur to support range and target installation; administrative, command, and control functions; access roads and trails; delivery of utilities (i.e., water, electric, wastewater, communications and solid waste handling); personnel lodging; and equipment and munitions storage. Additionally, all alternatives include RTA management activities, RTA use and scheduling, range observation to provide live feedback on training activities and target scoring, vegetation management for range use and firebreak purposes, as well as vehicle and equipment use and maintenance activities for RTA training. For all action alternatives, it is anticipated that approximately 95 full-time personnel would be needed to carry out range management and maintenance activities. These personnel would have responsibility for both RTAs on Tinian and Pagan, for purposes of analysis it is assumed these employees would live on Tinian. Both the Tinian RTA and the Pagan RTA require amphibious training beaches linked to an existing or improved road/trail system, maneuver areas to support personnel on foot or in vehicles, as well as access points (i.e., airfields, ports) for personnel, equipment, and cargo deliveries.

Based on the planned deployment and training exercise tempo for units in the U.S. Pacific Command Area of Responsibility, it was determined that 20 weeks of live-fire training on Tinian and 16 weeks of live-fire training on Pagan would meet the unfilled training requirements; therefore, these time periods
This EIS/OEIS analyzes 20 weeks per year of live-fire training on Tinian and 16 weeks per year of live-fire training on Pagan. In addition to the weeks of live-fire training for Tinian and for Pagan, other activities including pre-training and post-training activities (arrival and departure of trainees and equipment), non-live-fire training (e.g., logistics training), and RTA maintenance and management functions would occur outside of the live-fire training durations throughout the year.

The potential increase in training described in the *Unconstrained Training Concept for Tinian and Pagan* (Appendix C) reflects the maximum training capacity for each island. Potential future live-fire training could be accommodated up to a total of 45 weeks of training on Tinian and a total of 40 weeks of training on Pagan. Should the tempo of live-fire training need to be increased above the annual live-fire training demand of 20 weeks for Tinian and 16 weeks for Pagan analyzed in this EIS/ Overseas EIS (OEIS), additional NEPA compliance and agency consultations would be completed before implementing any increase in tempo.

Two additional projects are not being formally proposed at this time, but they are anticipated to be needed and would be implemented in the future although no specific timeframe has been identified. The two projects are: (1) relocation of the existing International Broadcasting Bureau on Tinian and (2) new dock and associated breakwater on Pagan. The International Broadcasting Bureau is located within the Military Lease Area. If, as a result of the selected alternative, the International Broadcasting Bureau must be relocated outside of the Military Lease Area, then additional NEPA analysis will be done as needed. The new International Broadcasting Bureau facility must be complete and fully operational before relocation occurs. Potential relocation of the International Broadcasting Bureau and the dock and breakwater on Pagan are analyzed programmatically in this EIS/OEIS (see Section 4.18, *Programmatic Analysis of Future Potential Project Components*).
2.2 UNIT AND COMBINED LEVEL TRAINING REQUIREMENTS, REPRESENTATIVE TRAINING, WEAPONS, EQUIPMENT, PARTICIPANTS, AND TRAINING SCENARIOS

Section 2.2 provides an overview of the training requirements that the proposed action and alternatives are intended to meet (Section 2.2.1, Unfilled Unit and Combined Level Training Requirements). It also provides a representative training structure that includes a general description of the ground, logistical, aviation, and service personnel that come together to train (Section 2.2.2, Representative Training). The types of weapons and equipment that would be used in the representative training are described in Section 2.2.3, Representative Weapons and Equipment. Representative training participants (e.g., bilateral, multilateral, joint exercises) are described and a representative 1-week training scenario is portrayed in Section 2.2.4, Representative Live-Fire Training Participants and Scenarios.

2.2.1 Unfilled Unit and Combined Level Training Requirements

As discussed in Section 1.3.6, Training Requirements and Siting Study, the 2013 CNMI Joint Military Training Requirements and Siting Study (Department of the Navy [DoN] 2013a) concluded that 42 unfilled training requirements could be achieved at the unit and combined levels in the CNMI. Table 2.2-1 provides a list of the 42 unfilled training requirements and identifies whether they apply to unit level, combined level, or both RTAs. For example, a High Hazard Impact Area is needed in both unit level and combined level RTAs to support live-fire munitions delivery. Other requirements common to both RTAs include, but are not limited to, Battle Sight Zero Range (i.e., range used to calibrate weapons firing), Field Artillery Indirect Firing Range (i.e., aiming and firing munitions without relying on a direct line of sight between the gun and its target), Mortar Range, Close Air Support, Landing and Drop Zones.
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Name</th>
<th>Training Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Hazard Impact Area</td>
<td>U,C</td>
</tr>
<tr>
<td>2</td>
<td>Combat Pistol Range</td>
<td>U</td>
</tr>
<tr>
<td>3</td>
<td>Multi-purpose Automated Unknown Distance Range</td>
<td>U</td>
</tr>
<tr>
<td>4</td>
<td>Live Hand Grenade Range</td>
<td>U</td>
</tr>
<tr>
<td>5</td>
<td>Field Artillery Indirect Fire Range</td>
<td>U,C</td>
</tr>
<tr>
<td>6</td>
<td>Mortar Range</td>
<td>U,C</td>
</tr>
<tr>
<td>7</td>
<td>Field Fire Range</td>
<td>U</td>
</tr>
<tr>
<td>8</td>
<td>Anti-Armor Tracking Range</td>
<td>U</td>
</tr>
<tr>
<td>9</td>
<td>Field Artillery Direct Fire Range</td>
<td>C</td>
</tr>
<tr>
<td>10</td>
<td>Tank/Fighting Stationary Target Range</td>
<td>U</td>
</tr>
<tr>
<td>11</td>
<td>Light Anti-Armor Weapon Range Live</td>
<td>U</td>
</tr>
<tr>
<td>12</td>
<td>Grenade Launcher Range</td>
<td>U</td>
</tr>
<tr>
<td>13</td>
<td>Battle Sight Zero Range</td>
<td>U,C</td>
</tr>
<tr>
<td>14</td>
<td>Infantry Platoon Battle Course</td>
<td>U</td>
</tr>
<tr>
<td>15</td>
<td>Multi-Purpose Training Range</td>
<td>U</td>
</tr>
<tr>
<td>16</td>
<td>Tank/Fighting Vehicle Multi-Purpose Range Complex</td>
<td>U</td>
</tr>
<tr>
<td>17</td>
<td>Combined Arms Training Range to support Close Air Support and Naval</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>Gunfire Support Training</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Battle Area Complex</td>
<td>U</td>
</tr>
<tr>
<td>19</td>
<td>Combined Arms Live-Fire Amphibious Beaches with Maneuver Area</td>
<td>C</td>
</tr>
<tr>
<td>20</td>
<td>Urban Assault Course</td>
<td>U</td>
</tr>
<tr>
<td>21</td>
<td>Convoy Course</td>
<td>U</td>
</tr>
<tr>
<td>22</td>
<td>Tracked Vehicle Driver’s Course</td>
<td>U</td>
</tr>
<tr>
<td>23</td>
<td>Tactical Amphibious Landing Beaches</td>
<td>U</td>
</tr>
<tr>
<td>24</td>
<td>Maneuver Area (Heavy Forces)</td>
<td>U</td>
</tr>
<tr>
<td>25</td>
<td>Maneuver Area (Light Forces)</td>
<td>U</td>
</tr>
<tr>
<td>26</td>
<td>Maneuver Area (Amphibious Forces)</td>
<td>U</td>
</tr>
<tr>
<td>27</td>
<td>Offensive Air Support Range</td>
<td>U,C</td>
</tr>
<tr>
<td>28</td>
<td>Close Air Support Range</td>
<td>U,C</td>
</tr>
<tr>
<td>29</td>
<td>Electronic Warfare Training Range*</td>
<td>U,C</td>
</tr>
<tr>
<td>30</td>
<td>Landing Zones</td>
<td>U,C</td>
</tr>
<tr>
<td>31</td>
<td>Drop Zones</td>
<td>U</td>
</tr>
<tr>
<td>32</td>
<td>Unmanned Aircraft Systems Operating Areas</td>
<td>U,C</td>
</tr>
<tr>
<td>33</td>
<td>Anti-Air Warfare Range</td>
<td>C</td>
</tr>
<tr>
<td>34</td>
<td>Terrain Flight Maneuver Area</td>
<td>U,C</td>
</tr>
<tr>
<td>35</td>
<td>Forward Arming and Refueling Point</td>
<td>U,C</td>
</tr>
<tr>
<td>36</td>
<td>Base camp and associated facilities and infrastructure</td>
<td>U</td>
</tr>
<tr>
<td>37</td>
<td>Range Control</td>
<td>U</td>
</tr>
<tr>
<td>38</td>
<td>Data Transfer Infrastructure</td>
<td>U</td>
</tr>
<tr>
<td>39</td>
<td>Ammunition Storage</td>
<td>U,C</td>
</tr>
<tr>
<td>40</td>
<td>Staging Areas</td>
<td>U</td>
</tr>
<tr>
<td>41</td>
<td>Adequate waterfront piers, harbor, and infrastructure</td>
<td>U,C</td>
</tr>
<tr>
<td>42</td>
<td>Adequate Roads, utilities, and infrastructure for training areas,</td>
<td>U</td>
</tr>
<tr>
<td></td>
<td>ranges, and facilities</td>
<td>U,C</td>
</tr>
</tbody>
</table>

*Legend: U=Unit Level Training; C=Combined Level Training.

*Note: *Electronic Warfare Training Range will be addressed under another NEPA action.
2.2.2 Representative Training

The proposed action would provide the capability and capacity for military personnel to conduct unit level and combined level training. Unit level and combined level training participants could be from any single or multiple (i.e., “joint”) U.S. Service or include other nations hosted by U.S. forces (i.e., “bilateral” or “multilateral”). Joint training for both unit and combined levels would include ground combat training with support from air, naval, and logistics detachments.

To begin developing the unit level and combined level RTA components of the proposed action, an established, representative military training structure was identified. Although the U.S. Army, Navy, Marine Corps, and Air Force (as well as National Guard and Reserves) differ in command and training structure, many military occupational specialties are similar in regard to the types of training being conducted. For instance, ground-based (Army), sea-to-land (Navy), and air-to-ground (Air Force) forces need similar training as Marine Corps ground-, sea-, and air-based units. To account for unfilled training requirements across the Services for ground combat training, in conjunction with air, logistics, and naval support, and the unique Marine Corps amphibious capabilities, the Marine Corps force structure was adopted and a Marine Corps battalion landing team was chosen as the basis for designing the unit level and combined level RTAs for joint training (Figure 2.2-1). A representative Marine Corps battalion landing team encompasses the training needs required by the other combat units within the U.S. military branches—ground combatants working with aviation, logistics, and naval surface fire support as well as amphibious support (a Marine Corps-specific requirement).

![Figure 2.2-1 Representative Marine Corps Battalion Landing Team](image-url)
A representative military training structure including ground combatants (e.g., battalion landing team) with aviation, logistics, and naval surface fire support is described below.

- **Ground Combatants.** A Marine Corps battalion landing team includes approximately 1,200 personnel and consists of two components: an infantry battalion (approximately 960 personnel) and attachments (approximately 340 personnel). The infantry battalion includes three rifle companies and one weapons company. An artillery battery, a light anti-armor reconnaissance platoon, an Amphibious Assault Vehicle platoon, a combat engineer platoon, a tank platoon, and a reconnaissance platoon could be included as attachments to form the battalion landing team. Figure 2.2-1 provides the organizational structure for the battalion landing team used in this example.

- **Aviation Support.** Aviation support could include a Marine composite squadron (i.e., aviation detachments) with approximately 100 personnel providing aviation support. The composite squadron consists of medium lift aircraft (e.g., MV-22s) transporting troops, equipment, and supplies; heavy lift aircraft (e.g., CH-53) delivering troops and cargo; and light attack rotary-wing (e.g., AH-1s) and fixed-wing aircraft (e.g., F-35Bs) for ground troop support during combat assault. Ground-support units attached to the aviation squadron include command and control, ground refueling, and aircraft maintenance.
• **Logistics Support.** The logistics detachments could include approximately 500 personnel intended to provide combat logistics (e.g., cargo handling, refueling, and munitions handling) and engineering support (e.g., mobility support and maintenance).

![Representative Logistics Support](image1)

(From left to right: refueling, maintenance, and mobility support)

• **Naval Surface Fire Support.** Naval surface fire support includes vessels for the purposes of providing naval gunfire support for ground training associated with combined level training. This would only occur for the combined exercises proposed for Pagan.

![Representative Naval Fire Support](image2)

(From left to right: frigate, cruiser, and destroyer)

### 2.2.3 Representative Weapons and Equipment

Multiple types of weapons and equipment would be used on the proposed Tinian and Pagan RTAs. Table 2.2-2 provides depictions of representative weaponry and equipment that could be used at both RTAs by a Marine Corps battalion landing team and other training groups. Specific weapons systems used by the U.S. and partner foreign nation forces that differ from those evaluated in this EIS/OEIS would be evaluated before they are employed in the RTAs to ensure their characteristics are equivalent to the weapon systems analyzed in this NEPA document.
<table>
<thead>
<tr>
<th>Weaponry and Equipment</th>
<th>Where Employed</th>
<th>Weapons Potentially Employed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pistols</td>
<td>Combat Pistol Range, Battle Area Complex, Urban Assault Course</td>
<td>9 mm, combat shotgun and .45 caliber pistols</td>
</tr>
<tr>
<td>Rifles (e.g., M16)</td>
<td>Multi-purpose Automated Unknown Distance Range, Field Fire Range, Battle Sight Zero Range, Infantry Platoon Battle Course, Battle Area Complex, Urban Assault Course, Maneuver Area (Heavy Forces), Maneuver Area (Light Forces)</td>
<td>M16, M4 carbine rifles, 7.62 mm and .50 caliber sniper weapons, M27 infantry automatic rifle</td>
</tr>
<tr>
<td>Hand Grenades</td>
<td>Live Hand Grenade Range with a dedicated High Hazard Impact Area</td>
<td>M67 fragmentation grenade</td>
</tr>
<tr>
<td>Machine Guns (e.g., M240)</td>
<td>Tank/Fighting Vehicle Stationary Target Range, Infantry Platoon Battle Course, Multi-Purpose Training Range, Tank/Fighting Vehicle Multi-Purpose Range Complex, Battle Area Complex, Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Convoy Course, Tactical Amphibious Landing Beaches (Pagan only), Maneuver Area (Heavy Forces), Maneuver Area (Light Forces) (non-live-fire on Tinian), Maneuver Area (Amphibious Forces)</td>
<td>M2 .50 caliber machine gun, M16 and M4 carbine rifles, M240 7.62 mm machine gun, M249 squad automatic weapon, M27 infantry automatic rifle</td>
</tr>
<tr>
<td>Rocket Launchers (e.g., Tube-fired, Optically-tracked, Wire-guided missile weapon systems)</td>
<td>Anti-Armor Tracking Range, Light Anti-Armor Weapon Range Live with a dedicated High Hazard Impact Area, Multi-Purpose Training Range, Battle Area Complex, Combined Arms Live-Fire Amphibious Beaches with Maneuver Area (Pagan only), Urban Assault Course, Maneuver Area (Heavy Forces), Maneuver Area (Light Forces) (non-live-fire on Tinian), Maneuver Area (Amphibious Forces)</td>
<td>Live, high explosive and inert Anti-Tank-4 (84 mm) and Shoulder Launched Multi-Purpose Assault Weapon versions of the Javelin, Light Anti-Armor Weapon (66 mm), Tube-fired, Optically-tracked, Wire-guided missile, and Shoulder Launched Multi-Purpose Assault Weapon (83 mm) systems, M72</td>
</tr>
</tbody>
</table>
### Table 2.2-2. Representative Weaponry and Equipment

<table>
<thead>
<tr>
<th>Light Anti-Armor/Tank Weapon</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where Employed:</strong> Tank/Fighting Vehicle Stationary Target Range, Grenade Launcher Range with a dedicated High Hazard Impact Area, Multi-Purpose Training Range, Tank/Fighting Vehicle Multi-Purpose Range Complex, Battle Area Complex, Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Maneuver Area (Heavy Forces), Maneuver Area (Light Forces), Maneuver Area (Amphibious Forces)</td>
</tr>
<tr>
<td><strong>Weapons Potentially Employed:</strong> M203 grenade launcher (40 mm), attached to an M16 or M4 rifle, MK19 40 mm grenade launcher</td>
</tr>
</tbody>
</table>

![Grenade Launcher](image1)  
(e.g., M203 mounted on M16 rifle)

<table>
<thead>
<tr>
<th>Mortars (e.g., M252 81 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where Employed:</strong> Field Artillery Indirect Fire Range (firing into a High Hazard Impact Area), Mortar Range (firing into a High Hazard Impact Area)</td>
</tr>
<tr>
<td><strong>Weapons Potentially Employed:</strong> 120 mm mortar for all training ranges listed above, M224 60 mm mortar and the M252 81 mm mortar require firing positions immediately adjacent to a High Hazard Impact Area are limited to the Mortar Range</td>
</tr>
</tbody>
</table>

![Mortars](image2)  
(e.g., M252 81 mm)

<table>
<thead>
<tr>
<th>Artillery (Howitzers) (e.g., M777 155 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where Employed:</strong> Field Artillery Indirect Fire Range (firing into a High Hazard Impact Area), Field Artillery Direct Fire Range (firing into a High Hazard Impact Area), Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Maneuver Area (Heavy Forces), Maneuver Area (Light Forces) (non-live-fire on Tinian), Maneuver Area (Amphibious Forces)</td>
</tr>
<tr>
<td><strong>Weapons Potentially Employed:</strong> 105 mm howitzer, the M777 155 mm howitzer</td>
</tr>
</tbody>
</table>

![Artillery](image3)  
(e.g., M777 155 mm)

<table>
<thead>
<tr>
<th>Fighting Vehicle (e.g., Army Stryker Fire Support Vehicle)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where Employed:</strong> Tank/Fighting Vehicle Stationary Target Range, Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Maneuver Area (Heavy Forces), Maneuver Area (Light Forces), Maneuver Area (Amphibious Forces)</td>
</tr>
<tr>
<td><strong>Equipment Potentially Employed:</strong> Army Stryker Fire Support Vehicle with 105 mm mobile gun system</td>
</tr>
</tbody>
</table>

![Fighting Vehicle](image4)  
(e.g., Army Stryker Fire Support Vehicle)

<table>
<thead>
<tr>
<th>Light Armored Vehicle (e.g., C2 variant of LAV-25)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where Employed:</strong> Tank/Fighting Vehicle Multi-Purpose Training Range Complex, Convoy Course, Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Maneuver Area (Heavy Forces), Maneuver Area (Light Forces) (non-live-fire on Tinian), Maneuver Area (Amphibious Forces)</td>
</tr>
<tr>
<td><strong>Equipment Potentially Employed:</strong> Light Armored Vehicle (LAV-25) with 25 mm chain gun</td>
</tr>
</tbody>
</table>

![Light Armored Vehicle](image5)  
(e.g., C2 variant of LAV-25)
<table>
<thead>
<tr>
<th>Table 2.2-2. Representative Weaponry and Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wheeled Vehicles</strong></td>
</tr>
<tr>
<td>Where Employed: Convoy Course, Maneuver Areas</td>
</tr>
<tr>
<td>Equipment Potentially Employed: High Mobility Multi-Purpose Wheeled Vehicles with the M2 heavy machine gun, the M240G/B machine gun, 7-Ton Trucks, Combat Vehicle</td>
</tr>
<tr>
<td><strong>Amphibious Assault Vehicle (e.g., AAV-7A1)</strong></td>
</tr>
<tr>
<td>Where Employed: Tank/Fighting Vehicle Multi-Purpose Training Range Complex, Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Tracked Vehicle Driver’s Course, Tactical Amphibious Landing Beaches, Maneuver Area (Heavy Forces), Maneuver Area (Amphibious Forces)</td>
</tr>
<tr>
<td>Equipment Potentially Employed: Amphibious Assault Vehicle (AAV-7A1), representative weapons are MK19 40 mm grenade launcher and M2HB .50-caliber machine gun</td>
</tr>
<tr>
<td><strong>Small Boats (e.g., Rubber Raiding Craft)</strong></td>
</tr>
<tr>
<td>Where Employed: Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Tactical Amphibious Landing Beaches, Maneuver Area (Amphibious Forces)</td>
</tr>
<tr>
<td>Equipment Types: Rubber Raiding Craft, Rigid Hulled Inflatable Boat</td>
</tr>
<tr>
<td><strong>Landing Craft Air Cushion</strong></td>
</tr>
<tr>
<td>Where Employed: Tactical Amphibious Landing Beaches</td>
</tr>
<tr>
<td>Equipment Types: Landing Craft Air Cushion</td>
</tr>
<tr>
<td><strong>Attack Helicopter (e.g., AH-1)</strong></td>
</tr>
<tr>
<td>Where Employed: Tank/Fighting Vehicle Multi-Purpose Training Range Complex, Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Close Air Support Range, Offensive Air Support Range</td>
</tr>
<tr>
<td>Equipment and Weapons Potentially Employed: AH-1 Cobra or the AH-64 Apache attack helicopter delivering aviation munitions such as Global Positioning System guided munitions, direct fire rockets, or bullets fired from guns</td>
</tr>
</tbody>
</table>
### Table 2.2-2. Representative Weaponry and Equipment

<table>
<thead>
<tr>
<th>Weaponry and Equipment</th>
<th>Where Employed</th>
<th>Equipment Potentially Employed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed-Winged Aircraft (e.g., FA-18)</td>
<td>Offensive Air Support Range, Close Air Support Range, Tinian International</td>
<td>FA-18 Hornet, F-35 Lighting II (Joint Strike Fighter), F-16, F-22, F-15E, AV-8B Harrier II,</td>
</tr>
<tr>
<td></td>
<td>Airport, North Field, Pagan airfield, Drop Zones</td>
<td>C-130, C-17, KC-135, KC-46 and similar aircraft</td>
</tr>
<tr>
<td>Helicopters and Tilt-rotor aircraft (e.g.,</td>
<td>Landing Zones, Drop Zones, Terrain Flight Maneuver Area</td>
<td>helicopters, tilt-rotor aircraft (i.e., MV-22). No weapons would be used.</td>
</tr>
<tr>
<td>MV-22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmanned Air Vehicle (e.g., Marine Shadow)</td>
<td>Unmanned Aircraft System Operating Areas, Landing Zones, open areas</td>
<td>Unmanned Air Vehicle Groups 1-4, e.g., Marine Corps RQ-7B Shadow (Group 3)</td>
</tr>
<tr>
<td>Helicopter Expedient Refueling Systems</td>
<td>Forward Arming and Refueling Point</td>
<td>Helicopter Expedient Refueling Systems used to provide refueling for aircraft</td>
</tr>
<tr>
<td>Military Operations on Urban Terrain/</td>
<td>Urban Assault Course</td>
<td></td>
</tr>
<tr>
<td>Urban Assault Course Structures</td>
<td></td>
<td>Small arms (e.g., rifle, pistol, and machine guns)</td>
</tr>
</tbody>
</table>
Table 2.2-2. Representative Weaponry and Equipment

<table>
<thead>
<tr>
<th>Combined Level Training Only</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Naval Gunfire</strong> (e.g., Royal Australian Navy Frigate)</td>
</tr>
<tr>
<td><strong>Where Employed:</strong> Combined Arms Training Range to Support Close Air Support and Naval Gunfire Support Training with a dedicated High Hazard Impact Area</td>
</tr>
<tr>
<td><strong>Weapons Potentially Employed:</strong> 5-inch naval gunfire high-explosive rounds firing into a High Hazard Impact Area</td>
</tr>
</tbody>
</table>

*Note: See Appendix C, Unconstrained Training Concept for Tinian and Pagan for more detailed descriptions of ranges and weapons. mm = millimeter. Source: DoN 2014a.*

### 2.2.4 Representative Live-Fire Training Participants and Scenarios

#### 2.2.4.1 Unit Level Training Participants

The goal for unit level training is to provide a RTA with the capacity to support the number and type of weapons and equipment associated with ground combat training. The necessary logistics and aviation support, and suitable Special Use Airspace and sea space are linked to the RTA. Additionally, the unit level RTA must be able to accommodate amphibious- and land-based live-fire training for U.S. Pacific Command Service Components, as well as bilateral and multilateral forces.

The cumulative duration of live-fire training in the unit level RTA would be up to 20 non-consecutive weeks per year (140 days per year), with varying lengths of training exercises. Prior to and after each live-fire training event, additional non-live-fire training preparation would occur with between 2 and 100 U.S. military personnel on island for administrative and logistical support. A majority of the training preparation weeks are likely to overlap, and a total of approximately 22 additional non-live-fire preparation weeks are anticipated. There would also be periodic maintenance and range management conducted on the RTA during times when live-fire training is not being conducted (see [Section 2.1, Overview of the Proposed Action](#)).

Construction will occur over a period of 8 to 10 years. During the proposed construction period, live-fire training activities would be incrementally increased, eventually culminating to the final 20 weeks proposed.

Training participants could include bilateral forces, multilateral forces, joint Services, Marine units, Special Operations Command forces, Marine Aircraft Wing aviation forces, and other U.S. military Services such as the National Guard and Reserves, among others. It is anticipated that participants would use the Tinian RTA for up to 2 weeks at a time and could include between 30 and 2,200 personnel. Tinian unit level representative training and exercise duration are summarized in Table 2.2-3 and described in the following paragraphs.

**Unilateral/Bilateral Training.** One U.S. company and one allied force company (approximately 500 personnel) would train for 2 weeks, once a year. Each training event would include approximately 1
A week of pre-training and 1 week of post-training preparation time (approximately 25 personnel). Ground combatants (i.e., infantry) would train on most of the training facilities. Limited logistics support would be anticipated and aviation support could occur but it is not emphasized as part of this training. Aviation training (i.e., Offensive Air Support, Close Air Support, Unmanned Aircraft Systems, Anti-Air Warfare, Terrain Flight Maneuver Area, Forward Arming and Refueling Point) would also be conducted, but at a level less than some of the other anticipated exercise periods. Pre- and post-training mobilization would occur via marine and air transportation from Guam or locations outside of the Mariana Islands. For all training participants, transportation via Joint High Speed Vessels may not be viable from locations outside Guam.

**Multilateral Training.** One U.S. company training with two allied force companies (approximately 750 personnel) would train together for 2 weeks, once a year. Each training event would include approximately 1 week of pre-training and 1 week of post-training preparation time (approximately 30 personnel). This training would be similar to bilateral training except the number of personnel would increase along with munitions use. Pre- and post-training mobilization would occur via marine and air transportation from Guam or locations outside of the Mariana Islands.

**Joint Services Exercises.** U.S. Services (approximately 1,000 personnel) would train together for 2 weeks, twice a year. Each training event would include approximately 2 weeks of pre-training and 1 week of post-training preparation time (approximately 50 personnel). This training would be similar to bilateral training except that there would be an increase in the number of personnel and munitions, and the units would come from more than one U.S. Service (e.g., Marine Corps and Army units). This type of training would emphasize joint ground combat planning and execution. Aviation and logistical support would increase from what is planned for the bilateral and multilateral training exercises. Therefore, the majority of the training facilities would potentially be used, including aviation ranges and the Field Artillery Indirect Fire Range. Pre- and post-training mobilization would occur via marine and air transportation from Guam or locations outside of the Mariana Islands.

**Marine Unit Training.** A Marine Corps ground combat element with aviation and logistics attachments (approximately 2,200 personnel) would train for 1 week, twice a year. Each training event would include approximately 1 week of pre-training and 1 week of post-training preparation time (approximately 100 personnel). As part of the training, personnel would depart from a ship offshore and come ashore using Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, as well as rotary- and tilt-wing aircraft. This training emphasizes ground combat with aviation and logistics support. Therefore, all training facilities would potentially be used. Pre- and post-training mobilization would occur from Navy ships off the coast of Tinian with Landing Craft Air Cushion vessels, Amphibious Assault Vehicles, and air transportation used to move personnel from the ship to shore. Ships would typically originate outside of Guam, but could stop there in transit to Tinian.

**Special Operations Command Exercises.** Special operations forces (approximately 30 personnel) would train for 1 week, twice a year. Each training event would include approximately 1 week of pre-training and 1 week of post-training preparation time (approximately 2 personnel). All training facilities would potentially be used. Pre- and post-training mobilization would occur via air transportation from Guam or locations outside of the Mariana Islands.
**Marine Aircraft Wing Aviation Training Relocation.** Marine Aircraft Wing personnel (approximately 300 personnel) would train for 2 weeks, twice a year. Each training event would include approximately 2 weeks of pre-training and 2 weeks of post-training preparation time (approximately 30 personnel). This training currently occurs on Tinian and continues under all alternatives. Emphasizing aviation, personnel would practice expeditionary airfield operations (e.g., refueling rotary-wing, tilt-rotor, and fixed-wing aircraft), arrested landings, and command and control of aircraft. Training activities would be focused on North Field and Tinian International Airport. Pre- and post-training mobilization would occur via air transportation from a location outside of the Mariana Islands.

**U.S. Services (National Guard, Reserves).** Along with active duty Navy and Air Force units stationed on Guam, various Army and Air Force Reserve as well as National Guard units are based within the Mariana Islands (approximately 500 personnel) and would train for 2 weeks, twice a year. Each training event would include approximately 1 week of pre-training and 1 week of post-training preparation time (approximately 25 personnel). One of these units is an infantry battalion whose training would be similar to the multilateral training noted above. Other units are specialized and provide such functions as engineering, supply, medical, security, and civil affairs. These units would use various training ranges consistent with their mission essential tasks. Pre- and post-training mobilization would occur via air and marine transportation from Guam and Saipan. A summary of Tinian unit level representative training and exercise time spans are provided in Table 2.2-3.

### Table 2.2-3. Unit Level Training and Exercises, Duration, and Personnel

<table>
<thead>
<tr>
<th>Training and Exercises</th>
<th>Live-Fire Training Duration and Personnel</th>
<th>Pre- and Post-Training Duration and Personnel (non-live-fire)*</th>
<th>Post- and Pre-Training Duration and Personnel (non-live-fire)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bilateral Training</strong></td>
<td>2 weeks, once a year 500</td>
<td>1 week, once a year 25</td>
<td>1 week, once a year 25</td>
</tr>
<tr>
<td><strong>Multilateral Training</strong></td>
<td>2 weeks, once a year 750</td>
<td>1 week, once a year 30</td>
<td>1 week, once a year 30</td>
</tr>
<tr>
<td><strong>Joint Services Exercises</strong></td>
<td>2 weeks, twice a year 1,000</td>
<td>2 weeks, twice a year 50</td>
<td>1 week, twice a year 50</td>
</tr>
<tr>
<td><strong>Marine Unit Training</strong></td>
<td>1 week, twice a year 2,200</td>
<td>1 week, twice a year 100</td>
<td>1 week, twice a year 100</td>
</tr>
<tr>
<td><strong>Special Operations Command Exercises</strong></td>
<td>1 week, twice a year 30</td>
<td>1 week, twice a year 2</td>
<td>1 week, twice a year 2</td>
</tr>
<tr>
<td><strong>Marine Aircraft Wing Aviation Training Relocation</strong></td>
<td>2 weeks, twice a year 300</td>
<td>2 weeks, twice a year 30</td>
<td>2 weeks, twice a year 30</td>
</tr>
<tr>
<td><strong>Other Services</strong></td>
<td>2 weeks, twice a year 500</td>
<td>1 week, twice a year 25</td>
<td>1 week, twice a year 25</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>20 weeks per year NA</td>
<td>16 weeks per year* NA</td>
<td>12 weeks per year* NA</td>
</tr>
</tbody>
</table>

*Note: After accounting for overlap, a combined total of 22 pre- and post-training weeks are anticipated per year. Pre- and post-training durations are typically 1 to 2 weeks in duration and are not inclusive of other approved non-live-fire training. NA = not applicable.
2.2.4.2 Unit Level Training Scenario

For planning purposes, the representative unit level training scenario is based on a Marine Unit (up to 2,200 personnel) training for 1 week, twice a year, plus pre- and post-training preparation time. A Marine Unit includes ground combat elements (i.e., battalion landing team) along with aviation support and logistic support. This training scenario was selected because it could potentially include training on most of the training facilities within the proposed Tinian RTA and, therefore provide the broadest training scenario as compared to other potential training participants. A key difference between Marine Unit training exercises and other types of training participants’ exercises is that a Marine Unit is largely self-contained and does not have the same degree of non-organic logistical needs (i.e., needs beyond those inherent to the unit) as the other participants. For example, a Marine Unit does not require a base camp, fueling, or transportation like many other training participants would.

The following example training scenario is based on a Marine Unit that trains for 1 week. Operations for small-caliber and airfield training in the following training scenario are assumed to occur about 80 percent (%) during the hours of 7:00 a.m. to 10:00 p.m. and 20% during the hours of 10:00 p.m. and 7:00 a.m. Large-caliber operations are assumed to occur about 96% during the hours of 7:00 a.m. to 10:00 p.m. and 4% during the hours of 10:00 p.m. and 7:00 a.m. The training scenarios described below are examples of the types of training that could occur, and they are not all-inclusive of every training event that may occur on the island.

2.2.4.2.1 Marine Unit Training Scenario, Tinian

Pre-Training Preparations. Approximately 1 week prior to the beginning of the training exercise, Tinian RTA Range Control personnel and a Marine Unit advance team of 100 personnel would perform various pre-exercise administrative functions within the Tinian RTA such as sign out of base camp facilities and equipment, clear the Military Lease Area of non-participating personnel, establish check points/road blocks at various internal Military Lease Area locations, and conduct communications checks between ship units and Tinian Range Control on control and safety (i.e., military frequency radio communications). If equipment were flown or shipped in prior to training, personnel would unload the equipment and stage it for training use. Appropriate biosecurity measures would be conducted for incoming aircraft, ships, and cargo (see Section 4.9, Terrestrial Biology and Appendix D, Best Management Practices for further discussion of biosecurity measures). All units would receive appropriate briefings regarding environmental, natural, and cultural resource restrictions and concerns related to training at the Tinian RTA. Pre-training preparations are outside the 20 weeks estimated for live-fire training.

Training Day 1. Marine Unit Reconnaissance and Surveillance teams would conduct intelligence gathering actions, to include a report of surf conditions for the various amphibious training sites. Amphibious units (Amphibious Assault Vehicles and Landing Craft Air Cushion vessels) would conduct an Amphibious Demonstration as a feint (no actual beach landings) used as a dry run for the actual training assault. Activities conducted on this training day could include both live-fire and non-live-fire training.
Training Day 2. The Marine Unit would conduct a company-sized amphibious assault using Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, combat swimmers, and small boats at the various Military Lease Area approved/selected amphibious training beaches. The amphibious assault would be combined with vertical insertion (i.e., helicopter or rotary-wing aircraft dropping off personnel or equipment) of an infantry company via MV-22s and CH-53s at North Field. As these units come ashore, they would move either by vehicle (i.e., High Mobility Multi-Purpose Wheeled Vehicles off Landing Craft Air Cushion vessels) or foot to the base camp. Portions of other Marine Unit (aviation combat element and logistics combat element) would come ashore in successive waves to establish logistical support of follow-on training events. Activities conducted on this training day could include both live-fire and non-live-fire training.

Training Day 3. Marine Unit personnel would come ashore and conduct required safety briefs and range orientation. Based on their organic weapons (i.e., weapons belonging to and brought along with the unit), units would conduct live-fire weapons calibration on various ranges (i.e., Battle Sight Zero Range for small weapons systems; Light Armored Vehicles and Amphibious Assault Vehicles on the Tank/Fighting Vehicle Multi-Purpose Range Complex). Utilizing Special Use Airspace, aviation units would support ground training using aircraft such as AH-1 and AV-8B Harrier II. Ground personnel would direct delivery of aviation munitions into the High Hazard Impact Area, followed by non-live-fire or live-fire munitions delivery (i.e., shooting from aircraft or discharging munitions), using the High Hazard Impact Area. This would also entail mortar and artillery firing at targets within the High Hazard Impact Area. As needed, some units may conduct pistol and rifle re-qualification training.

Training Day 4. Battalion Landing Team infantry units (selected platoons) would cycle through the Infantry Platoon Battle Course, conducting a day dry run (i.e., non-live-fire), and a day and/or night live-fire scenario. Light armored reconnaissance and Amphibious Assault Vehicle units would conduct live-fire and maneuver training on the Tank/Fighting Vehicle Multi-Purpose Range Complex with other selected infantry platoons embarked. The Amphibious Assault Vehicle platoon would also conduct amphibious training for unit level training and provide embarked re-qualification training for those infantry units that did not participate in the initial landings. Mortar and artillery units would conduct unit level training, firing at targets within the High Hazard Impact Area. With careful scheduling to create a safe separation of training activities around the impact area, infantry units would perform hand grenade, grenade launcher, and rocket training utilizing the High Hazard Impact Area.

Training Day 5. Battalion Landing Team infantry units (all three infantry companies) would cycle through the Battle Area Complex(es), conducting a day dry run, and day live-fire scenario. MV-22s and CH-53s would use Landing Zones within or near the Battle Area Complex objective areas to insert segments of the infantry units, while other segments of the infantry unit conduct an assault on foot. Aviation support of ground combat training would be integrated into the fire support plan, using the High Hazard Impact Area.

Training Day 6. Training activities would be largely concentrated on a night cycle. Similar to Training Day 5, the units would execute company level offensive assaults at night on the Battle Area Complex(es). This includes night Landing Zone use and employment of offensive air support (aviation support for ground combat training).
Training Day 7. Battalion landing team units would cycle through the Convoy Course, typically with approximately 10 vehicles in a convoy, each vehicle with approximately 4 individuals. Units would use various vehicles (i.e., High Mobility Multi-Purpose Wheeled Vehicles, 7-ton trucks, Light Armored Vehicles) and proceed through the course, engaging targets as dictated by the specific training scenario for that day/unit type (number of engagement areas/course route is Alternative-dependent). The scenario would include integration of offensive air support in coordination with ground troop movement and casualty evacuation.

Post-training Events. Similar to the advance team, the number of personnel associated with the post-training team can vary greatly. Each unit can have a post-training team of anywhere between 2 and 100 personnel. After completion of training, the post-training Marine Unit team would take approximately 1 week to complete exercise withdrawal, and conduct post training maintenance. Post training events are outside of the 20 weeks estimated for live-fire training. Biosecurity inspections and wash-downs would be conducted at designated facilities prior to air or sea departure.

2.2.4.3 Combined Level Training Participants

The concept for the combined level RTA is to provide the capability and capacity to train and conduct exercises using the wide spectrum of weapons and equipment, to include, but not be limited to, ground troops, close air support from the U.S. and/or allied nation air forces, and sea-to-surface weapons coverage from the Navy and/or allied nation navies. To carry out large-scale, amphibious, ground-based, as well as air- and sea-based live-fire training, military units would use the proposed combined level RTA for combat and maneuver exercises with other U.S. armed forces (Army, Navy, and Air Force) as well as multilaterally with other allied nations. Military units would use the combined level RTA for fire and maneuver training in combined arms scenarios that are unavailable elsewhere in the Mariana Islands or U.S.-controlled lands in the Western Pacific. Combined level training is most beneficial to the training participants when the training scenarios are varied and unique in order to simulate combat situations.

The cumulative duration of live-fire training in the combined level RTA would be up to 16 non-consecutive weeks per year. An approximately 19 additional weeks of non-live-fire pre- and post-training preparations would be required for logistical support. During these weeks there would be between 6 and 50 U.S. military personnel on island for administrative and logistical support. There would also be periodic maintenance and range management conducted on the RTA during times when live-fire training is not being conducted. Representative combined level RTA training participants and training exercise duration are summarized in Table 2.2.4 and discussed in the following paragraphs. A gradual increase in operations over the proposed 8 to 10 year construction period is anticipated.
### Table 2.2-4. Combined Level Training and Exercises, Duration, and Personnel

<table>
<thead>
<tr>
<th>Training and Exercises</th>
<th>Live-Fire Training Duration and Personnel</th>
<th>Pre-Training Duration and Personnel (non-live-fire)*</th>
<th>Post-Training Duration and Personnel (non-live-fire)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Unit Training</td>
<td>1 week, twice a year 2,200</td>
<td>1 week, twice a year 10</td>
<td>1 week, twice a year 10</td>
</tr>
<tr>
<td>Transiting Marine Unit Training</td>
<td>2 weeks, twice a year 2,200</td>
<td>1 week, twice a year 10</td>
<td>1 week, twice a year 10</td>
</tr>
<tr>
<td>Pacific Command Exercises</td>
<td>2 weeks, twice a year 1,000</td>
<td>2 weeks, twice a year 50</td>
<td>1 week, twice a year 50</td>
</tr>
<tr>
<td>Bilateral and Multilateral Training</td>
<td>2 weeks, twice a year 750</td>
<td>1 week, twice a year 40</td>
<td>1 week, twice a year 40</td>
</tr>
<tr>
<td>Special Operations Forces Training</td>
<td>1 week, twice a year 30</td>
<td>1 week, twice a year 6</td>
<td>1 week, twice a year 6</td>
</tr>
<tr>
<td>Total</td>
<td>16 weeks per year NA</td>
<td>12 weeks per year* NA</td>
<td>10 weeks per year* NA</td>
</tr>
</tbody>
</table>

*Note: After accounting for overlap, a combined total of 19 pre- and post-training weeks are anticipated per year. Pre- and post-training durations are typically 1 to 2 weeks in duration and are not inclusive of other approved non-live-fire training. NA = not applicable.

**Marine Unit Training.** The ground combat element (battalion landing team) of a Marine Unit, with aviation and logistics element support (approximately 2,200 personnel) would originate from outside of the Mariana Islands and join to train together for 1 week, twice a year. Each training event would include approximately 1 week of pre-training and 1 week of post-training preparation time (approximately 10 personnel). As part of this training, personnel would depart from naval ships offshore and come ashore using Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, small boats, or aviation (rotary-wing or tilt-rotor aircraft). This training would be purely expeditionary (i.e., minimal permanent facilities would exist) with an emphasis on ground combat live-fire and maneuver, combined arms training with logistics, aviation, and naval gunfire support. During the initial training exercises on Pagan, logistical training activities could include military training trail improvement, airfield clearance, and development of the expeditionary base camp/bivouac area and staging areas. These improvements would be associated with the first training exercises on Pagan only and would not be recurring. All ranges and maneuver areas would be utilized as part of this training. Pre- and post-training mobilization would occur via Navy ships located off the coast of Pagan with personnel coming to and from shore on Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, small boats and aircraft.

**Transiting Marine Unit Training.** This is similar to the Marine Unit Training (approximately 2,200 personnel) described above except that this training would include a Marine Unit transiting through the area from outside of the Mariana Islands and the duration would be for 2 weeks, twice a year. Each training event would include approximately 1 week of pre-training and 1 week of post-training preparation time (approximately 10 personnel). Pre- and post-training mobilization would occur via Navy ships located off the Coast of Pagan with personnel coming to and from shore on Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, small boats and aircraft.

**Pacific Command Exercises.** U.S. and multilateral Services (approximately 1,000 personnel) originating from outside of the Mariana Islands would train for 2 weeks, twice a year. Each training event would include approximately 2 weeks of pre-training and 1 week of post-training preparation time (approximately 50 personnel). This training would be similar to Marine Unit training with the additional
facets of integrating multilateral units into the training audience and the incorporation of joint mission essential training goals, spanning a much wider scope and depth than other exercises. Pre- and post-training mobilization would occur via Navy ships located off the coast of Pagan with personnel coming to and from shore on Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, small boats and aircraft. Other air transportation (i.e., not from navy ships) could also occur.

**Unilateral, Bilateral and Multilateral Training.** One to two U.S. companies and one to two allied force company(ies) (approximately 750 personnel) would originate from outside of the Mariana Islands and join to train for 2 weeks, twice a year. Each training event would include approximately 1 week of pre-training and 1 week of post-training preparation time (approximately 40 personnel). This training would be similar to Marine Unit training, with the additional facet of integrating the bilateral or multilateral units into the training audience. Pre- and post-training mobilization would occur via Navy ships located off the coast of Pagan with personnel coming to and from shore on Amphibious Assault Vehicles, Landing Craft Air Cushion ships, small boats and aircraft. Other air transportation (i.e., not from navy ships) could also occur.

**Special Operations Forces Training.** Special operations forces (approximately 30 personnel) would arrive via aircraft and train for approximately 1 week twice a year. Each training event would include approximately 1 week of pre-training and 1 week of post-training preparation time (approximately 6 personnel). All ranges and maneuver areas would potentially be used. Pre- and post-training mobilization would occur via Navy ships located off the coast of Pagan with personnel coming to and from shore primarily by aircraft.

### 2.2.4.4 Combined Level Training Scenario

For planning purposes, the representative training scenario is based on a Marine Unit (up to 2,200 personnel) training for 1 week twice a year. This training scenario was selected because it could potentially include training on virtually all the training facilities within the Pagan RTA, and therefore, provide the broadest training scenario compared to some of the other potential training participants. However, this scenario is merely an example of the type of training that could occur and is not all-inclusive of every training event that would occur on the island.

#### 2.2.4.4.1 Marine Unit Training Scenario, Pagan

This training scenario assumes that the majority of operations would occur during the hours 7:00 a.m. to 10:00 p.m.; however, up to 50% of a training event could occur during the hours 10:00 p.m. to 7:00 a.m.

**Pre-training Preparations.** Approximately 19 additional weeks of non-live-fire preparations time for pre- and post-training logistical support is anticipated. The number of personnel associated with the advance team can vary greatly depending on the mode of travel, amount of equipment brought with the team, and required set-up time, among other factors. Range Control personnel and a Marine Unit advance team of approximately 10 personnel would perform various pre-exercise administrative functions and set up logistics within the Pagan RTA such as clearing maneuver areas and live-fire ranges, establishing live-fire targets within selected areas, road blocks, setting up Range Control ashore, and performing communications checks. Appropriate biosecurity measures would be conducted for incoming cargo. Range Control personnel would ensure that Pagan was cleared of non-training personnel. Pre-training preparations would take approximately 1 week and are not included in the 16 weeks estimated for live-
fire training. Prior to the start of training, all units would receive instruction concerning environmental, natural and cultural resource restrictions and concerns in the training areas.

Training Day 1. Pre-landing training attacks would occur to simulate attrition of enemy forces. For example, aircraft and naval ships would fire at “enemy” targets as a first wave of attack. Specialized intelligence gathering units (i.e., four-person reconnaissance team) would conduct reconnaissance and surveillance of landing force objective areas. Amphibious units (Amphibious Assault Vehicles, Landing Craft Air Cushion vessels) would conduct an amphibious demonstration as a feint (no actual beach landings) used as a dry run for the actual assault.

Training Day 2. Various teams such as six-person Fire Support Teams and five-person Shore Fire Control Parties would move ashore via MV-22s, inserted at various observation vantage points throughout the island to guide weapons employment and provide control of aviation and naval ship delivered munitions before and during the assault stage. These actions are to continue the degradation of enemy air defenses and indirect fire capabilities such that the enemy forces are unable to successfully oppose the assault.

Training Day 3. An infantry company of approximately 182 personnel would conduct an amphibious assault using Amphibious Assault Vehicles and Landing Craft Air Cushion vessels at Landing Force Objective A (Blue Beach) and Landing Force Objective B (Red Beach), combined with vertical insertion of an infantry company via MV-22 and CH-53s near Landing Force Objective C (airfield). Fixed-wing and rotary-wing assets would provide close air support in support of movement ashore, engaging enemy targets that offer opposition to movement ashore. Artillery battery and mortar teams would come ashore in phases, set up firing positions, and support maneuver with ground fire. Reconnaissance and Surveillance teams would provide objective area observations and target refinement. Support units (approximately 200 personnel) would develop a Forward Arming and Refueling Point at the air strip. Based on exercise scenario demand, Marine Unit aviation support would use both the Forward Arming and Refueling Point and amphibious craft for rearming and refueling. MV-22s and CH-53s would provide logistical resupply of ground forces using nearby Landing Zones. Logistics combat elements would prepare and set up the expeditionary base camp as a short-term bivouac area and supply point ashore.

Training Day 4. An infantry company of the Battalion Landing Team would conduct a company coordinated movement to seize Landing Force Objective D (high ground north of Laguna Sanhalom [Upper Lake], northwest side of Mount Pagan). The infantry company would maneuver from Landing Force Objectives A and B via the western corridor, primarily by foot. Fixed-wing and rotary-wing aviation would conduct close air support for offensive ground maneuver (i.e., provide aviation “cover” for ground combatant movements). Indirect fire weapons would be repositioned as necessary to support the ground movement timeline.

Training Day 5. An infantry company of the Battalion Landing Team would conduct a company coordinated movement to seize Landing Force Objective E (northeast quadrant of northern Pagan, northeast of Mount Pagan). The infantry company would maneuver from Landing Force Objective C via the eastern corridor, primarily by foot. Live-fire fixed-wing and rotary-wing close air support (i.e., aviation support of ground combatants) would be conducted in concert with the ground scheme of maneuver.
Training Day 6. The infantry companies ashore would plan and execute defensive fire operations, begin re-positioning for withdrawal, and hand over battlespace to a notional follow-on unit. Fixed-wing and rotary-wing aviation would conduct close air support (i.e., aviation support of ground combatants) in concert with defensive fire operations.

Training Day 7. The infantry companies ashore would begin a complete withdrawal. Units would move toward their original assault locations for transit back to amphibious craft, in reverse sequence.

Post-training Events. Over approximately 1 week, a Marine Unit post-training team of approximately 100 personnel would complete exercise withdrawal, tear-down, prepare to ship equipment back to home base and clean up. Biosecurity inspections and wash-downs would be conducted per appropriate protocols. All training and Range Control personnel and equipment would move back to amphibious craft via Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, and aviation (MV-22, CH-53).

2.3 Alternatives Development

The U.S. Marine Corps Forces Pacific as the Executive Agent undertook the following methodical process to identify potential alternatives for meeting unfilled, joint military training requirements in the CNMI. The U.S. Marine Corps Forces Pacific first developed and applied operational siting criteria (see Section 2.3.1, Operational Siting Criteria) which identified Tinian and Pagan as the only suitable locations for development of RTAs for unit level and combined level training, respectively. Use of both the islands is required to meet the purpose and need for the proposed action. Alternative development then analyzed various laydowns on Tinian and Pagan to address the unfilled training requirements.

2.3.1 Operational Siting Criteria

Operational siting criteria were developed as part of the CNMI Joint Military Training Requirements and Siting Study (DoN 2013a) (see Section 1.3.6, Training Requirements and Siting Study) to identify potential locations within the CNMI that could meet these unfilled training requirements. These criteria included land use and topographic compatibility, the need for beachfront and transition lands for amphibious training, airspace and sea space, military training trails, and the ability to employ a spectrum of weapons systems (Table 2.3-1).
Table 2.3-1. Requirements and Siting Study – Operational Siting Criteria

<table>
<thead>
<tr>
<th>Land Use Compatibility:</th>
<th>Meet All Unit Level Requirements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- U.S. publicly-owned or leased land is preferred. Pursuant to §806 of the 1976 Covenant, the U.S. Government, in recognizing and respecting the scarcity and special importance of land in the CNMI, agreed to first seek an interest in public real property before pursuing any private real property interest.</td>
<td></td>
</tr>
<tr>
<td>- Sufficient space for high hazard impact and safety areas.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Topographic Compatibility:</th>
<th>Mobility Corridor(s):</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Maneuver areas should have varying terrain but cannot exceed 30% slope for vehicles.</td>
<td></td>
</tr>
<tr>
<td>- Have an unobstructed line of sight for direct-fire ranges, with a downward slope of no more than 2% from the firing points to the targets on fixed firing ranges.</td>
<td></td>
</tr>
<tr>
<td>- Allow designation of restricted areas and military operations areas to separate non-participating aircraft from military activities.</td>
<td></td>
</tr>
<tr>
<td>- Sufficient water surfaces to accommodate warning areas that separate military operations from non-participating marine vessels.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Beachfront and Transition to Land:</th>
<th>Full Spectrum Weapons Employment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Near offshore lands must allow for amphibious training.</td>
<td></td>
</tr>
<tr>
<td>- Beachfront must have a slope less than 7%, a width of at least 1,640 feet (500 meters), and be clear of obstacles (such as boulders) that are greater than 3 feet (1 meter).</td>
<td></td>
</tr>
<tr>
<td>- Transit space for amphibious vehicles to move from amphibious beach training areas to live-fire training venues.</td>
<td></td>
</tr>
<tr>
<td>- High Hazard Impact Area must provide sufficient land to allow live-fire from the suite of weapons deployed from ground-based units, as well as those mounted on aircraft and Navy vessels.</td>
<td></td>
</tr>
<tr>
<td>- Allow simultaneous execution and command and control of ground forces with aircraft and Navy vessels.</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** DoN 2013a.
The operational siting criteria (see Table 2.3-1) were applied to screen the 14 CNMI islands for feasible RTA sites. Of the 14 CNMI islands, only a combination of RTA sites on Tinian and Pagan were identified as capable of meeting unit level and combined level screening criteria, and could address virtually all 42 unfilled training requirements (Table 2.3-2).

<table>
<thead>
<tr>
<th>Island</th>
<th>Unit level Criteria</th>
<th>Combined level Criteria</th>
<th>Unit and Combined level Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Land Use</td>
<td>Topographic</td>
<td>Beachfront</td>
</tr>
<tr>
<td>Agrihan</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Aguijan</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Alamagan</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Anatahan</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Farallon de Medinilla</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pagan</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sarigan</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Tinian</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Guguan</td>
<td>No</td>
<td></td>
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<tr>
<td>Asuncion</td>
<td>No</td>
<td></td>
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<tr>
<td>Maug</td>
<td>No</td>
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<tr>
<td>Uracus</td>
<td>No</td>
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<tr>
<td>Saipan</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rota</td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: DoN 2013a.

While the ideal scenario would be to site both RTAs on one island, neither Tinian nor Pagan individually have the space to support both. In addition, the lands currently leased by the Department of Defense on Tinian lack land areas large enough to accommodate the safety footprint for the broad spectrum of weapons used in combined level training. Therefore, Tinian would be most suitable for unit level RTA development and Pagan for combined level RTA training. Tinian and Pagan collectively is the only combination of training locations that meets the purpose of and need for the proposed action.

### 2.3.2 Development of Unit Level Range and Training Area Alternatives on Tinian

The primary criteria for unit level RTA alternative development was maximizing use of the Military Lease Area — an area controlled by the U.S. government under a long-term lease.

The Military Lease Area meets the operational siting criteria for a unit level training RTA. It is located away from civilian population centers to ensure safe separation of military activities and the public. The Military Lease Area also has accessible beaches for amphibious training and roadways for tracked and wheeled vehicles. There is suitable topography and land area for maneuvering purposes for unit level RTAs. There are suitable airfields, available airspace, and adjacent sea space to accommodate the
proposed training activities on Tinian. Additionally, Tinian International Airport and the Port of Tinian are both in close proximity to provide efficient personnel, cargo, and equipment deliveries.

The goal for Tinian unit level RTA training is two-fold: the first provides the capability and capacity for using the weapons organic to (i.e., belonging to and brought along with) units ranging in size of about 30 to 2,200 personnel. The second goal is to link ground-based activities with aviation and amphibious training. Tinian alternatives development went through two stages. The first stage included the initial identification of the locations of training facilities and support facilities on Tinian. The second stage was a refinement of alternatives to better meet the purpose and need for the proposed action and address socioeconomic and environmental concerns and input from public comment.

2.3.2.1 Initial Development of Tinian Unit Level Range and Training Area Alternatives

Initial alternative development on Tinian involved identifying where unit level support facilities and training facilities could be accommodated (DoN 2014a). An alternative needs to maximize the potential for simultaneous use so that multiple ranges and training areas can be used simultaneously and the use of one range does not necessarily preclude the use of other ranges. Opportunities for compatible combinations or configurations of ranges, training courses, or maneuver area laydowns were evaluated to minimize land needed and maximize the ability to train at a given location if other types of training were ongoing in another location (i.e., simultaneity of use).

To be considered a viable and reasonable alternative, any RTA layout on Tinian must satisfy the following criteria:

**Land Use Compatibility:** An alternative must have a suitable location and sufficient land area for the High Hazard Impact Area that will accommodate the spectrum of weapons and munitions proposed; allow for the Hand Grenade Range, Mortar Range, Light Anti-Armor Range, Grenade Launcher Range, Demolition Range, Field Artillery Indirect Fire Range targets, Offensive Air Support Range targets, and Close Air Support Range targets; and provide a buffer area to ensure public safety. Additionally, this impact area must be situated in such a manner that when it is active, maneuver training could still be conducted in its vicinity.

**Topographic Compatibility:** An alternative must have land areas with adequate space and suitable topography (slope) for the largest components of proposed training (e.g., Tank/Fighting Vehicle Multi-Purpose Range Complex, Infantry Platoon Battle Course, and Battle Area Complex).

**Beachfront and Transition to Land:** An alternative must have beaches suitable to conduct ship-to-objective maneuvering or amphibious training. Required capability is that four Amphibious Assault Vehicles can land at one location at one time and transit from the landing beach to suitable land areas for conducting tactical maneuvering to established ranges (e.g., Tracked Vehicle Driver’s Course, Tank/Fighting Vehicle Multi-Purpose Range Complex).

**Airspace and Sea Space:** An alternative must have sufficient land, airspace and sea space for ground-training activities to operate in conjunction with aircraft maneuvering in overlying airspace (e.g., Close Air Support Range training, Offensive Air Support Range training).
An alternative must include suitable locations for aircraft Drop Zones (e.g., personnel and cargo delivery via parachute) and Landing Zones (i.e., locations for aircraft takeoffs and landings), and airfields and open space where Unmanned Aircraft Systems can operate in Special Use Airspace. An alternative must have enough sea space to safely separate military operations from non-participating marine vessels.

The next step of alternative development identified how Tinian could accommodate the various training components and included the steps identified below.

**Step 1: Apply Criteria for Large-Scale Unit Level Training Components.** Initial planning involved siting the largest ranges (i.e., Tank/Fighting Vehicle Multi-Purpose Range Complex, and Battle Area Complex), High Hazard Impact Area and their associated surface/weapons danger zones. Siting of the largest ranges took into account alternatives that allowed for (1) the continued operation of the International Broadcasting Bureau in its present location within the Military Lease Area; and (2) eventual discontinuation of the operation of the International Broadcasting Bureau within the Military Lease Area.

**Step 2: Apply Screening Criteria for Additional Unit Level Training Components.** Following placement of the larger training components, the smaller ranges/training areas (e.g., Combat Pistol Range) and supporting infrastructure were sited.

**Step 3: Evaluate and Select Alternatives for Analysis.** The above process identified three reasonable alternatives to be carried forward for analysis (see Section 2.4, Tinian Alternatives). These alternatives on Tinian were identified and presented during the scoping period.

### 2.3.2.2 Refinement of Tinian Unit Level Range and Training Area Alternatives

After evaluating the continuous input obtained through ongoing dialogue with the CNMI government and other stakeholders (see Section 1.5.3.3, Collaborative Stakeholder Coordination) and the results of intensive field surveys, the three alternatives were further refined. Notable changes that have occurred since scoping include:

**Tank/Fighting Vehicle Multi-Purpose Range Complex.** The Tank/Fighting Vehicle Multi-Purpose Range Complex was shifted west due to airspace conflicts, avoidance of National Historic Landmark and terrain obstacles. Firing locations were moved to avoid terrain obstacles and provide longer engagement zones for Light Armor Vehicle weapon training.

**High Hazard Impact Area.** The High Hazard Impact Area was reduced in size by eliminating explosive aviation ordnance and restricting use to inert aviation ordnance. This facilitated improved mortar firing positions and accommodated fire and maneuver activities on the Battle Area Complex. This reduction enabled the layout of the fire break/road to shift away from cliff line/limestone forests and off the National Historic Landmark. These changes minimized environmental impacts.

**Convoy Course.** The Convoy Course was moved to reduce the size of the course and number of engagement areas. These changes were made to keep training activities away from Lake Hagoi, provide the ability on a portion of the course to fire into the High Hazard Impact Area, maximize the use of existing paved areas to the greatest extent possible, distance the engagement areas from surface water...
bodies to minimize potential negative socioeconomic and environmental effects, and to reduce the overlap of surface danger zones with commercial airspace.

**Field Artillery Indirect Fire Range.** One Field Artillery Indirect Fire Range firing position was shifted away from Ushi Point and onto flat terrain.

**Special Use Airspace.** Special Use Airspace was modified to avoid conflict with Saipan International Airport’s Class D airspace and to encompass the surface danger zones associated with the Convoy Course and other ranges. Additional modifications to Special Use Airspace overlying Tinian were made to minimize impacts to aircraft transiting between Saipan and Tinian. Previously planned Special Use Airspace was partitioned both vertically and horizontally to allow a greater degree of scheduling precision to match specific airspace with specific ground range use, and commercial on-land operations.

**Amphibious Training.** All beaches within the Military Lease Area were considered for amphibious training operations; however, a careful selection process was employed based on engineering analysis and environmental factors. Beaches on the windward side of the Military Lease Area, including Unai Chiget, Unai Dankulo and Unai Masalok, were not considered for use of Amphibious Assault Vehicle landings due to wind and wave action. The reef configuration at Unai Dankulo would not support training for Landing Craft Air Cushion vessel landings. Unai Masalok was the only windward beach identified as a feasible location for amphibious training with Landing Craft Air Cushion vessels, small boats and swimmers. On the leeward side Unai Lam Lam, Unai Babui and Unai Chulu were considered for amphibious training. Unai Lam Lam was considered too small for Amphibious Assault Vehicle and Landing Craft Air Cushion vessel training, but suitable for small boats and swimmers. Based on environmental criteria including analysis of bathymetry and coral cover, Unai Babui and Unai Chulu were both considered for Amphibious Assault Vehicle and Landing Craft Air Cushion vessel training. A detailed engineering analysis of construction alternatives was conducted for these two locations (see Appendix J, Amphibious Beach Landing Site Engineering and Coastal Processes Analyses). Three different methods for constructing amphibious landing ramps were considered, including a dredge only option, a pile-armored ramp, and a tribar-armored ramp. The dredge only option was dismissed, as the longevity of the exposed reef surface with no armoring was uncertain. The tribar alternative was also dismissed, due to uncertainty of the tribar surface compatibility with Amphibious Assault Vehicle operations. The pile-armored ramp alternative was chosen for its stable design and long-term durable surface.

After careful consideration of data and input from resource agencies, it was determined that the minimum tactical amphibious training requirements could be met at one beach. Unai Chulu was chosen as the single beach for Amphibious Assault Vehicle landings due to wider configuration which better fits the training requirement. Ultimately, Unai Babui was dismissed from consideration for Amphibious Assault Vehicle training to lessen environmental impacts, but it would still support training for Landing Craft Air Cushion vessels, small boat, and swimmer training.

Areas outside of Military Lease Area were discounted for tactical amphibious training because they do not provide immediate access (i.e., contiguous) to live-fire training, which is a training criterion.

**Compatibility with Existing Land Uses Outside of the Military Lease Area.** Potential conflicts with existing land uses were accounted for, such as location of populated areas (i.e., noise receptors), recognized historic properties, sensitive natural resources, existing infrastructure (e.g., runways, roads, power supply), recreation sites, and economic activities.
2.3.3 Development of Combined Level Range and Training Area Alternatives on Pagan

2.3.3.1 Initial Development of Pagan Combined Level Range and Training Area Alternatives

Combined level training is different from unit level in that it allows various units or unit types to train simultaneously towards a single training objective within the RTA whereas in unit level training, generally only one unit type trains together towards an objective. As in combat, each unit works in coordination with one another during combined level training. The land area for combined level training must be capable of supporting multiple unit level tasks simultaneously, combined into a broader task. The combined level training RTA is designed to replicate, to the extent possible, the fluid nature of a battlefield with multiple land, sea, or air-based units engaging in a series of activities at the same time (DoN 2014a).

The primary criterion for combined level RTA alternative development was to maximize land use on northern Pagan. This portion of the island is sparsely vegetated due to volcanic activity, has several accessible beaches, and contains an inactive World War II-era airfield. The relative lack of vegetation provides the visibility required for Field Artillery Indirect Fire Range, Mortar Range, Field Artillery Direct Fire Range, Combined Arms Training Range to support Close Air Support and Naval Gunfire Support Training, and space for maneuvering (i.e., heavy forces, light forces, and amphibious forces). Accessible beaches allow for amphibious training (i.e., Combined Arms Live-Fire Amphibious Beaches with Maneuver Area, Tactical Amphibious Landing Beaches, and Maneuver Area [Amphibious Forces]) and logistical support for delivering cargo and personnel. The presence of an airfield supports aviation activities.

Development of combined level RTA alternatives on Pagan involved identifying where training facilities could potentially be accommodated on the island (DoN 2014a). To be a viable and reasonable alternative, any RTA on Pagan must at a minimum satisfy the conditions for unit level training as well as the following additional criteria:

- **Land Use Compatibility:** An alternative must have land areas with a suitable location for a High Hazard Impact Area (or areas) that will accommodate the spectrum of weapons and munitions proposed, allow for ground-based, aviation, and naval munitions; and provide a buffer to ensure public safety. This impact area (or areas) must be situated in such a manner that when it is active, maneuver training could still be conducted in its vicinity.
- **Topographic Compatibility:** An alternative must have land areas with adequate space and suitable topography (slope) for maneuvering (e.g., heavy forces, amphibious forces). Land areas were identified for use as “military training trails;” these would serve as unimproved pathways to move and maneuver personnel, vehicles, and equipment across the island to an objective. The maneuver area should be at least 1,640-feet (500-meters) wide with a slope of less than 30% to support a mechanized/motorized infantry company in a tactical formation.
- **Beachfront and Transition to Land:** An alternative must have beaches suitable to conduct ship-to-objective maneuvering or amphibious training (e.g., Combined Arms Live-Fire Amphibious
Beaches with Maneuver Area, Tactical Amphibious Landing Beaches, and Maneuver Area (Amphibious Forces).

- **Airspace and Sea Space:** An alternative must have a suitable location for aircraft operations at Landing Zones (i.e., areas where aircraft land and take off) and Drop Zones (i.e., areas where aircraft drop personnel and cargo delivery via parachute), and airfields and overlying airspace to support Unmanned Aircraft Systems and other aircraft operations. Sufficient water surfaces to accommodate danger zones that separate military operations from non-participating marine vessels.

- **Full Spectrum Weapons Employment:** An alternative must include a suitable location(s) for the High Hazard Impact Area(s) that would accommodate the full spectrum of weapons required for combined level training while providing a safe distance from the proposed expeditionary base camp/bivouac area and airfield. The targets for the Field Artillery Indirect Fire Range, Mortar Range, Field Artillery Direct Fire Range, Combined Arms Training Range to Support Close Air Support and Naval Gunfire Support Training, Offensive Air Support Range, and Close Air Support Range need to be co-located as these types of training utilize high explosive munitions which require a High Hazard Impact Area to provide a larger variety of target placement and engagement scenarios. The High Hazard Impact Area needs to be in a central area for Field Artillery Indirect Fire Range points to fire overhead into the impact area.

- **Mobility Corridor(s):** An alternative must allow for mobility corridors with sufficient space and flexibility for integrated ground, air, and sea training by including sufficient land, airspace, and sea space to conduct simultaneous training of combined arms, live-fire, amphibious maneuvering, naval surface fire support (i.e., ship-to-shore bombardment), air-delivered munitions, and indirect (i.e., artillery and mortars) and direct munitions firing training. The area must be large enough to provide separate impact areas and maneuver areas, such that live-fire and maneuver training can be safely conducted simultaneously.

The next step of alternative development identified how Pagan could accommodate the various training components as discussed in the steps below:

**Step 1:** Apply Criteria for Large-Scale Combined Level Training Components. The initial planning effort was to site the largest ranges and High Hazard Impact Area(s) and their associated surface/weapons danger zones.

**Step 2:** Apply Screening Criteria for Additional Combined Level Training Components. Following placement of various configurations of the larger training components, the bivouac area and airfield extension were sited.

**Step 3:** Evaluate and Select Alternatives for Analysis. The above process identified two reasonable alternatives to be carried forward for analysis.

### 2.3.3.2 Refinement of Pagan Combined Level Range and Training Area Alternatives

After consideration of input received at the public scoping meetings, intensive field surveys and ongoing dialogue with the CNMI government, the alternatives were further refined. Notable changes since presentation of the preliminary alternatives at the public scoping meetings include:
High Hazard Impact Area. Changes were made to the configuration of the northern High Hazard Impact Area to provide separation from Lake Sanhalom and to provide space for safe maneuverability on the ground and account for danger zones associated with weapons systems and munitions employment. Under one of the alternatives, one High Hazard Impact Area was removed from the Pagan isthmus to reduce environmental impact and allow for greater room for ground maneuvers.

Special Use Airspace. Airspace was modified to better facilitate civil aviation activity during periods of military training. Previously planned Special Use Airspace (Pagan R-7204) was partitioned to allow a greater degree of scheduling precision to match specific airspace with specific ground range use. Airspace was partitioned both vertically and horizontally to enable use by certain aviation and maritime activities during training and to facilitate access into and around the island.

Amphibious Training. All beaches on Pagan were considered for amphibious training. A careful identification process was employed based on training operations and environmental factors. Beaches on the windward side were not considered for Amphibious Assault Vehicle landings due to wind and wave action. Based on environmental criteria including analysis of bathymetry, bottom type and coral cover, Blue, Green and Red Beach were considered for Amphibious Assault Vehicle landings. Adjustments were made in the approach zone to lessen potential effects to coral. Blue, Green, Red, and South were also considered for Landing Craft Air Cushion vessel training. North Beach and Gold Beach were identified for small boat and swimmer insertions.

Environmental and Operational Considerations. Environmental (e.g., lakes, coral reef habitat, Endangered Species Act species presence, cultural resources) and operational (e.g., lack of beach access or foot trails to southern Pagan) considerations were evaluated and resulted in readjustment of the locations or configurations of ranges, maneuver areas, or supporting infrastructure.

2.3.4 Action Alternatives Carried Forward for Analysis

Action alternatives carried forward for analysis in this EIS/OEIS, which meet the purpose and need for the proposed action, include three unit level RTA alternatives on Tinian and two combined level RTA alternatives on Pagan and their associated usage. These are discussed in Sections 2.4, Tinian Alternatives, and 2.5, Pagan Alternatives, respectively. Implementation of one Tinian unit level alternative and one Pagan combined level alternative is required to satisfy the purpose and need for the proposed action.

2.4 Tinian Alternatives

Three Tinian unit level RTA alternatives (herein referred to as the “Tinian action alternatives”) that, when combined with a Pagan action alternative, meet the purpose and need described in Chapter 1, Section 1.3, Purpose of and Need for the Proposed Action, were identified for unit level training on Tinian. An overview map of the island of Tinian is provided in Figure 2.4-1. The following describes the Tinian action alternatives including the elements common to all action alternatives and details relating to each of them and a single Tinian no-action alternative.
2.4.1 Elements Common to All Action Alternatives

Each of the three Tinian action alternatives has common elements. These include: (1) Land Use Agreements; (2) Construction and Improvements, (3) Training Operations, (4) Operations and Management; (5) Transportation; (6) Munitions; (7) Danger Zones; (8) Amphibious Operations; (9) Airspace Requirements; and (10) Sea Space Requirements.

Best management practices and standard operating procedures would be incorporated into the proposed action and are common to all Tinian action alternatives. Best management practices are existing policies, practices, and measures required by law, regulation, or Department of Defense policy that reduce the environmental impacts of a proposed action and are common practices in the industry. Best management practices include standard military design, construction, or operations practices or procedures, compliance with laws and typical regulatory permit requirements that the Department of Defense is committed to implementing. The best management practices relevant to this proposed action are discussed in Appendix D, Best Management Practices, and listed in Table D-1, Best Management Practices. Best management practices are inherent in the construction and operation of the proposed project and are not considered separately as mitigation.

For the purpose of this EIS/OEIS, mitigation, avoidance and minimization measures are modifications to the proposed action that are implemented for the sole purpose of reducing a specific potential environmental impact on a particular resource or implemented to actively benefit a resource. Mitigation, avoidance and minimization measures are considered additional, project-specific measures proposed during the environmental review process and regulatory agency consultation. Unlike best management practices, there is no commitment to the mitigation measure until it is documented through the Record of Decision, a permit/approval, programmatic agreement or other formal agreement. Mitigation measures are not discussed in Chapter 2 as part of the proposed action but are detailed by each resource area in Chapter 4 and summarized in Section 4.20, Summary of Impacts and Mitigation Measures.
Figure 2.4-1
Tinian Location Map

Legend

Military Lease Area

Street

0 0.5 1 2 Miles

0 0.5 1 2 Kilometers

North Field
Tinian International Airport
Tinian Harbor
Lamanibot Bay
Unai Babui
Unai Lam Lam
Unai Chulu
Unai Chiget
Unai Dankulo
Unai Masalok
Southwest Carolinas Point
Marpo Point
San Jose
Port of Tinian
Tinian Harbor

Philippine Sea
Pacific Ocean
2.4.1.1 Land Use Agreements

Various land use agreements would be required to implement the proposed action on Tinian. The U.S. currently has a real estate agreement for nearly two-thirds of Tinian, (i.e., the Military Lease Area). The Department of Defense would acquire jurisdictional control of additional lands outside of the Military Lease Area through long-term real estate agreements. Since the 1975 Covenant and Technical Agreement (see Appendix K, Summary of Historical Land Use Agreements between the U.S. and the CNMI), some areas covered under the original lease have been returned to the CNMI government through lease amendments. Long-term real estate agreements with the CNMI for roadway and utility easements would be required. The additional areas would include the north portion of Tinian International Airport and parcels near the Port of Tinian.

The International Broadcasting Bureau site is located within the Military Lease Area. Under Tinian Alternative 1, the International Broadcasting Bureau facility would continue to operate. Under Tinian Alternatives 2 and 3, the International Broadcasting Bureau facility would no longer exist in its current location. The International Broadcasting Bureau is a Cooperating Agency for this EIS/OEIS and has been involved in this NEPA process. A full discussion of land acquisition and land uses on Tinian is provided in Chapters 3.7 and 4.7, Land Use.

2.4.1.2 Construction and Improvements

Construction of the training facilities, (e.g., ranges, training courses, High Hazard Impact Area, Landing Zones, Drop Zones, Observation Posts, Surface Radar sites) would start after the Record of Decision (anticipated in Summer 2016). Construction is expected to span 8 to 10 years depending on funding and operational commitments of the U.S. military.

Construction activities would involve ground disturbance and disturbance of nearshore reef areas (e.g., grading, excavating, digging, clearing, leveling, trenching, drilling, dredging) during construction of proposed support facilities, roads, utilities, and training facilities.

Anticipated ground disturbance resulting in impervious surfaces include roads, airport improvements, base camp facilities, port improvements, and minor structures associated with training facilities. Not all ground disturbances would create impervious surfaces. Anticipated ground disturbance activities that would allow for the continuation of pervious surfaces include landscape vegetation clearance, grading, leveling, and vegetation maintenance. Vegetation maintenance on Tinian and Pagan is discussed in Sections 2.4.1.4, Operation and Management of Tinian Range and Training Area, and 2.5.1.4, Operation and Management of Pagan Range and Training Area, respectively. Appendix F, Geology and Soils Technical Memo, provides a summary of ground disturbance and impervious surfaces associated with the construction of the RTA facilities and infrastructure.

Construction and improvements for this alternative include two broad categories: (1) support facilities and infrastructure, and (2) training facilities.

Support Facilities and Infrastructure Construction. Support facilities include the base camp, Munitions Storage Area, airport and port improvements, access roads, gates, fences, fuel pipeline, and utilities (including water, wastewater, electrical, information technology, communications, and solid waste).
Construction and improvement of support facilities common to all of the action alternatives are described in subsections 2.4.1.2.1, Base Camp Construction, to 2.4.1.2.7, Utility Improvements.

Training Facilities Construction. Numerous training facilities (e.g. ranges, training courses, maneuver areas, High Hazard Impact Area, Landing Zones, Drop Zones, range Observation Posts, Surface Radar sites) would be constructed within the Tinian RTA for all action alternatives. To provide the reader with an easier way to identify the various RTA training facilities, they were grouped into four range complexes based on geographic proximity. The complexes are identified as Range Complex A, B, C, and D. Construction and improvement of training facilities common to all of the action alternatives are described in subsections 2.4.1.2.8, Range Complex A Construction, to 2.4.1.2.12, Military Lease Area-wide Training Assets Construction.

2.4.1.2.1 Base Camp Construction

As depicted on Figure 2.4-2, the proposed base camp would be established to support multiple units at a given time. The base camp is designed to support up to 1,500 trainees in 15 permanent, open-bay barracks. Tent pads and a temporary mess hall would also be constructed to support an additional 1,500 surge trainees which allow for the overlap of more than one training group with either a pre- or post-training party.

Facilities would also be built for headquarter functions, dining, medical aid, security and fire protection, utilities (electrical power, potable water, wastewater, solid waste handling and recycling, information technology/communication), fuel storage, equipment warehouse, weapons armory, a Landing Zone, range management, communications tower, and vehicle/equipment maintenance. Visiting training units would also be provided with work space, staging areas for laydown/motor pool/storage for their equipment, as well as drill and physical training fields. Ground disturbance associated with construction of the base camp would be approximately 257 acres (104 hectares) with approximately 30 acres (12 hectares) of that being newly created impervious surface.

2.4.1.2.2 Munitions Storage Area Construction

A permanent Munitions Storage Area would be established, surrounded by a fence for security and safety. As depicted on Figure 2.4-3, the permanent Munitions Storage Area would include the following: (1) eight munitions storage magazines (2) an entry control point (guard shack); (3) a biosecurity area; (4) ordnance operations area; (5) electrical charging station; (6) munitions handling equipment fuel point; (7) a receipt, stowage, segregation, and issue facility; (8) two auxiliary storage facilities; (9) custodial storage facility; (10) a loading dock; (11) a munitions holding pad; (12) a maintenance facility; (13) a munitions assembly pad; (14) an inert storage facility; (15) fencing; and (16) access roads and parking.

Communications support to the storage area includes video, electronic security and monitoring systems, and telephone. Munitions would be transported to Tinian using either sea (primarily) or air transport, and the necessary biosecurity inspections would be conducted at the point of departure (e.g., on Guam) and/or upon arrival at Tinian for incoming munitions cargo. Ground disturbance associated with construction of the Munitions Storage Area would be approximately 38 acres (15 hectares) with approximately 8 acres (3 hectares) of that being newly created impervious surface.
Figure 2.4-2
Tinian All Action Alternatives
Base Camp

Legend
- Base Camp Area, Range Control, and Staging Area (253 acres)
- Airfield and Basecamp Components:
  - Military Lease Area Boundary
  - Existing Roads (Improved and Unimproved)
  - Proposed Access Road
  - Convoy Course
  - Tracked Vehicle Driver’s Course
  - Chain Link with Barbed Wire Fence
- Latrines/Laundry
- Hazardous Waste Storage and Transfer Facility
- Water Tank Building (Size TBD)
- Water Storage Tank (500k Gal)
- Hazardous/Flammable Materials Storage Facility
- Armory
- Vehicle Washrack
- Cold Storage Warehouse
- Solid Waste Recycling Center
- Source: NAVFAC Pacific 2013

Note: Layouts are notional. Final design subject to modification within proposed ground disturbance footprint.

Source: NAVFAC Pacific 2013
Figure 2.4-3
Tinian All Action Alternatives
Munitions Storage Area

Legend
- Military Lease Area Boundary
- Existing Roads (Improved and Unimproved)
- Munitions Storage Area (38 acres)
- Proposed Access Road
- Proposed Supply Route
- Convey Course Engagement Areas
- Convey Course
- Tracked Vehicle Driver’s Course
- FAA Runway Protection Zone
- Munitions Storage Area
- Notional Safety Area

Note: Layouts are notional. Final design subject to modification within proposed ground disturbance footprint.

Source: NAVFAC Pacific 2013
To support live-fire training during construction of the permanent Munitions Storage Area, a temporary Munitions Storage Area would be established. Transportation and inspection procedures would be conducted as noted for the permanent Munitions Storage Area. Ground disturbance associated with the construction of the temporary Munitions Storage Area would be approximately 19 acres (8 hectares) and located within the same area for the permanent Munitions Storage Area.

### 2.4.1.2.3 Airport Improvements Construction

To accommodate the anticipated aircraft training tempo and equipment/cargo needs, taxiways, directly north and adjacent to the runway of Tinian International Airport, would be constructed. Airport improvements are depicted on Figure 2.4-4 and would include: (1) tactical aircraft parking ramp; (2) cargo aircraft parking ramp; (3) connecting taxiways; (4) ordnance arming and de-arming pads; (5) hot cargo (i.e., munitions) pad/combat aircraft loading area; (6) fuel tanks and expeditionary/temporary refueling area; (7) arresting gear pads; (8) munitions holding pads; (9) taxiway crossings; and (10) access roads connecting to the airfield.

The existing runway would not be extended or reconfigured. However, it would be improved (i.e., the runway painted to replicate conditions found on an aircraft carrier at sea) for a Field Carrier Landing Practice Pad and Landing Helicopter Dock Pad to practice takeoff and landings adjacent to the proposed improvement area (Figure 2.4-4). Ground disturbance associated with construction of the airfield improvements would be approximately 41 acres (17 hectares) with approximately all 41 acres (17 hectares) of that being newly created impervious surface.

The Commonwealth Ports Authority manages and operates the airports and seaports throughout the CNMI. The U.S. military has been working with the Commonwealth Ports Authority to develop an Airport Layout Plan for the proposed improvements at Tinian International Airport. The Airport Layout Plan shows the existing airport layout and planned future development. The Commonwealth Ports Authority as the airport sponsor maintains the Airport Layout Plan and is required to submit any proposed changes on the Airport Layout Plan to the Federal Aviation Administration for review and approval to confirm that the proposed changes meet Federal Aviation Administration airport standards and requirements. The proposed new military development at Tinian International Airport, which is the subject of this EIS/OEIS is shown on the Draft Engineering Drawing of Airport Layout Plan included as Appendix S.

### 2.4.1.2.4 Port of Tinian Improvements and Supply Route

Figure 2.4-5 shows the locations of the proposed shoreside Port of Tinian improvements and supply route. Proposed port improvements include the construction of the following new facilities: (1) a biosecurity building; (2) a vehicle and equipment wash down area; (3) vehicle inspection area; (4) a bulk fuel storage facility; (5) parking; (6) a stormwater retention pond; and (7) cargo inspection and holding area. Improvements would be made on Commonwealth Ports Authority land in the vicinity of the existing old public boat ramp at the Port of Tinian in order to facilitate egress from the ramp to the roadway. No in-water construction is proposed.
Figure 2.4-4
Tinian All Action Alternatives
Airport Improvements

Legend
- Arresting Gear line
- Fuel Lines
- Runway Centerline
- BD ESQD Arc
- PTR ESQD Arc
- Existing and Proposed Fencelines

Legend (continued)
- Proposed Access Road
- Tracked Vehicle Driver's Course
- Convoy Course
- Proposed Supply Route
- Existing Roads (Improved and Unimproved)
- Base Camp Area, Range Control, and Staging Area (256.2 acres)
- Military Lease Area Boundary

Legend (continued)
- USMC Parking (MV-22 or CH-53E)
- Hot Cargo - Fighter
- Fuel Tanks
- Fuel Pipeline

Base Camp
Aircraft Maintenance Facilities
Fuel Tanks
Access Roads
Aircraft Parking Ramp (12) MV-22/CH53E
Proposed Military Taxiway
Cargo Pad
Expeditionary Fueling Pad, Fuel Pits
Arresting Gear
CNMI Proposed Cross Taxiway
LSO Shack
Fresnel Lens
Potential Future Taxiway Expansion
Landing Helicopter Dock Pad
Field Carrier Landing Practice Pad
Existing Commercial Taxiway
Tinian International Airport

Note: Layouts are notional. Final design subject to modification within proposed ground disturbance footprint.

Source: NAVFAC Pacific 2013
Figure 2.4-5
Tinian All Action Alternatives
Port Improvements and Supply Route

Note: Layouts are notional. Final design subject to modification within proposed ground disturbance footprint.
Ground disturbance associated with construction of the port improvements would be approximately 5 acres (2 hectares) with approximately all 5 acres (2 hectares) of that being newly created impervious surface. The design and sizing of the port and biosecurity facilities is notional and subject to further consultation and needs assessment.

As depicted in Figure 2.4.5, a primary cargo transport route with road upgrades would be constructed from the port to the Military Lease Area to support the movement of heavy equipment, vehicles, personnel, and munitions associated with the training units and for the anticipated increase of traffic numbers. A secondary supply transportation route would be provided for an alternate route between the airport and the Munitions Storage Area. These road improvements are discussed in Section 2.4.1.2.5.1, Road Improvements.

Ground disturbance associated with approximately 6-mile supply road from the port to the Military Lease Area is included in the overall ground disturbance for all of the roadways (see Section 2.4.1.2.6, Fence Lines and Gates).

2.4.1.2.5 Access Road Improvements

2.4.1.2.5.1 Road Improvements

Improvements to existing roadways and construction of new roadways would be required to provide and/or improve access to training facilities to support training activities and to improve public access on Tinian (within and outside the Military Lease Area) (Figure 2.4-6). Ground disturbance for roadway improvements would total approximately 133 acres (53 hectares), with approximately 83 acres (34 hectares) of newly created impervious surface. Best management practices associated with design, construction and stormwater management are included in Appendix D, Best Management Practices. Fences and gates would be installed that would restrict access to the Military Lease Area and select training areas when live-fire training is occurring. Roadway improvements considered for implementation as part of the proposed action are described below:

Improve Road Right-of-Way for Utilities. Utility connections and a fuel pipeline would be provided in a 6.0-foot (1.8-meter) wide utility corridor adjacent to existing roadways. Utility connections are proposed along the west side of Broadway, from IT&E (cable landing facility) to 42nd Street, and along the north side of 42nd Street, from Broadway to 6th Avenue/8th Avenue. Utility improvements would occur within the road right-of-way, but would not require improvements to the roadway. Total ground disturbance would be approximately 2 acres (1 hectares); it is assumed that all of this would be newly created impervious surface.

Repair Existing Road for Public Use. The public access roadway is a paved asphalt concrete roadway that contains two 10.0-foot (3.0-meter) wide travel lanes (one lane in each direction) with 4.0-foot (1.2-meter) wide graded gravel shoulders on both sides. The typical cross section width would be 28.0 feet (8.5 meters). Public access roadways provide circulation for both military and public use and include portions of 8th Avenue, Riverside Drive, Chulu Beach Road, and Lennox Avenue. Improvement actions include clearing overgrown vegetation and resurfacing existing roads to safely accommodate two-way traffic. Total ground disturbance would be approximately 38 acres (15 hectares); it is assumed that no newly created impervious surface would be associated with this.
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**Repair Existing Road for Public Use - Boulevard.** The public access boulevard is a variant of the public access roadway. Its key distinction is the division of the roadway by a center landscape (dirt/grass) median that varies in width along the roadway. It contains two 10.0-foot (3.0-meter) wide travel lanes (one lane in each direction) with 4.0-foot (1.2-meter) wide graded gravel shoulders on both sides. The segment of 8th Avenue from 71st Street to 123rd Street would be repaired to a public access boulevard. Improvement actions include clearing overgrown vegetation and resurfacing the existing road (specifically the entire length of the west [southbound] travel lane, and segments of the east [northbound] lane as needed) to safely accommodate two-way traffic. The existing dirt/grass median would not be improved, with the exception of vegetation clearance where required for sight distance and visibility. Total ground disturbance is included in the repairs to existing roads for public use (above).

**Construct New Paved Road.** Paved roads are asphalt concrete roadways used for on-site circulation and access to the Munitions Storage Area at the base camp, as well as inside and outside the Military Lease Area. These roadways contain two 10.0-foot (3.0-meter) wide paved travel lanes (one lane in each direction) with 4.0-foot (1.2-meter) wide graded gravel shoulders on both sides. Some roadways in this classification may accommodate curbs and sidewalks. The typical cross section width would be 28.0 feet (8.5 meters). The cross section for this type of roadway is identical to that of the public access roadway, but this roadway type has a different pavement loading requirement and is not intended for public use. Improvement actions include clearing overgrown vegetation, resurfacing existing paved roads, and reconstructing/upgrading existing dirt/gravel roads to paved roads. Total ground disturbance would be approximately 29 acres (12 hectares); it is assumed that all of this would be newly created impervious surface.

**Repair Existing Road for General Use.** General use roadways are graded gravel base roads with sand bind and/or seal on the surface and top layers. This roadway type provides general access and circulation and consists of two 10.0-foot (3.0-meter) wide travel lanes (one lane in each direction) with 4.0-foot (1.2-meter) wide shoulders on both sides. The typical cross section width would be 28.0 feet (8.5 meters). The segment of 86th Street from 8th Avenue to Broadway would be repaired to serve as a general use roadway. Improvement actions include vegetation clearance and reconstruction to sealed dirt/graded gravel road. Total ground disturbance would be approximately 12 acres (5 hectares); it is assumed that no newly created impervious surface would be associated with this.

**Construct New Gravel Road.** Gravel roads are graded gravel base roads with sand bind and/or seal on the surface and top layers, and are generally intended for relatively flat terrain. This roadway is most suited for handling unidirectional traffic patterns; as such, they are most suitable for points with directional split travel characteristics. Gravel roads provide one travel lane measuring 14.0-feet (4.3-meters) wide, and are used for military access to Observation Posts and circulation around the High Hazard Impact Area perimeter. Convoy Course engagement areas (492 feet [150 meters] in length) may be used as pull-outs where possible (e.g., along the High Hazard Impact Area perimeter) to allow for vehicle passing or emergency parking. No additional pullouts would be constructed. This type of roadway is not intended for use by the public. Total ground disturbance would be approximately 8 acres (3 hectares). Although gravel roads are not typically considered impervious surfaces, however, with frequent use and because these roads would be constructed over limestone-derived soils and rock, they will take on an impervious quality. Therefore, it is assumed that all 8 acres (3 hectares) would be newly created impervious surface.
Establish Military Training Road. Military training roads are unpaved (dirt/gravel) roadways and are for military use within the Military Lease Area. These roads would be designed with one travel lane measuring 14.0-feet (4.3-meters) wide. Convoy Course engagement areas (492 feet [150 meters] in length) may be used as pull-outs where possible (i.e., along Riverside Drive) to allow for vehicle passing or emergency parking. No additional pullouts would be constructed. This type of roadway is not intended for use by the public. Total ground disturbance would be approximately 18 acres (7 hectares). Although unpaved military training trails are not typically considered impervious surfaces, with frequent use and because these trails would be constructed over limestone-derived soils and rock, they will take on an impervious quality. Therefore, it is assumed that all 18 acres (7 hectares) would be newly created impervious surface.

Perimeter Patrol Road. The perimeter patrol road is an unpaved (sand sealed/dirt surface layers and graded gravel base) road that is designed to run along the southern perimeter of the Military Lease Area and the northern, eastern perimeters of the base camp, and the western perimeter of the High Hazard Impact Area. It provides one travel lane measuring 10.0-feet (3.0-meters) wide with a 3.0-foot (0.9-meter) wide shoulder on one side and 3.0 feet (0.9 meters) of vegetation clearance between the road and the perimeter fence on the other side. An additional 10.0 feet (3.0 meters) of vegetation clearance would be provided outside the Military Lease Area adjacent to the perimeter fence. Perimeter patrol roads would be constructed as new roadways in locations where there is no existing road. This type of roadway is not intended for use by the public. Total ground disturbance would be approximately 26 acres (10 hectares). Although unpaved roads are not typically considered impervious surfaces, with frequent use and because these roads would be constructed over limestone-derived soils and rock, they will take on an impervious quality. Therefore, it is assumed that all 26 acres (10 hectares) would be newly created impervious surface.

Road Closures – No Improvements. Closures are proposed for those roadways (i.e., roads within the High Hazard Impact Area) that would be closed to unauthorized personnel. The roads would remain in place but would be used only as range clearance service roads. This type of roadway is not intended for use by the public.

The following cargo transit and tracked-vehicle transit routes would be established on Tinian:

Port to the Base Camp and Munitions Storage Area. Tracked and wheeled vehicles would transit between the boat ramp and 8th Avenue along a new cargo transit route/tracked vehicle transit lane. The cargo transit route/tracked vehicle transit lane would be located south of and run parallel to West Avenue to the Tinian Power Plant and continue north to its intersection with 8th Avenue. The cargo transit route/tracked vehicle transit lane would provide two 10.0-foot (3.0-meter) wide paved travel lanes (one lane in each direction) with one 4.0-foot (1.2-meter) wide gravel shoulder and one 14.0-foot (4.3-meter) wide gravel road to support tracked vehicles within a minimal footprint. The typical cross section width would be 44.0 feet (13.4 meters). Total ground disturbance and impervious surface associated with these roadways are included in Section 2.4.1.2.5.1, Road Improvements.

Tracked-Vehicle Training Trail (Driver’s Course). The tracked-vehicle training trail (Figure 2.4-13) is an unpaved trail composed of sealed dirt/graded surface layers and gravel base. It provides one travel lane measuring 14.0-feet (4.3-meters) wide and is best suited for handling unidirectional traffic patterns. Convoy Course engagement areas (492 feet [150 meters] in length) may be used as pull-outs where
possible to allow for vehicle passing or emergency parking. No additional pull-outs would be constructed. Roadway surfaces would be reinforced (e.g., with a concrete pad) at locations where cross-over travel for tracked vehicles must be accommodated. The tracked-vehicle training trail would also be used by other military vehicles within the Military Lease Area and would merge with the perimeter patrol road near the base camp. This type of roadway is not intended for use by the public. Total ground disturbance and impervious surface associated with Driver’s Course is included in Section 2.4.1.2.5.1, Road Improvements.

Road improvements are summarized in Table 2.4-1 and Figure 2.4-6 shows the locations of the proposed access improvements, fence lines, and gates.

<table>
<thead>
<tr>
<th>ID</th>
<th>Road</th>
<th>Segment</th>
<th>Current Type and Condition</th>
<th>Operational Requirement</th>
<th>Proposed New Construction or Improvement to Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Broadway</td>
<td>South of 42nd Street</td>
<td>Paved, good condition</td>
<td>Port and base camp utility connections</td>
<td>Utilities</td>
</tr>
<tr>
<td>B</td>
<td>42nd Street</td>
<td>Between 8th Avenue and Broadway</td>
<td>Paved, good condition</td>
<td>Port and base camp utility connections</td>
<td>Utilities</td>
</tr>
<tr>
<td>C</td>
<td>Boat ramp access</td>
<td>Between boat ramp and unnamed East/West road</td>
<td>Dirt/grass, overgrown, nonexistent</td>
<td>Military supply route, tracked-vehicle transit route</td>
<td>Construct new paved road</td>
</tr>
<tr>
<td>D</td>
<td>Unnamed North/South road</td>
<td>Unnamed East/West road to West Street</td>
<td>Nonexistent</td>
<td>Port and base camp utility connections</td>
<td>Construct new paved road, tracked-vehicle trail</td>
</tr>
<tr>
<td>E</td>
<td>Unnamed East/West road</td>
<td>Port of Tinian to 6th Avenue</td>
<td>Dirt/grass, overgrown, nonexistent</td>
<td>Military supply route, tracked-vehicle transit route</td>
<td>Construct new paved road, tracked-vehicle trail</td>
</tr>
<tr>
<td>F</td>
<td>New road</td>
<td>6th Avenue Bypass</td>
<td>Dirt/grass, overgrown, Nonexistent</td>
<td>6th Avenue Bypass</td>
<td>Dirt/grass, overgrown, Nonexistent</td>
</tr>
<tr>
<td>G</td>
<td>6th Avenue</td>
<td>Between West Street and 8th Avenue</td>
<td>Coral gravel, some paving, good condition</td>
<td>Military supply route, port and base camp utility connections</td>
<td>Improve for public use</td>
</tr>
<tr>
<td>HA</td>
<td>8th Avenue</td>
<td>Between Dump and Riverside Drive</td>
<td>Paved, fair condition</td>
<td>Public access, military supply route, port and base camp utility connections</td>
<td>Construct new paved road</td>
</tr>
<tr>
<td>HB</td>
<td>8th Avenue</td>
<td>Between Dump and 6th Avenue</td>
<td>Ungraded, poor condition</td>
<td>Public access, military supply route, port and base camp utility connections</td>
<td>Improve for public use</td>
</tr>
<tr>
<td>I</td>
<td>8th Avenue</td>
<td>West of Tinian International Airport</td>
<td>Gravel, ungraded, poor condition</td>
<td>Public access, military supply route, port and base camp utility connections, realignment to accommodate potential runway expansion</td>
<td>Construct new paved road</td>
</tr>
</tbody>
</table>
Table 2.4-1. Proposed Tinian Unit Level RTA Road Improvements

<table>
<thead>
<tr>
<th>ID</th>
<th>Road</th>
<th>Segment</th>
<th>Current Type and Condition</th>
<th>Operational Requirement</th>
<th>Proposed New Construction or Improvement to Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Riverside Drive</td>
<td>Between 8&lt;sup&gt;th&lt;/sup&gt; Avenue and 71&lt;sup&gt;st&lt;/sup&gt; Street</td>
<td>Dirt/grass, fair condition</td>
<td>Munitions supply route, MSA access, utility connections, live-fire Convoy Course</td>
<td>Construct new paved road</td>
</tr>
<tr>
<td>K</td>
<td>MSA access</td>
<td>Between Riverside Drive and 71&lt;sup&gt;st&lt;/sup&gt; Street</td>
<td>Dirt/grass, fair condition</td>
<td>MSA access</td>
<td>Construct new paved road</td>
</tr>
<tr>
<td>L</td>
<td>71&lt;sup&gt;st&lt;/sup&gt; Street</td>
<td>Between MSA gate and 8&lt;sup&gt;th&lt;/sup&gt; Avenue</td>
<td>Dirt/grass, fair condition</td>
<td>MSA access, live-fire Convoy Course</td>
<td>Construct new paved road</td>
</tr>
<tr>
<td>M</td>
<td>Base camp internal roads</td>
<td>Base camp</td>
<td>Nonexistent</td>
<td>base camp circulation</td>
<td>Construct new paved road</td>
</tr>
<tr>
<td>N</td>
<td>Base camp training access road</td>
<td>Base camp to 86&lt;sup&gt;th&lt;/sup&gt; Street</td>
<td>Nonexistent</td>
<td>base camp circulation</td>
<td>Construct new paved road</td>
</tr>
<tr>
<td>O</td>
<td>8&lt;sup&gt;th&lt;/sup&gt; Avenue</td>
<td>Realigned 8&lt;sup&gt;th&lt;/sup&gt; Avenue to base camp gate</td>
<td>Paved, poor condition</td>
<td>Public access, military supply route, port and base camp utility connections</td>
<td>Improve for public use</td>
</tr>
<tr>
<td>P</td>
<td>8&lt;sup&gt;th&lt;/sup&gt; Avenue</td>
<td>Base camp gate to 86&lt;sup&gt;th&lt;/sup&gt; Street</td>
<td>Paved, poor condition</td>
<td>Public access, military supply route, port and base camp utility connections</td>
<td>Improve for public use (boulevard)</td>
</tr>
<tr>
<td>Q</td>
<td>8&lt;sup&gt;th&lt;/sup&gt; Avenue</td>
<td>Between 86&lt;sup&gt;th&lt;/sup&gt; Street and 123&lt;sup&gt;rd&lt;/sup&gt; Street</td>
<td>Paved, overgrown, poor condition</td>
<td>Public access, live-fire Convoy Course, Observation Post and range utility connections</td>
<td>Improve for public use (boulevard)</td>
</tr>
<tr>
<td>R</td>
<td>Riverside Drive</td>
<td>Between 123&lt;sup&gt;rd&lt;/sup&gt; Street and Unai Chulu and Babui Road</td>
<td>Paved, poor condition</td>
<td>Public access, amphibious landing access</td>
<td>Improve for public use</td>
</tr>
<tr>
<td>S</td>
<td>Lennox Avenue Access Road</td>
<td>Between 8&lt;sup&gt;th&lt;/sup&gt; Avenue and Lennox Avenue</td>
<td>Paved, poor condition</td>
<td>Public access, live-fire Convoy Course, access to ranges</td>
<td>Improve for public use</td>
</tr>
<tr>
<td>T</td>
<td>Lennox Avenue/Boston Post Road</td>
<td>Between Lennox Avenue Access Road and Unai Lam Lam Access Road</td>
<td>Paved, poor condition</td>
<td>Public access, live-fire Convoy Course, access to ranges</td>
<td>Improve for public use</td>
</tr>
<tr>
<td>U</td>
<td>86&lt;sup&gt;th&lt;/sup&gt; Street</td>
<td>Between 8&lt;sup&gt;th&lt;/sup&gt; Avenue and Broadway</td>
<td>Paved, poor condition</td>
<td>Live-fire Convoy Course, access to ranges</td>
<td>Improve for general use</td>
</tr>
<tr>
<td>V</td>
<td>71&lt;sup&gt;st&lt;/sup&gt; Street</td>
<td>Between MSA gate and Riverside Drive</td>
<td>Dirt/grass, fair condition</td>
<td>Live-fire Convoy Course</td>
<td>Establish military training road</td>
</tr>
<tr>
<td>W</td>
<td>Riverside Drive</td>
<td>West of 71&lt;sup&gt;st&lt;/sup&gt; Street</td>
<td>Dirt/grass, fair condition</td>
<td>Access to Observation Posts and ranges</td>
<td>Establish military training road</td>
</tr>
<tr>
<td>X</td>
<td>Riverside Drive</td>
<td>Between 71&lt;sup&gt;st&lt;/sup&gt; Street and 86&lt;sup&gt;th&lt;/sup&gt; Street</td>
<td>Dirt/grass, fair condition</td>
<td>Live-fire Convoy Course, Observation Post utility connections</td>
<td>Establish military training road</td>
</tr>
</tbody>
</table>
### Table 2.4-1. Proposed Tinian Unit Level RTA Road Improvements

<table>
<thead>
<tr>
<th>ID</th>
<th>Road</th>
<th>Segment</th>
<th>Current Type and Condition</th>
<th>Operational Requirement</th>
<th>Proposed New Construction or Improvement to Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Riverside Drive</td>
<td>Between 86th Street and southern International Broadcasting Bureau boundary</td>
<td>Dirt/grass, fair condition</td>
<td>Live-fire Convoy Course, Observation Post utility connections</td>
<td>Establish military training road</td>
</tr>
<tr>
<td>Z</td>
<td>Riverside Drive</td>
<td>Between southern International Broadcasting Bureau boundary and 123rd Street</td>
<td>Dirt/grass, fair condition</td>
<td>Live-fire Convoy Course, Observation Post utility connections</td>
<td>Establish military training road</td>
</tr>
<tr>
<td>AA</td>
<td>113th Street (International Broadcasting Bureau internal road)</td>
<td>Between Riverside Drive and 8th Avenue</td>
<td>Dirt/grass, fair condition and nonexistent</td>
<td>Live-fire Convoy Course (Tinian Alternative 1 only)</td>
<td>Establish military training road (Road only improved if IBB is relocated, would require new construction to connect to Riverside Drive)</td>
</tr>
<tr>
<td>AB</td>
<td>96th Street</td>
<td>Between Broadway and Masalok Beach Road</td>
<td>Dirt/grass, fair condition</td>
<td>Access to ranges</td>
<td>Establish military training road</td>
</tr>
<tr>
<td>AC</td>
<td>Access Observation Post 8</td>
<td>Between Broadway and Observation Post 8</td>
<td>Gravel, fair condition</td>
<td>Access to Observation Post 8, access to ranges</td>
<td>Establish military training road</td>
</tr>
<tr>
<td>AD</td>
<td>Access Observation Post 8</td>
<td>Between Broadway and Observation Post 8</td>
<td>Gravel, fair condition</td>
<td>Access to Observation Post 8, access to ranges</td>
<td>Construct new gravel road</td>
</tr>
<tr>
<td>AE</td>
<td>Access to Masalok Beach</td>
<td>Masalok Beach</td>
<td>Foot trail, fair condition</td>
<td>Amphibious landing access (LCAC)</td>
<td>Construct new gravel road</td>
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<tr>
<td>AF</td>
<td>Access Observation Post 7</td>
<td>East of High Hazard Impact Area</td>
<td>Nonexistent</td>
<td>Access to Observation Post 7, Observation Post utility connections</td>
<td>Construct new gravel road</td>
</tr>
<tr>
<td>AG</td>
<td>High Hazard Impact Area perimeter road</td>
<td>East of High Hazard Impact Area</td>
<td>Nonexistent</td>
<td>Live-fire Convoy Course, access to ranges, fire break</td>
<td>Construct new gravel road</td>
</tr>
<tr>
<td>AH</td>
<td>High Hazard Impact Area perimeter road</td>
<td>East of High Hazard Impact Area</td>
<td>Nonexistent</td>
<td>Live-fire Convoy Course, access to ranges, fire break</td>
<td>Construct new gravel road</td>
</tr>
<tr>
<td>AI</td>
<td>High Hazard Impact Area perimeter road</td>
<td>West of High Hazard Impact Area</td>
<td>Nonexistent</td>
<td>Access to ranges, fire break</td>
<td>Construct new perimeter patrol road</td>
</tr>
<tr>
<td>AJ</td>
<td>Military Lease Area/base camp perimeter patrol road and tracked-vehicle trail</td>
<td>Military Lease Area/base camp perimeter</td>
<td>Nonexistent</td>
<td>Perimeter patrol road, tracked-vehicle transit route</td>
<td>Construct new perimeter patrol road</td>
</tr>
<tr>
<td>AK</td>
<td>Military Lease Area perimeter patrol road</td>
<td>Military Lease Area perimeter</td>
<td>Nonexistent</td>
<td>Perimeter patrol road</td>
<td>Construct new perimeter patrol road</td>
</tr>
</tbody>
</table>
### Table 2.4-1. Proposed Tinian Unit Level RTA Road Improvements

<table>
<thead>
<tr>
<th>ID</th>
<th>Road</th>
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<th>Current Type and Condition</th>
<th>Operational Requirement</th>
<th>Proposed New Construction or Improvement to Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>Military Lease Area perimeter patrol road</td>
<td>Military Lease Area perimeter</td>
<td>Nonexistent</td>
<td>Perimeter patrol road</td>
<td>Construct new perimeter patrol road</td>
</tr>
<tr>
<td>AM</td>
<td>Base camp perimeter patrol road</td>
<td>Base camp perimeter</td>
<td>Nonexistent</td>
<td>Perimeter patrol road</td>
<td>Construct new perimeter patrol road</td>
</tr>
<tr>
<td>AN</td>
<td>Broadway</td>
<td>South of roundabout</td>
<td>Paved, overgrown, fair condition</td>
<td>High Hazard Impact Area</td>
<td>Roadway closure</td>
</tr>
<tr>
<td>AO</td>
<td>Broadway</td>
<td>North of roundabout</td>
<td>Paved, fair condition</td>
<td>High Hazard Impact Area</td>
<td>Roadway closure</td>
</tr>
<tr>
<td>AP</td>
<td>Lennox Avenue</td>
<td>West of roundabout</td>
<td>Paved, poor condition</td>
<td>High Hazard Impact Area</td>
<td>Roadway closure</td>
</tr>
<tr>
<td>AQ</td>
<td>116th Street</td>
<td>West of roundabout</td>
<td>Paved, poor condition</td>
<td>High Hazard Impact Area</td>
<td>Roadway closure</td>
</tr>
<tr>
<td>AR</td>
<td>116th Street</td>
<td>East of roundabout</td>
<td>Gravel, dirt/grass, fair condition</td>
<td>High Hazard Impact Area</td>
<td>Roadway closure</td>
</tr>
<tr>
<td>BA</td>
<td>Access to Surface Radar 1</td>
<td>Between 86th Street and Surface Radar 1</td>
<td>Nonexistent</td>
<td>Access to Surface Radar 1</td>
<td>Construct new gravel road</td>
</tr>
<tr>
<td>BB</td>
<td>Access to Surface Radar 2</td>
<td>Between unnamed road and Surface Radar 2</td>
<td>Nonexistent</td>
<td>Access to Surface Radar 2</td>
<td>Construct new gravel road</td>
</tr>
<tr>
<td>BC</td>
<td>Access to Surface Radar 3</td>
<td>Between Riverside Drive and Surface Radar 3</td>
<td>Nonexistent</td>
<td>Access to Surface Radar 3</td>
<td>Construct new gravel road</td>
</tr>
<tr>
<td>BD</td>
<td>Access to Surface Radar 5</td>
<td>Between unnamed existing road and Surface Radar 5</td>
<td>Nonexistent</td>
<td>Access to Surface Radar 5</td>
<td>Construct new gravel road</td>
</tr>
<tr>
<td>BE</td>
<td>Access to Surface Radar 6</td>
<td>Between Unai Dankulo Trail and Surface Radar 6</td>
<td>Nonexistent</td>
<td>Access to Surface Radar 6</td>
<td>Construct new gravel road</td>
</tr>
</tbody>
</table>

**Legend:** ID = Segment identification letter code corresponding to segment ID on proposed roadway improvements as shown in Figure 2.4-6; LCAC = Landing Craft Air Cushion; MSA = Munitions Storage Area.

**Source:** DoN 2014b.
2.4.1.2.6 Fence Lines and Gates

The Military Lease Area would become an active military training area that includes hazardous activity. Gates and fencing would be employed for access control and security (see Figure 2.4-6). Ground disturbance and impervious surfaces associated with fence lines and gates are included in the support facility (e.g., base camp), roadway, trail, or training facility (e.g., Range Complex A) of which they are associated.

Two types of security fences are proposed on Tinian:

**Chain-Link with Barbed Wire Fence.** The chain-link with barbed wire fence would be 7.0-feet (2.1-meters) high plus three strands of barbed wire at the top on a single extension arm. This type of chain-link fence accommodates a swinging gate.

**Barbed Wire Fence.** The barbed wire fence would be 4.0-feet (1.2-meters) tall with four strands of barbed wire (farm-style fence), which accommodates farm-type gates.

In accordance with military safety protocols and security regulations, demarcation of the boundary of the installation and access point restrictions would be constructed. Appropriate signage will be placed along boundary fencing at regular intervals. A new airport chain-link fence would be constructed along the border of the Commonwealth Ports Authority property (i.e., the airport boundary) and the Military Lease Area, separating the airport property from the Military Lease Area and proposed base camp. A new barbed wire fence would delineate the boundary to the west of the airport to the shoreline, and east of the airport to the shoreline. There would be two gates in the western perimeter fence, one of which would be at the intersection with 8th Avenue and the other at the intersection with Riverside Drive. Consistent with safety and security requirements, access to the Military Lease Area would be restricted to authorized personnel during certain training events. All access points would be either closed or manned to ensure unauthorized access does not occur during restricted times.

**Base Camp.** There would be a perimeter chain-link with barbed wire fence and four access points to the base camp. There would be one entry control facility located at the base camp for use by all U.S. military personnel, visitors, and vehicle traffic to the installation.

**Munitions Storage Area.** A new chain-link with barbed wire perimeter fence would be constructed around the Munitions Storage Area with two entry gates and access restricted to authorized personnel. An additional barbed wire fence would be located from 300 to 1,400 feet (91 to 427 meters) out from the chain-link fence for secondary protection of the Munitions Storage Area.

**High Hazard Impact Area.** A new barbed wire fence would delineate the High Hazard Impact Area. There would be access gates for use by military personnel authorized to enter this area.

**Training Facilities.** There would be limited fencing within the Military Lease Area. Access points to specific training areas on roadways would have gates with fenced extensions on roadways to restrict entry during training events. Surface Radar sites would be fenced and restricted from public access.
2.4.1.2.7 Utility Improvements

Figure 2.4-7 shows the locations of the proposed utility improvements. Technical utilities studies were prepared to determine facility requirements for the proposed action based on existing infrastructure capacity and proposed action demand or load on the infrastructure. These studies, inclusive of methods and assumptions, are included in this EIS/OEIS as Appendix P, Utilities Study. Ground disturbance and impervious surfaces associated with utility improvements are included in the support facility (e.g., base camp), roadway, trail, or training facility (e.g., Range Complex A) of which they are associated.

2.4.1.2.7.1 Electrical Power

The existing Tinian Power Plant generation capacity is sufficient to support the anticipated power demand of the proposed action and no additional power generation is proposed. There is a requirement to support mission critical facilities during power blackouts and individual emergency generators would be installed near these facilities.

New power distribution lines and improvements to existing power distribution lines would be required. The alignments are shown on Figure 2.4-7. Key components are as follows: (1) use current power distribution line from the power plant to the International Broadcasting Bureau, aligned along 8th Avenue to the proposed base camp and Munitions Storage Area; (2) upgrade portions of the existing line to underground between the base camp going north to the RTA and International Broadcasting Bureau; and (3) extend electrical service to Surface Radar sites as shown in Figure 2.4-7. In the future, should the underground sections of power distribution lines be more desirable than overhead, a change could be implemented.

New overhead power lines would tie into existing overhead power lines to service the proposed new port facilities. This would require new power poles, overhead distribution lines, and a service transformer.

2.4.1.2.7.2 Potable Water

Potable water improvements are proposed for meeting the potable water requirements for the intended future military presence on the island. Average daily potable water demand for the proposed action is anticipated at approximately 262,200 gallons per day (see Section 4.14, Utilities). The potable water source will come from new vertical wells drilled within the Military Lease Area. Approximately five new wells are required to support the proposed facilities and personnel during Stage 1 and will be installed in areas to the northeast of the base camp (Figure 2.4-7). In addition, the military proposes improvements to the existing potable water service in the port area of the village of San Jose. A water tank with a minimum storage volume of 500,000 gallons (1,892,706 liters) is proposed within the base camp for operational, fire and emergency demands.

2.4.1.2.7.3 Stormwater

Management of stormwater quality and quantity would be provided to maintain existing condition hydrology to the maximum extent feasible and to control pollutant loading in accordance with the CNMI regulations and U.S. federal and Navy guidance/policies. This will be accomplished through the use of best management practices, described in Appendix D, Best Management Practices, including the use of conventional stormwater conveyance, treatment and detention, and integrated management practices such as Low Impact Development and water quality monitoring and management.
Figure 2.4-7
Tinian All Action Alternatives
Utility Improvements

Legend
- Military Lease Area
- Existing Roads (Improved and Unimproved)
- Communications Tower and Area Distribution Node
- Water Source Point
- Water Tank
- Water Line
- Observation Post
- Surface Radar Site
- Electrical Substation
- Electrical Cable Line
- IT/Communications Line
- Wastewater Treatment Facility/Wastewater Disposal Field
- Wastewater Lift Station
- Wastewater Line
- Stormwater Ditch
- Open Drainage Area
- Proposed Port Feature
- Fuel Pipeline
- Fuel Tanks

Note: Layouts are notional. Final design subject to modification within proposed ground disturbance footprint.

See Port Inset

See Base Camp Inset

NORTH
Swale conveyance will be utilized where feasible in place of gray infrastructure (pipe and inlets) to route surface stormwater to detention ponds for control of runoff rates.

Stormwater treatment includes small scale Low Impact Development treatment devices located throughout the areas of proposed improvements along with larger scale downstream extended detention and retention, as applicable.

Grading and overall stormwater management will be performed in a manner to maintain existing basin and sub-basin hydrology, where feasible, to limit the required stormwater infrastructure and pond sizes.

### 2.4.1.2.7.4 Wastewater

The base camp wastewater system would consist of a gravity collection system with one pump station, a treatment plant (minimum secondary treatment), and a subsurface disposal area consisting of sub-leaching fields. The proposed gravity collection system would be built along the proposed roadway alignments. The wastewater collection system would discharge wastewater generated from base camp facilities to the proposed wastewater treatment plant. The recommended conceptual layout of the proposed wastewater system is shown in Figure 2.4-7. Final disposal of the treated effluent would be through a leach field within the base camp area. The leach field would be located west of the proposed treatment plant. Wastewater from the Munitions Storage Area would have a separate septic tank and leach field.

Two wastewater systems would be associated with the port facilities, one for industrial wastewater at the vehicle washdown facility, and one for domestic wastewater generated at the biosecurity building (see Appendix P, Utilities Study). Portable toilets would be used at the port and emptied using a vacuum truck. The waste would be conveyed to the wastewater treatment plant at the base camp for treatment and disposal.

Airfield facilities would consist of portable toilets that would be used and emptied periodically using a vacuum truck and conveyed to the proposed wastewater treatment plant at the base camp system for treatment and disposal.

Within the RTA, portable toilets would be used and emptied periodically using a vacuum truck and conveyed to the proposed wastewater treatment plant at the base camp for treatment and disposal.

### 2.4.1.2.7.5 Solid Waste

A solid waste transfer station and recycling center would be constructed at the base camp. Solid waste would be processed and size-reduced for shipment to a permitted Resource Conservation and Recovery Act subtitle D landfill, potentially located off-island. This approach could be revised in the future should island-wide options be implemented by the CNMI. Such options could include a new landfill or an incineration facility. Incineration would provide substantial volume reduction but still require disposal of ash in a properly permitted landfill.

### 2.4.1.2.7.6 Communications/Information Technology

The proposed telecommunications system for each alternative would consist of a combination of overhead pole-mounted cabling and underground conduits, manholes/handholes, and pull-boxes that would provide the site infrastructure to support government communications systems (e.g., government telephone, government data, security, and closed circuit television), as well as
commercial utility services, including commercial telephone, internet, and cable television. The proposed core information technology/communications hardwired cable connections through overhead pole-supported cabling and underground concrete-encased duct banks and cabling would connect the area distribution node at the base camp to ranges and range surveillance locations (Observation Posts and Surface Radar sites). Distribution from the base camp node would be provided through underground concrete-encased duct banks when required near or on ranges. New distribution infrastructure originating at the two area distribution nodes would distribute telecommunications services to end-user buildings and facilities in the base camp, ranges, and other facilities. Proposed core information technology/communications hardwired cable connections through overhead pole-supported cabling and underground concrete-encased duct banks and cabling would connect the area distribution node at the base camp to the area distribution node near Mount Lasso and to range entrances. Distribution from the area distribution node near Mount Lasso would be provided through underground concrete-encased duct banks and cabling for connections to the range entrances.

Commercial telephone, internet, and cable television services would be provided to the base camp through infrastructure provided by the commercial utility providers. The cables are anticipated to be installed mostly overhead except for routing that crosses the runway clear zone, which would be installed underground. Inside the base camp, the cables for commercial telephone, internet, and cable television service would be distributed around the base camp through overhead pole-supported cabling.

The Munitions Storage Area would include communications for video surveillance, monitoring security systems, Non-secure Internet Protocol Router/Secure Internet Protocol Router, management information systems (e.g., maintenance data input/collection), and wireless capability where possible. The Surface Radar sites would include communications for radar, video, and/or thermal imaging equipment. The Observation Posts would include communication for telephones. Should the overhead system be deemed unsatisfactory, there is a potential to reroute those sections to underground in the future. Both cases are considered — a mix of overhead and underground, and all underground.

### 2.4.1.2.8 Range Complex A Construction

The four range complexes comprise the Tinian RTA, Range Complexes A, B, C and D (Figure 2.4-8), would be located throughout the Military Lease Area.

Range Complex A (Figure 2.4-9) would include: (1) a High Hazard Impact Area; (2) Live Hand Grenade Range (a ground range); (3) firing positions for the Mortar Range (a ground range); (4) Light Anti-Armor Weapon Live Range (a ground range); (5) Grenade Launcher Range (a ground range); (6) a Demolition Range (a ground range); (7) targets associated the Offensive Air Support Range (an aviation range); (8) targets associated with the Close Air Support Range (an aviation range). Also located within the High Hazard Impact Area would be targets associated with the Field Artillery Indirect Range and the Convoy Course (both discussed under Section 2.4.1.2.12, Military Lease Area-wide Training Assets Construction).
Figure 2.4-8
Tinian Range Complexes
Figure 2.4-9
Tinian All Action Alternatives
Range Complex A

Legend

Proposed Actions:
- Range Areas
- Observation Post
- Mortar Firing Position
- Proposed Perimeter Road/Firebreak/Buffer Area
- Tracked Vehicle Driver's Course
- Existing Roads (Improved and Unimproved)
- High Hazard Impact Area (935 acres)
- Ground Disturbance for Range Complex
- Ground Ranges and Target Placement (527 acres including Range Areas)

Demolition Range Features
- Demolition Preparation and Storage Area
- Protective Bunker
- Detonation Area
- Proposed Demolition Range Access Trail
- Military Lease Area
Associated with each range are target areas that would require an initial construction ground disturbance to create a line of sight to the target area. The firing positions for ground ranges would be located at the edge of the High Hazard Impact Area. The Demolition Range would be located on the southeastern side of the High Hazard Impact area and include construction of a cleared area for detonating charges, a 10 foot by 20 foot (3 meter by 6 meter) protected bunker and a 20 foot by 20 foot (6 meter by 6 meter) covered area for demolition preparation and ammunition storage. The Live Hand Grenade Range would include construction of four throwing positions/pits with 6 foot (1.8 meter) high earthen berms between each position. In addition, a 98-foot (30-meter) fire break to include a perimeter road would be constructed around the High Hazard Impact Area. The perimeter road would provide one travel lane measuring 10-feet (3-meters) wide with a 3.0-foot (0.9-meter) shoulder on one side and 3.0 feet (0.9 meters) of vegetation clearance between the road and the perimeter fence on the other side. Fencing and signage would be placed around the perimeter of the High Hazard Impact Area. Interior roads would also be constructed to facilitate range complex maintenance.

Proposed roads and fencing under the Tinian action alternatives are described in Section 2.4.1, Elements Common to All Action Alternatives. Although the entire outline of Range Complex A is 935 acres (375 hectares), the total ground disturbance area associated with construction for Range Complex A would be approximately 527 acres (213 hectares) which includes the clearance for the target areas and firing positions associated with each of the ground and aviation ranges as well as the targets associated with the Field Indirect Range. The ground disturbance for the perimeter and access roads is included in the roadway improvements. With repeated use for training (i.e., targets for high explosive munitions), it is assumed that the 527 acres (213 hectares) would not be impervious.

### 2.4.1.2.9 Range Complex B Construction

Range Complex B (Figure 2.4-8 and Figure 2.4-10) would include six ground ranges: (1) the Combat Pistol Range; (2) Anti-Armor Tracking Range; (3) Tank/Fighting Vehicle Stationary Target Range; (4) Battle Sight Zero Range; (5) Multi-Purpose Training Range; and (6) the Tank/Fighting Vehicle Multi-Purpose Range Complex. The Combat Pistol Range and the Battle Sight Zero Range would each include construction of 13 foot (4 meter) high earthen berms, and a 20-foot (6-meter) high impact berm would be constructed at the Multi-Purpose Training Range. Within Range Complex B, ground disturbance associated with construction would include interior roadways and target firing points and objectives. The total ground disturbance area associated with construction for this range complex would be approximately 47 acres (20 hectares). With repeated use for training, it is assumed that the ground disturbed areas would take on an impervious quality and is thus considered newly created impervious surface. The ground disturbance total does not include the acreage for the lines of sight (83 acres [34 hectares]) as these areas would not be disturbed during construction and would only require vegetation maintenance as part of routine range maintenance.
Mount Lasso

Tank/Fighting Vehicle Multi-Purpose Range Complex
- Tank/Fighting Vehicle Stationary Target Range
- Anti-Armor Tracking Range
  (Objective Areas 16 acres)
  (Lines of Sight 83 acres)

Multi-Purpose Training Range
  (23 acres)

Combat Pistol Range
  (2 acres)

Battle Sight Zero Range
  (2 acres)

Tinian International Airport

Base Camp

Figure 2.4-10
Tinian All Action Alternatives
Range Complex B

Legend
- Range Complex A
- Range Complex C

Proposed Actions:
- Range Areas
- Landing Zone
- Indirect Artillery Firing Position
- Mortar Firing Position
- Observation Post
- Surface Radar Site
- Tracked Vehicle Driver's Course
- Objective Area
- Lines of Sight
- Military Lease Area

0 500 1,000 2,000 Feet

0 100 200 400 Meters

NORTH
2.4.1.2.10 Range Complex C Construction

Range Complex C (Figure 2.4-8 and Figure 2.4-11) includes four ground ranges: (1) the Multi-Purpose Automated Unknown Distance Range; (2) Field Fire Range; (3) Infantry Platoon Battle Course; and (4) Urban Assault Course. Within Range Complex C, interior roadways and objective areas would require ground disturbance associated with construction. In addition, approximately 20 temporary one-story roofless structures would be installed as part of the proposed Urban Assault Course and a 26-32 foot (8-10 meter) high no impact berm is required for the Multi-Purpose Automated Unknown Distance Range. The total ground disturbance area associated with construction for this range complex would be approximately 80 acres (32 hectares). With repeated use for training, it is assumed that the ground disturbed areas would take on an impervious quality and is thus considered newly created impervious surface. The ground disturbance total does not include the acreage for the lines of sight (88 acres [35 hectares]) as these areas would not be disturbed during construction and would only require vegetation maintenance as part of routine range maintenance.

2.4.1.2.11 Range Complex D Construction

Range Complex D (Figure 2.4-8 and Figure 2.4-12) would include: (1) an aviation Drop Zone; (2) an aviation Landing Zone (i.e., existing cleared runways Able, Baker, Charlie); (3) Unmanned Aircraft Systems Ground Station; and (4) a Forward Arming and Refueling Point. Within Range Complex D, there are expeditionary runways (North Field runways) that have already been cleared and maintained. Ground disturbance would be approximately 475 acres (192 hectares); however, none of it would be considered newly created impervious surface as only existing impervious surfaces (e.g., runways, taxiways) would be repeatedly used (e.g., Landing Zone) and the remainder (associated with the Drop Zone) would be maintained as vegetated lands. Historic assets at the North Field National Historic Landmark (located within Range Complex D) would be protected during construction activities. For further discussion of historic assets at North Field, see Sections 3.11 and 4.11, Cultural Resources.

2.4.1.2.12 Military Lease Area-wide Training Assets Construction

In addition to the training facilities associated with Range Complexes A, B, C, and D, several individual facilities would be constructed throughout the Military Lease Area (Figure 2.4-13). These include the following:

2.4.1.2.12.1 Field Artillery Indirect Fire Range

Field Artillery Indirect Fire Range construction would involve ground disturbance at ten designated firing points — five south of Unai Masalok, two north of the base camp, and three east of Ushi Point. Total ground disturbance associated with these firing points would be 85 acres (34 hectares); it is assumed that through repeated use that the firing points would take on an impervious quality and are considered newly created impervious surface.
Landing Zone activities could occur in cleared areas.
Figure 2.4-13
Tinian All Action Alternatives
Military Lease Area-Wide Training Assets
2.4.1.2.12.2 The Convoy Course

Convoy Course construction would involve ground disturbance of the designated course and engagement areas under all action alternatives (six for Alternative 1 and 11 for Alternatives 2 and 3) and course roadways within the military lease area. The Convoy Course length for Alternative 1 is longer than that associated with Alternatives 2 and 3. Section 2.4.2, Tinian Alternative 1, and Section 2.4.3, Tinian Alternative 2, provide details on construction footprint for the action alternatives.

2.4.1.2.12.3 Tracked Vehicle Driver’s Course

Tracked Vehicle Driver’s Course construction would include gravel pathways largely parallel to existing and proposed roads extending from the port to the Military Lease Area (considered transit lanes not part of the live-fire training course) and throughout the Military Lease Area (considered live-fire training course). Roadway surfaces would be reinforced (e.g., with a concrete pad) at locations where cross-over travel for tracked vehicles must be accommodated. The total ground disturbance associated with the Tracked Vehicle Driver’s Course located outside of Range Complexes A through D would be 100 acres (40 hectares) and is included in the overall ground disturbance associated with road improvements (see Section 2.4.1.2.6, Fence Lines and Gates).

2.4.1.2.12.4 Tactical Amphibious Beach Landings (non-live-fire)

A tactical amphibious training ramp would be constructed on federal submerged lands for Amphibious Assault Vehicles at Unai Chulu to create a safe landing surface for training operations. Construction of the in-water landing area for Amphibious Assault Vehicles would modify the seafloor (i.e., limestone, coral reef) by contouring the approach zone (landing area) to create a pile-armored ramp at a 15 degree slope. The pile-armored ramp would consist of a gravel bed atop the coral base and a durable grooved concrete slab surface designed to be stable under severe wave conditions. Trenches with concrete anchors would secure the toe and top of the ramp and join the ramp with existing ocean surfaces. The construction would create a stable landing area for the Amphibious Assault Vehicles to safely come ashore on a repeated basis. The amphibious landing ramp at Unai Chulu would be approximately 656-feet (200-meters) long and average 160-feet (50-meters) wide with an anticipated dredge volume of 798,111 cubic feet (22,600 cubic meters) (Figures 2.4-14, 2.4-15, and 2.4-16).

Construction is anticipated to take approximately 36 weeks. Construction logistics include up to 2 acres (1 hectare) for staging on North Field, and two smaller laydown areas totaling 1 acre (0.4 hectare) adjacent to the beach, and access roads for transportation of materials and supplies (Figure 2.4-14). Temporary causeways would be constructed to allow an excavator access over the water. The temporary causeways would be constructed using pile-supported trestles through the surf zone and out to 12 feet (4 meters) depth. Steel sheet piles and steel pipe piles would be installed into the reef and penetrate approximately 40 feet (12 meters) into the substrate (see Figures 2.4-15 and 2.4-16). The causeways would be constructed using dredged material and would be removed after amphibious landing ramp construction was complete. After the removal of the causeways, excess fill material (i.e., dredge material) would be reused or disposed of at an approved in-water or upland disposal sites. See Appendix J, Amphibious Beach Landing Site Engineering and Coastal Processes Analyses for additional details on the proposed construction methods for the amphibious landing ramps.
Figure 2.4-14
Tinian Tactical Amphibious
Beach Landing Laydown Area and Access
Figure 2.4-15 Unai Chulu
Tactical Amphibious Beach Landing
Dredging and Construction

Source: NAVFAC Pacific 2013; Sea Engineering, Inc. 2014

1 Depth values based on mean-mean low water and grouped to distinguish between the following depths of concern:
   - Maximum Potential Impact Depth (-12 feet)
   - In-water Draft of AAV (-7 feet)
   - Wave Surge Potential Track Impact (-5 feet)
   - Track Engagement (-3 feet)
   - Reef Flat Maneuver (-1 feet or above)

2 Unai Chulu will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.
Figure 2.4-16 Unai Chulu
Tactical Amphibious Beach Landing Operations

Legend
- Amphibious Landing Ramp
- Proposed Tracked Vehicle Route
- Existing Road
- 4 Meter Depth Contour
- 1 Meter Depth Contour
- Approach Zone²
- Craft Landing Site (75 ft radius)
- Landing Footprint
- Operations Footprint

Depth Relative to Mean Lower Low Water¹
- Greater than 40 feet Depth
- 40 to -20 feet Depth
- 20 to -12 feet Depth
- 12 to -7 feet Depth
- 7 to -5 feet Depth
- 5 to -3 feet Depth
- 3 to -1 feet Depth
- 1 to 0 feet Depth
- 0 to 3 feet
- 3 to 5 feet
- Greater than 5 feet

¹ Depth values based on mean-mean low water and grouped to distinguish between the following depths of concern:
  - Maximum Potential Impact Depth (-12 feet)
  - In-water Draft of AAV (-7 feet)
  - Wave Surge Potential Track Impact (-5 feet)
  - Track Engagement (-3 feet)
  - Reef Flat Maneuver (-1 feet or above)

² Unai Chulu will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.

Source: NAVFAC Pacific 2013; Sea Engineering, Inc. 2014
2.4.1.2.12.5 Maneuver Area (Light Forces)

Maneuver Area (Light Forces) training would not involve any construction activities.

2.4.1.2.12.6 Landing Zones

A total of six Landing Zones would be constructed under each of the action alternatives: (1) base camp; (2) Range Complex D; (3) Pina; (4) east of the base camp; (5) within Range Complex C; and (6) north of Range Complex C. Construction ground disturbance associated with Landing Zones proposed for the base camp and Range Complex D are included the overall ground disturbance for the base camp and Range Complex D (see Sections 2.4.1.2.1, Base Camp Construction, and 2.4.1.2.11, Range Complex D Construction). The Landing Zone at North Field would utilize cleared runways (e.g., Baker, Charlie and Dog) and would not include any new ground disturbance (see discussion under Section 2.4.1.2.11, Range Complex D Construction). The other Landing Zones would be approximately 3 acres (1 hectare) each inclusive of two MV-22 landing pads in addition to a 350-foot (107-meter) buffer area located around the Landing Zone to allow for the wind velocity, engine exhaust and high temperatures created by the hovering aircraft. Ground disturbance associated with all of the smaller Landing Zones would total 13 acres (5 hectares); it is assumed that through repeated use that the four smaller Landing Zones would take on an impervious quality and are considered newly created impervious surface.

2.4.1.2.12.7 Observation Posts

Observation Posts would be constructed at up to eight locations within the Military Lease Area. The Observations Posts will primarily be used to observe the High Hazard Impact Area (Range Complex A). Each tower would be capable of holding a maximum of six personnel and would be constructed above the tree/vegetation line in order to achieve uninterrupted views.

Each Observation Post would be constructed (centered) in an approximately 50 foot by 50 foot (15 meter by 15 meter) area that would be cleared of vegetation. Observations Posts 1 through 6 would be approximately 50-feet (15-meters) tall and Observation Posts 7 and 8 would be approximately 65-feet (20-meters) tall. The towers would include telephone service through above-ground or below-ground transmission lines. There would be no electrical power supplied to the towers. Ground disturbance associated with the Observation Posts outside the High Hazard Impact Area would involve clearing approximately 0.06 acre (0.02 hectare) per post for a total of 0.2 acre (0.08 hectare). The same amount of impervious surface is anticipated due to repeated use. Six Observation Posts would be located inside the High Hazard Impact Area fence for security. Five of the Observation Posts would be located within ground disturbed areas associated with the High Hazard Impact Area. Observation Posts 1 through 6 would be accessible via the High Hazard Impact Area perimeter road and Observation Posts 7 and 8 would have dedicated access roads.

2.4.1.2.12.8 Surface Radar Sites

Surface Radar sites would be constructed - one at each of six different locations within the Military Lease Area. The Surface Radar sites would monitor the surface danger zones. They would consist of approximately 25 to 50 foot (8 to 15 meter) towers constructed (centered) in an approximately 80 by 80 foot area will be cleared of vegetation and be fenced and gated for security. Information technology/communications infrastructure would be provided through above-ground and below-ground transmission lines. Each site would include electrical service, single mode fiber optic communications
connections, a Surface Radar, a visual color camera and/or a thermal imager, and a diesel back-up generator. Surface Radar sites 1 and 6 will include an additional camera for monitoring the surface danger zone to shore interface. Ground disturbance associated with each Surface Radar sites would be approximately 0.15 acre (0.06 hectare) per post for a total of approximately 0.9 acre (0.4 hectare). The same amount of impervious surface is anticipated due to repeated use. Surface Radar sites would have dedicated access roads (with the exception of Surface Radar site 4, situated at Ushi Point).

2.4.1.3 Training Operations

At the proposed Tinian RTA, the amount and variety of training would progressively increase over the 8 to 10 year construction period culminating in the final 20 weeks proposed. It is anticipated that training would commence when the Tinian RTA is first established. Live-fire training using small-arms would occur from the start; however, training with large-caliber weapons would not occur until the Special Use Airspace is approved and mapped by the Federal Aviation Administration. This approval involves federal rule-making.

Some ranges may be used daily during training weeks such as the Combat Pistol Range, others may be used for only specialized training events of short duration (e.g., Battle Sight Zero Range), while others, such as the Infantry Platoon Battle Course, may be used for longer durations. Units planning to conduct training on Tinian would schedule their training through a scheduling system approximately 6 months prior to the training event.

2.4.1.3.1 Range Complex A Training Operations

Range Complex A comprises the High Hazard Impact Area where live-fire high explosives from ground-based and aviation training activities would be employed. Ground-based activities would include hand grenades thrown and launched from the Live Hand Grenade and Grenade Launcher ranges, respectively; personnel would use 60 and 81 millimeter mortars at the Mortar Range firing positions; and rockets would be employed at the firing points associated with the Light Anti-Armor Weapon Live Range. The Live Hand Grenade Range would include construction of four throwing positions/pits with 6 foot (1.8 meter) high earthen berms between each position. Within the Demolition Range, explosives training would occur, there would be detonations of charges with a maximum of 24 pounds net explosive weight within a designated detonation point (a cleared area set back from roads and supporting facilities).

Aviation activities would use live munitions from machine guns and rockets and delivery of inert aviation ordnance at targets within the High Hazard Impact Area as part of Offensive Air Support Range and Close Air Support Range training. Additionally, artillery would be fired indirectly at the High Hazard Impact Area from Field Indirect Fire Range firing positions throughout the RTA (see Military Lease Area-wide Training below). Once active, the High Hazard Impact Area would be used for live-fire training only; no maneuvering would be allowed and access would be restricted to authorized personnel only.
2.4.1.3.2 **Range Complex B Training Operations**

The primary emphasis of Range Complex B would be to conduct live-fire vehicle-mounted (e.g., tanks, fighting vehicles) training. Personnel in vehicles would move to firing points and using the lines of sight they would practice firing at stationary and moving targets (i.e., target objectives). Although not the primary purpose for this range complex, personnel would maneuver on foot within the range complex in squads. This type of foot maneuvering differs from that within the Infantry Platoon Battle Course (Range Complex C) which occurs in larger groups (i.e., platoon level).

Training at the following ranges would include the use of rifles, machine guns, as well as grenade and rocket launchers: (1) Anti-Armor Tracking Range, (2) Tank/Fighting Vehicle Stationary Target Range, (3) Multi-Purpose Training Range, and (4) Tank/Fighting Vehicle Multi-Purpose Range Complex. Munitions at those ranges would include live munitions as well as inert grenades, rockets, and 60 millimeter and 81 millimeter mortars.

Training at the Combat Pistol and Battle Sight Zero ranges would involve small caliber weapons (e.g., pistols, rifles, and shotguns). These two ranges are co-located in Range Complex B to maximize training space efficiency.

Simulated aviation training would occur within Range Complex B but it would not involve firing of weapons.

2.4.1.3.3 **Range Complex C Training Operations**

The primary emphasis of Range Complex C would be the live-fire training activities associated with the Infantry Platoon Battle Course and the Urban Assault Course. Training activities at the Infantry Platoon Battle Course, and Urban Assault Courses would involve personnel moving primarily on foot to target objective areas employing live munitions for rifles and inert munitions for grenade and rocket launchers. The two smaller ranges (e.g., Multi-Purpose Automated Unknown Distance Range and Field Fire Range) would be stationary and co-located in the complex to maximize space efficiency.

Simulated aviation training would occur within Range Complex C but it would not involve firing of weapons. This type of aviation training involves the flight patterns used for live-fire munitions delivery, but without the release or delivery of munitions. Attack helicopters and fixed-wing aircraft (jets) would perform these “dry-runs” to provide ground-based tactical air controllers air-ground coordination training.

2.4.1.3.4 **Range Complex D Training Operations**

Training within Range Complex D emphasizes both aviation training and ground training. Aviation training would occur within a Drop Zone, a Landing Zone, an Unmanned Aircraft Systems Ground Station, and a Forward Arming and Refueling Point. Aviation training would include takeoff and landing practice for fixed wing, helicopters, tilt-rotor aircraft, and unmanned aircraft (i.e., drones), drop (parachute) of personnel/cargo/equipment, aircraft refueling, and aviation command and control. Historic assets at North Field will be protected during Range Complex D training operations. For further discussion of historic assets at North Field, see Sections 3.11 and 4.11, Cultural Resources.
2.4.1.3.5 Military Lease Area-wide Training Assets Training Operations

The Military Lease Area-wide training assets would include the following live-fire and non-live-fire training operations:

2.4.1.3.5.1 Field Artillery Indirect Fire Range (live-fire)

Field Artillery Indirect Fire Range would involve personnel firing live rounds (such as 120 millimeter mortar and 155 millimeter high explosive) from ten designated firing points (five south of Unai Masalok, two north of the base camp, and three east of Ushi Point) into the High Hazard Impact Area (Range Complex A).

2.4.1.3.5.2 Convoy Course (live-fire)

Convoy Course training would involve personnel driving vehicles in a convoy along a specific route through the Tinian RTA. The primary emphasis of this course is for vehicles (wheeled and tracked) to progress from one engagement zone to the next, firing weapons at targets and maneuvering the vehicles. Tracked vehicles conducting convoy course training would be limited to those roads intended for tracked vehicles (i.e., Tracked Vehicle Driver’s Course). The designated course and engagement areas vary between alternatives. Section 2.4.2, Tinian Alternative 1, and Section 2.4.3, Tinian Alternative 2, provide details on the designated course for each of the action alternatives.

2.4.1.3.5.3 Tracked Vehicle Driver’s Course (non-live-fire)

Tracked Vehicle Driver’s Course training would involve personnel driving tracked vehicles (e.g., Amphibious Assault Vehicles) along designated roads or pathways. Tracked vehicles conducting convoy course training would be limited to those roads intended for tracked vehicles (i.e., Tracked Vehicle Driver’s Course). Training conducted on the course is non-live-fire which would use blank munitions to conduct force on force weapons training.

2.4.1.3.5.4 Tactical Amphibious Landing Beaches (non-live-fire)

Tactical Amphibious Landing Beach training (i.e., “amphibious training”) would take place to varying degrees at four beaches within the Military Lease Area: (1) Unai Babui; (2) Unai Chulu; (3) Unai Lam Lam; and (4) Unai Masalok. Tactical amphibious training would involve the use of Amphibious Assault Vehicles (at Unai Chulu), Landing Craft Air Cushion vessels (at Unai Babui, Unai Chulu, and Unai Masalok), small boats (e.g., inflatable Rubber Raiding Craft) and combat swimmers (at Unai Babui, Unai Chulu, Unai Lam Lam, and Unai Masalok). These activities are described in the following bullets.

- Amphibious Assault Vehicles would land at Unai Chulu and the vehicles would come ashore and use military roads to gain access to the Tracked Vehicle Driver’s Course.
- Landing Craft Air Cushion vessels would land at Unai Babui, Unai Chulu, and Unai Masalok. Vessels would come ashore or near shore, offload personnel, equipment and vehicles, and personnel would move either on foot or by vehicle to training facilities within the RTA.
- Combat swimmer and small boat landings would occur at Unai Babui, Unai Chulu, Unai Lam Lam, and Unai Masalok. Personnel and swimmers would come ashore and move either on foot or by vehicle to training facilities within the RTA.
2.4.1.3.5.5 Maneuver Area (Light Forces) (non-live-fire)

Maneuver Area (Light Forces) training would involve personnel moving on foot along roadways, pathways, and open land areas within the Military Lease Area. Vehicle maneuvering would only occur on developed roads and trails. This training is non-live-fire which would use blank munitions to conduct force on force weapons training.

2.4.1.3.5.6 Maneuver Area (Amphibious Forces) (non-live-fire)

Maneuver Area (Amphibious Forces) would involve personnel driving Amphibious Assault Vehicles from designated amphibious training beaches to engage in training within the RTA. Tracked vehicles would travel only along the Tracked Vehicle Drivers course. Furthermore, at designated amphibious training beaches, Landing Craft Air Cushion vessels would embark and/or disembark personnel and wheeled vehicles; small boats would on- and/or off-load personnel; and combat swimmers would come ashore and/or depart. Personnel and equipment would engage in training within the RTA. This training is non-live-fire which would use blank munitions to conduct force on force weapons training only when personnel and equipment are on shore.

2.4.1.3.5.7 Landing Zones (non-live-fire)

Training using Landing Zones would involve fixed wing, helicopters, tilt-rotor, and unmanned aircraft landing and taking off at existing (cleared) North Field runways (e.g., Baker, Charlie and Dog). In addition, five smaller designated Landing Zones at Pina (south of Unai Masalok), base camp, east of base camp, within Range Complex C, and north of Range Complex C would involve helicopters and tilt-rotor aircraft landing and taking off. Landing Zone training is non-live-fire and no aviation munitions would be employed (including blanks).

2.4.1.3.5.8 Observation Posts (non-live-fire)

Observation Posts within the Military Lease Area would allow personnel to observe operations in the high hazard impact area and monitor ordnance scoring and detonation.

2.4.1.3.5.9 Surface Radar Sites (non-live-fire)

Surface Radar sites along the shoreline would monitor the surface danger zones. Through visual inspection and the use of cameras and/or a thermal imaging, the surface danger zones will be cleared and monitored prior to and during training events. Surface Radar sites 1 and 6 would include an additional camera for monitoring the surface danger zone to shore interface.

2.4.1.3.5.10 Terrain Flight Maneuver Area (non-live-fire)

Terrain Flight Maneuver Area training would occur while aircraft are in transit. This type of training is non-live-fire and does not involve the use of weapons. It includes a flight over terrain below 200 feet (60 meters).

2.4.1.3.6 Amphibious Training Operations

Proposed amphibious training operations include non-live-fire tactical and administrative operations on the island of Tinian. Tactical amphibious training operations are intended to represent a combat situation where as administrative amphibious training is intended to allow amphibious craft to come ashore for logistical purposes. As described in Section 2.4.1.3.5, Military Lease Area-wide Training
Assets, under all Tinian action alternatives, four beaches within the Military Lease Area would be used for tactical amphibious training operations: Unai Babui, Unai Chulu, Unai Lam Lam, and Unai Masalok. In addition, the old boat ramp at the Port of Tinian would be used for administrative amphibious training (see Section 2.4.1.2.12.4, Tactical Amphibious Beach Landings (non-live-fire)).

- Amphibious Assault Vehicle Landings—Unai Chulu
- Landing Craft Air Cushion Vessel Landings—Unai Chulu, Unai Babui, and Unai Masalok
- Small Boat and Swimmer Training—Unai Chulu, Unai Babui, Unai Lam Lam, and Unai Masalok

Typically, an amphibious craft leaves the larger ship (or stages itself for the training event) anywhere between 2 to 4 miles (4 to 7 kilometers) away from the landing beach. Table 2.4-2 provides annual estimated tactical amphibious operations under any of the action alternatives.

The number of daily tactical amphibious landings (i.e., use of an amphibious craft to come ashore) may vary based on many factors such as the training scenario and objectives, weather/sea state, and vehicle availability. The combination of these factors present challenges in predicting the frequency of tactical amphibious training. In general, tactical amphibious training on Tinian would be spread evenly throughout the 20 weeks of military training, consistent with the unit level of training emphasis, with daily variations as noted below. The amphibious training on Tinian would occur less frequently but over a longer period of time than the Pagan amphibious training.

<table>
<thead>
<tr>
<th>Type of Amphibious Landing</th>
<th>Proposed Annual Landing Events</th>
<th>Number of Vehicles/Landing per Event**</th>
<th>Annual Total Landings*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amphibious Assault Vehicle-Landings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine Unit-simulated landings</td>
<td>54</td>
<td>4</td>
<td>852</td>
</tr>
<tr>
<td>Marine Unit-landings</td>
<td>66</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Foreign Allies-landing</td>
<td>27</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Major Joint Exercises-landings</td>
<td>66</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>Landing Craft Air Cushion-Landings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine Units</td>
<td>32</td>
<td>2</td>
<td>144</td>
</tr>
<tr>
<td>Foreign Allies</td>
<td>16</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Major Joint Exercises</td>
<td>24</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Small Boats-Landings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special Operations Forces</td>
<td>12</td>
<td>2</td>
<td>1,368</td>
</tr>
<tr>
<td>Marine Units</td>
<td>54</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Foreign Allies</td>
<td>6</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Major Joint Exercises</td>
<td>24</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Notes: *Total number of vehicles landing annually.
** An event is a single vehicle landing or a single vehicle departure.
Source: DoN 2014a.
2.4.1.3.6.1 Tactical Amphibious Assault Vehicle Landings

For Amphibious Assault Vehicles, a typical light training day may consist of four vehicles landing and departing three times in a 24-hour period, on a specified beach. A typical heavy training day may consist of 16 vehicles landing and departing two times in a 24-hour period, on a specified beach. Generally, these heavy and light training days occur at various intervals over individual two week training cycles at Tinian. Amphibious Assault Vehicles can transport up to 18 individuals per vehicle.

2.4.1.3.6.2 Landing Craft Air Cushion Vessel Landings

For Landing Craft Air Cushion vessels, similar training frequencies would occur. A typical light training day may consist of two vessels landing and departing two times in a 24-hour period, and a typical heavy training day two vessels would land and depart six times. Unai Chulu and Unai Masalok would be used more often than Unai Babui. These typical days would occur within a one or two week training cycle. Landing craft air cushion vessels can transport up to 186 individuals per vehicle.

2.4.1.3.6.3 Small Boat Training

For small boat and swimmer training, a typical light training day may consist of four boats landing and departing four times, and a typical heavy training day would be four boats landings and departing ten times each. All designated beaches would be used at a similar frequency. Small boats can transport up to 8 individuals per vehicle.

2.4.1.3.6.4 Combat Swimmer Training

Combat Swimmer training to occur on Unai Chulu, Unai Babui, Unai Lam Lam, and Unai Masalok, could occur two ways: (1) insertion, and, (2) scout swimmers (initial terminal guidance) to guide small boats (not Amphibious Assault Vehicles and Landing Craft Air Cushion) to the landing beach. A typical group of swimmers is four, but could be as large as 16. As far as average frequency, a typical group of four swimmers would train daily, on any given beach, during the 20 weeks of live-fire training on Tinian.

2.4.1.3.7 Airfield Training Operations

All Tinian action alternatives would include airfield operations for training at Tinian International Airport, North Field and on proposed Landing Zones. For the purposes of this EIS, Landing Zones are considered crude airfields for field use by rotary-wing and tilt-rotor aircraft. Airfield training operations would include take-offs and landings, field carrier landing practice operations, helicopter and tilt-rotor aircraft training at Landing Zones, and the base for Unmanned Aircraft Systems operations. Table 2.4-3 provides a summary of annual training operations by aircraft type and time of day associated with the airfields at Tinian International Airport and North Field.
Table 2.4. Tinian All Alternatives Proposed Annual Airfield Military Operations

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Tinian International Airport</th>
<th>North Field</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7:00 a.m.- 10:00 p.m.</td>
<td>10:00 p.m.- 7:00 a.m.</td>
<td>Total</td>
</tr>
<tr>
<td>Transport Tilt-rotor</td>
<td>720</td>
<td>280</td>
<td>1,000</td>
</tr>
<tr>
<td>Transport Rotary-wing</td>
<td>680</td>
<td>280</td>
<td>960</td>
</tr>
<tr>
<td>Attack Helicopter</td>
<td>520</td>
<td>240</td>
<td>760</td>
</tr>
<tr>
<td>Transport Fixed Wing</td>
<td>800</td>
<td>400</td>
<td>1,200</td>
</tr>
<tr>
<td>Unmanned</td>
<td>200</td>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td>Fighter</td>
<td>1,600</td>
<td>400</td>
<td>2,000</td>
</tr>
<tr>
<td>Heavy commercial transport</td>
<td>24</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Fighter – Field Carrier Landing Practice</td>
<td>2,500</td>
<td>500</td>
<td>3,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,044</strong></td>
<td><strong>2,200</strong></td>
<td><strong>9,244</strong></td>
</tr>
</tbody>
</table>

**Notes:**
1. Operations include a takeoff or a landing and each are counted as one operation. A take-off and a landing are two operations.
3. See also Section 2.4.1.5.1, Air Transportation.

Table 2.4-4 presents annual aircraft training operations by aircraft type and time of day which include training for pilots and ground personnel for the insertion or extraction of personnel and equipment simulating combat situations. The operations can include close air support in transit to or from the operation.

Table 2.4-4. All Tinian Action Alternatives Proposed Typical Annual Landing Zone Operations

<table>
<thead>
<tr>
<th>Aircraft Type (Example)</th>
<th>Annual Number of Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7:00 a.m.- 10:00 p.m.</td>
</tr>
<tr>
<td>Transport Tilt-Rotor (MV-22)</td>
<td>320</td>
</tr>
<tr>
<td>Transport Rotary-Wing (CH-53)</td>
<td>280</td>
</tr>
<tr>
<td>Attack Helicopter (AH-1/H-60)</td>
<td>120</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>720</strong></td>
</tr>
</tbody>
</table>

**Notes:**
1. Number of operations include all Landing Zones.
2. A portion of the training flights would include transport of personnel and equipment as part of their training mission.

2.4.1.3.8 Simultaneous Use of Training Assets

For safety purposes, Range Control personnel would coordinate with training exercise planners to establish when each training facility would be used throughout a training day. In general, a degree of simultaneous use of each range complex could occur. However, certain activities at a given range complex or training facility might temporarily exclude other activities in the same range complex or other area. For example, within Range Complex A, during aviation training associated with Offensive Air Support Range training or Close Air Support Range training, certain ground based ranges (i.e., Hand Grenade Range, Mortar Range, Grenade Launcher Range, and Light Anti-Armor Weapon Range) would
not be in operation. This is due to the overlap of weapons danger zones associated with the aviation munitions and the ground-based ranges located within Range Complex A. Similarly, during live-fire training on the Convoy Course, other training activities not associated with the live-fire Convoy Course in the vicinity of the “hot” engagement areas would not be allowed.

Range Control and training exercise planners would factor the number of training events planned for a given day, the intent or objective of each event, number of personnel, types of equipment, weaponry, and munitions and devise a plan to safely accommodate training on as many range complexes and training facilities as possible. This type of planning and simultaneous training execution takes place at similar live-fire training venues throughout the military Services and is the subject of specific range regulations and standard operating procedures.

### 2.4.1.4 Operation and Management of Tinian Range and Training Area

#### 2.4.1.4.1 Operation of Tinian Range and Training Area

Approximately 95 personnel would be employed, likely reside on Tinian, and work year-round supporting Tinian RTA operations and maintenance activities. Overall, the proposed Tinian RTA would operate 20 weeks per year (non-consecutive weeks of live-fire training), with a typical training duration of 2 weeks. Training would potentially occur 7 days per week. Operations for small-caliber and airfield training are assumed to occur about 80% during the hours of 7:00 a.m. to 10:00 p.m. and 20% during the hours of 10:00 p.m. and 7:00 a.m. Large-caliber operations are assumed to occur about 96% during the hours of 7:00 a.m. to 10:00 p.m. and 4% during the hours of 10:00 p.m. and 7:00 a.m. (DoN 2014c).

For a given live-fire training exercise period, it is anticipated that there would be 30 to 2,200 transient training and support personnel in addition to the 95 permanent support personnel at the Tinian RTA. However, in order to accommodate the possibility of overlapping training parties, the Tinian RTA base camp is designed to accommodate up to 3,000 personnel (1,500 trainees in permanent, open bay barracks and 1,500 trainees in tents). This would support overlap of a Marine Unit exercise with a multilateral training exercise or other overlapping exercise pre- or post-training party.

Personnel and cargo would move to and from the Military Lease Area, and to and from Tinian via barges, ferries, military Joint High Speed Vessels, amphibious craft, and other military sealift platforms.

The primary supply route from the Port of Tinian to the Military Lease Area would support the movement of heavy equipment, vehicles, personnel, and munitions associated with the training units. Amphibious Assault Vehicles would use the existing old public boat ramp with land-based improvements for administrative amphibious landings. A Tracked Vehicle Driver’s Course transit lane (graded and graveled) for the Amphibious Assault Vehicles and tanks would allow these vehicles to transit directly from the old boat ramp (after completing biosecurity measures) at the Port of Tinian to the Military Lease Area. Personnel arriving via the port would be bused to the base camp. A logistical support plan for munitions, fuel, equipment, and vehicle movement would be developed. This logistical plan, along with the required spill prevention and response plan, would address explosive safety, biosecurity, and commercial port and airport transport requirements; the plans would be coordinated with the Defense Logistics Agency and Naval Supply Systems Command Energy as appropriate.
2.4.1.4.1 Security

In accordance with U.S. military safety and security regulations the RTA boundary would be identified by erecting a mix of both chain-link and barbed-wire fences at specific locations within the Military Lease Area. Figure 2.4-6 illustrates where fences and gates would be established to restrict access and ensure public safety when training facilities are active.

2.4.1.4.1.2 Public Access

Public access would largely be available to certain portions of the Military Lease Area and waters off the Military Lease Area when no training is occurring, with some exceptions. Public access would always be restricted at the following areas: (1) the entire High Hazard Impact Area; (2) the Munitions Storage Area; (3) the base camp; and (4) the Observation Posts and Surface Radar sites. In general, public access would be allowed to all locations except the four noted above when training is not occurring.

Access procedures would be implemented to ensure safety and provide guidance and direction. Public access would be provided by an entry control facility, or “Visitors Office” along the southern boundary of the Military Lease Area. Entry control is the primary method used to assure safety by separating hazardous training activities from non-participants. Entry control procedures would be applicable during training events. The entry control facility would conduct visitor processing, vehicle registration, identification checks, as well as privately-owned vehicle and truck inspections. Visitors would check in at the entry control facility prior to entering and upon leaving the Military Lease Area (DoN 2014d).

Public access to the Military Lease Area including the North Field National Historic Landmark, grazing lands, beaches, trails and other points of interest is a priority. Public access to the RTA would be prohibited, to varying degrees depending on training tempo, in some to all areas of the RTA during live-fire and other training events. However, public access would be allowed at times when such training events are not taking place. It is envisioned that public access to some or all areas of the RTA would occur during a couple daylight hours on a nearly daily basis. A range control facility and dedicated range scheduler would be in place to assess public access in real-time and to provide advance notice of public access dates, time frames, and areas. Range control and the scheduler would coordinate public access directly with the Tinian Mayor’s Office and other interested parties, such as ranchers and entities within the tourism industry.

Units would schedule their live-fire training through a schedule system approximately 6 months prior to the training event (DoN 2014d), and training periods would be published electronically by the U.S. military using current methods of public notification and with posted signs. Public notices for daily training events would be published. This prior planning would allow sufficient lead time for commercial travel and tourism companies to engage in potential markets for those individuals seeking to visit Tinian. This notice would also provide visitors and residents days and times when they may access the Military Lease Area. As training cycles are refined, a public RTA access plan would be developed to address individual requests for access (DoN 2014d).

Access to nearshore waters would be allowed outside of the proposed 20 weeks of live-fire training. During training events, access to nearshore waters would be regulated through the establishment of danger zones. Danger zones are discussed further in Section 2.4.1.9, Sea Space Requirements.
2.4.1.4.1.3 Biosecurity

The Department of Defense will require development and implementation of detailed Hazard Analysis and Critical Control Point plans tailored for individual construction, transport, and logistics activities related to CJMT actions. For all training activities, general Hazard Analysis and Critical Control Point plans will be developed prior to initiation of training, and implementation will be required for each training event. The Department of Defense will require a biosecurity education program for 100% of contractors, Department of Defense civilian and military personnel, and foreign military on native versus non-native species, including the brown treesnake; prevention and control methods; and reporting requirements. To address non-native species risk pathways, DoN funded the development of a Regional Biosecurity Plan. When the plan is completed, for recommendations applicable to CJMT activities, the Department of Defense will work cooperatively with appropriate agencies to develop and implement interdiction and control protocols. Finally, Joint Region Marianas has established a comprehensive brown treesnake interdiction program to ensure that military activities, including the transport of personnel and equipment from Guam, do not contribute to the spread of brown treesnakes within the CNMI. Brown treesnake interdiction requirements contained in Navy Region Marianas and Joint Region Marianas instructions will be implemented for CJMT activities. Additional biosecurity details are provided in Section 4.9, Terrestrial Biology and Appendix D, Best Management Practices.

2.4.1.4.1.4 Emergency Services

Military personnel coming to train at the Tinian RTA would be accompanied by their associated medical/emergency medical personnel and equipment. A medical evacuation plan would be prepared to address how a critically injured person would receive medical treatment.

A fire management plan specific to proposed CJMT activities would be prepared prior to initiation of live-fire training on Tinian. This fire management plan would address the preventative and immediate actions required for fire hazards connected with RTA training. Water resources and labor would be identified to ensure safe training and protection of public safety and property. A 90-foot (30-meter) firebreak would be provided around the High Hazard Impact Area. Water trucks and hydrants would be located at the base camp and Munitions Storage Area. Prescribed burns to control vegetation would occur within the High Hazard Impact Area only after assessment of fire conditions. Other emergency response plans are discussed in Section 4.17, Public Health and Safety.

It is anticipated that appropriate mutual aid agreements or memorandums will be established among the civilian and military emergency services prior to training events.

2.4.1.4.1.5 Operational Range Management

Live-fire ranges would be managed in accordance with current Marine Corps range management policies and procedures, which are designed to ensure the safe, efficient, effective, and environmentally sustainable use of the range areas. The RTA on Tinian would be managed in accordance with Marine Corps Order P3550.10 with Change 1, Policies and Procedures for RTA Management (DoN 2005).
These policies and procedures would be reviewed and coordinated with Joint Region Marianas regional range management. All service policies include the following:

- A Range Safety Program would be established per Marine Corps Order 3570.1C, Range Safety detailing procedures for RTA safety, emergency response (medical and fire), Explosive Ordnance Disposal, training mishap investigations, safety training, and range inspections (DoN 2012).
- RTA procedures for scheduling, collecting utilization data and reporting range use.
- Controls for RTA airspace in accordance with Federal Aviation Administration regulations and agreements, with an objective of use by multiple agencies with minimal interference and maximum safety.
- Controls for monitoring danger zones to ensure safety of mariners in nearshore waters.
- Management of movement and access into and within the RTA.
- Coordination of all RTA communications and radar surveillance.
- Provision of range maintenance including vegetation maintenance, operational range clearance, and clearance of unexploded ordnance.
- Maintenance of ranges, targets, training devices, fencing, gates, and signage.
- Coordination of vehicle and transportation operations and maintenance.
- Procedures for environmental protection.
- Provide administration and personnel management.

2.4.1.4.1.6 Environmental Protection

In the ongoing periodic training use and maintenance of the proposed ranges, basic environmental protection features that would be incorporated into the RTA Management Plan would include:

- Fire condition monitoring for firefighting readiness and modification of training as appropriate as part of RTA management procedures. Unit-based firefighting personnel can access range areas with appropriate equipment.
- Specific regulations and information provided for using units to protect the environment as part of RTA procedures. Adherence to protective measures established in natural and cultural resource management plans.
- Adherence to RTA procedures and information provided under Marine Corps Order P3550.10 for using units to protect the environment.
- Clear marking of ranges and transit routes necessary to reach these areas. Restricting vehicular activities to designated/previously identified areas.
- Adherence to existing policies and management activities to prevent erosion and preserve soils, including applicable stormwater pollution prevention plans.

2.4.1.4.1.7 Range Environmental Vulnerability Assessment

Department of Defense Instruction 4715.14 is the overarching policy that establishes the requirement for the Marine Corps Range Environmental Vulnerability Assessment program (Department of Defense 2005). This policy requires the military services to assess the potential environmental impacts of military munitions use on existing operational ranges and determine whether there has been a release or a substantial threat of a release of munitions constituents (i.e., chemical components of munitions) to an off-range area. If a release occurs off-range, the policy also requires the military services determine whether or not the release poses an unacceptable risk to human health and/or the environment based
upon the known characteristics of the chemical(s). The Range Environmental Vulnerability Assessment process includes data collection, analysis, documentation and follow-on activities, as needed. See Section 4.3, Water Resources and Section 4.16, Hazardous Materials and Waste for additional description of Range Environmental Vulnerability Assessment and its application to the proposed action.

### 2.4.1.4.1.8 Bulk Fuel Storage

Bulk fuel requirements (regular unleaded gas, diesel, and aviation fuel) would be replenished either by sea or air on a periodic basis at the Port of Tinian and base camp. Military and commercial fuel supply vessels would dock and deliver fuel to the new Jet Propellant bulk fuel storage facility at the Port of Tinian (see Figure 2.4-5). Regular unleaded gas and diesel would be provided through the current Tinian commercial facilities adjacent to the port. The fuel would be trucked from the port fuel storage facility to an expeditionary bulk storage facility at the airfield-base camp (see Figure 2.4-2) or a fuel pipeline would be constructed to transfer fuel to the bulk storage facility at the airfield. Individual fuel distribution would be from the co-located facility at the airfield-base camp location. Additionally, bulk fuel would be delivered via air resupply from such platforms as a KC-130 or other military air tanker-refueled to the expeditionary bulk fuel storage facility at the airfield-base camp. It is anticipated that a fuel storage capacity of up to 850,000 gallons (3,217,600 liters) of Jet Propellant would be needed to support RTA operations and management. Up to 195,000 gallons (738,000 liters) of diesel would be needed annually. Ground disturbance associated with bulk fuel storage is included in the improvements to the Port of Tinian and the base camp improvements.

As with munitions movement, a logistical support plan, including required spill prevention plan and spill response plan, that coordinates explosive safety, biosecurity, and commercial port and airport requirements will be developed as appropriate.

### 2.4.1.4.2 Vegetation Management at Tinian Range and Training Area

To maintain RTA operations, vegetation control would be required and undertaken by Range Control personnel. The proposed base camp, airfield improvements, port improvements, and RTA facilities would all require varying degrees of vegetation management. For example, accommodating line-of-sight, fire control, and equipment laydowns are factors dictating the degree of proposed vegetation maintenance. A description of proposed vegetation maintenance areas and management is provided in Appendix F, Geology and Soils Technical Memo.

### 2.4.1.5 Transportation

Air, marine and ground transportation options are common to all three Tinian action alternatives and are identified below.

#### 2.4.1.5.1 Air Transportation

Air transportation support to and from Tinian would include contracted commercial air carriers and the occasional use of U.S. military aircraft. Air operations associated with transport are discussed in this section, while air operations associated with tactical maneuver training are discussed in Section 2.4.1.3.7, Airfield Training Operations. Air transport operations (or sorties) could be between Andersen Air Force Base on Guam and Tinian International Airport or originate outside of the Mariana Islands (see Appendix O, Transportation Study for further detail). Approximately 24 annual heavy commercial
operations (e.g., Boeing 747 or equivalent) would support the transport of personnel and equipment, with operations occurring between 7:00 a.m. and 10:00 p.m. The proposed new military parking apron planned north of the current runway is anticipated to alleviate current challenges on Tinian when military aircraft land and offload near the terminal. Biosecurity protocols would be instituted for aircraft carrying military equipment and/or personnel arriving and departing Tinian.

2.4.1.5.2 Ground Transportation

Ground transportation would be provided by each unit transporting its own equipment required for training. These would include High Mobility Multi-Purpose Wheeled Vehicles (i.e., Humvees), Medium Tactical Vehicle Replacements, 7-ton trucks for convoy training, and other tactical vehicles (e.g., Amphibious Assault Vehicles, Light Armored Vehicles). In addition, various types of military and commercial vehicles and/or equipment are planned for personnel movement and permanent support of administrative and range maintenance functions for base camp and range administrative and maintenance functions as well as airfield and port operations. These include: 8 buses, 2 cars, 15 4-wheel drive light trucks, 5 medium tactical 7-ton trucks, 5 commercial flatbed trucks, 2 D7 bulldozers, 2 front-end loaders, 1 forklift, 1 material handling equipment, 3 fire trucks, 1 firefighting water supply truck, 1 extended boom forklift, 8 4-wheel drive dump trucks, 2 gang mowers with tractors, and 4 mowers. It should be noted that this list is not inclusive of vehicles and/or equipment that would be used during the construction period. The training participants using the Tinian RTA would be transient personnel and therefore, privately-owned vehicles would not be authorized for use during non-training hours.

2.4.1.5.3 Marine Transportation

Equipment and personnel movement would be by commercial or military vessels including but not limited to Joint High Speed Vessels, commercial high-speed ferry, other ferry, Amphibious Assault Vehicles, or any other passenger/cargo vessel.

Based on annual training requirements, Joint High Speed Vessels are anticipated to dock at the Port of Tinian between 60 and 120 times annually. Each training event is different and is characterized by a different mix of personnel and equipment, therefore actual number of annual landings may vary. Depending on the mix of cargo, we can anticipate that the JHSV will be in port between 6 and 12 hours each visit. The duration in port will vary and can be impacted by mechanical issues or weather delays, either of which can extend a port stay by days.

See Appendix O, Transportation Study for detailed information. Biosecurity protocols would be instituted for vessels transporting military equipment and/or personnel arriving and departing Tinian.

2.4.1.6 Munitions

Under all of the Tinian action alternatives, munitions transportation, storage, and expenditure would be the same, as each alternative would accommodate the same amount of munitions use during training activities. Table 2.4-5 provides a breakdown of munitions expenditures. Munitions are divided by type, as well as identifying whether they are employed by ground-based personnel or delivered from aircraft. No naval shore bombardment munitions would be expended at the Tinian RTA. The potential for military expended materials falling outside of designated ranges complexes is discussed in Section 2.4.1.7, Danger Zones.
### Table 2.4-5. Proposed Tinian RTA Representative Annual Munitions Expenditures:

**All Tinian Action Alternatives***

<table>
<thead>
<tr>
<th>Munitions Type</th>
<th>Quantity (individual munitions)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ground-Based Training</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Field Artillery/Mortar/Rocket/Grenade</strong></td>
<td></td>
</tr>
<tr>
<td>155 mm HE</td>
<td>13,596</td>
</tr>
<tr>
<td>155 mm Illumination</td>
<td>1,056</td>
</tr>
<tr>
<td>155 mm Smoke</td>
<td>660</td>
</tr>
<tr>
<td>120 mm HE</td>
<td>6,600</td>
</tr>
<tr>
<td>120 mm Illumination</td>
<td>1,668</td>
</tr>
<tr>
<td>120 mm Smoke</td>
<td>1,668</td>
</tr>
<tr>
<td>21 mm Sub-cal Trainer</td>
<td>4,104</td>
</tr>
<tr>
<td>25 mm gun (Inert)</td>
<td>6,240</td>
</tr>
<tr>
<td>40 mm Grenade HE</td>
<td>54,250</td>
</tr>
<tr>
<td>40 mm Practice</td>
<td>7,371</td>
</tr>
<tr>
<td>60 mm HE</td>
<td>1,452</td>
</tr>
<tr>
<td>60 mm Smoke</td>
<td>336</td>
</tr>
<tr>
<td>60 mm Inert</td>
<td>1,632</td>
</tr>
<tr>
<td>81 mm Illumination</td>
<td>612</td>
</tr>
<tr>
<td>81 mm Smoke</td>
<td>336</td>
</tr>
<tr>
<td>83 mm HE</td>
<td>256</td>
</tr>
<tr>
<td>83 mm practice round</td>
<td>1,032</td>
</tr>
<tr>
<td>84 mm</td>
<td>372</td>
</tr>
<tr>
<td>Grenade (practice)</td>
<td>6,174</td>
</tr>
<tr>
<td>Grenade (Fragmentation)</td>
<td>3,190</td>
</tr>
<tr>
<td><strong>Small Arms</strong></td>
<td></td>
</tr>
<tr>
<td>9 mm</td>
<td>27,623</td>
</tr>
<tr>
<td>5.56 mm</td>
<td>3,368,159</td>
</tr>
<tr>
<td>.45 cal</td>
<td>3,000</td>
</tr>
<tr>
<td>.50 cal</td>
<td>251,364</td>
</tr>
<tr>
<td>7.62 mm</td>
<td>1,241,977</td>
</tr>
<tr>
<td>Shotgun</td>
<td>32,520</td>
</tr>
<tr>
<td><strong>Air-Delivered Munitions</strong></td>
<td></td>
</tr>
<tr>
<td>25 pound Aviation Ordnance (Inert)</td>
<td>1,000</td>
</tr>
<tr>
<td>500 pound Aviation Ordnance (Inert)</td>
<td>175</td>
</tr>
<tr>
<td>1,000 pound Aviation Ordnance (Inert)</td>
<td>175</td>
</tr>
<tr>
<td>Laser Guided Training Round (Inert)</td>
<td>250</td>
</tr>
<tr>
<td>2.75-inch Rocket (Inert)</td>
<td>2,500</td>
</tr>
<tr>
<td>5-inch Rocket (Inert)</td>
<td>2,500</td>
</tr>
<tr>
<td>20 mm Training Practice Bullet</td>
<td>22,500</td>
</tr>
<tr>
<td>25 mm Training Practice Bullet</td>
<td>22,500</td>
</tr>
<tr>
<td>7.62 mm Bullet</td>
<td>75,000</td>
</tr>
<tr>
<td>.50 cal Bullet</td>
<td>50,000</td>
</tr>
</tbody>
</table>

*Note: All munitions listed are representative and can be substituted with a similar munition on a one-for-one basis if the substituted munitions are of equal or lesser net explosive weight. Assuming operational parameters (i.e., firing positions, target areas) remain the same and the substituted munitions are of equal or lesser net explosive weight, it is assumed to have a comparable noise profile as the listed munition.

Legend: mm = millimeter; cal = caliber; HE = high explosive; Inert = non explosive.
2.4.1.7 Danger Zones

Under all Tinian action alternatives, three-dimensional areas would be designed that delineate portions of the earth’s surface and the overlying airspace in which personnel and/or equipment may be endangered by ground weapons firing or detonation activities because of ricochet or fragmentation hazard. The size and configuration of the three-dimensional area, called a “surface danger zone,” is dependent on the performance characteristics of a given weapons system, training requirements, range configuration, and geographical location. As described in Section 2.4.1.8, Airspace Requirements, the Federal Aviation Administration would establish Special Use Airspace restrictions above these areas in accordance with Federal Aviation Administration rule-making authority. As described in Section 2.4.1.9, Sea Space Requirements, when a surface danger zone extends over the water, the area would be established as a “danger zone” via the U.S. Army Corps of Engineers rule-making process.

In accordance with the Operational Risk Management process outlined in OPNAV Instruction 3500.39C and Marine Corps Order 3500.27B (DoN 2010a, 2011), the project Range Control staff would implement a variety of mechanisms to manage risk within the surface danger zone, including:

- Develop and clearly mark surface danger zones, which determine the restricted land, airspace, and sea space requirements to laterally and vertically contain projectiles, fragments, debris, and components resulting from the firing of weapons. Surface danger zones over navigable waterways may be marked by buoys if practical; these areas will be noted on nautical charts and are off limits during live-fire training events.

- Prior to conducting training activities, clear public and non-participating personnel from the training area.

- Continually assess the live-fire range operations and update/revise safety measures as needed.

Figure 2.4-17 shows composite surface danger zones for each of the three Tinian action alternatives. Only portions of the surface danger zone that correspond to active training areas would be closed off during training events.

The surface danger zones associated with training operations on Tinian would overlap nearshore waters by approximately 18,280 acres (7,397 hectares) in Tinian Alternative 1, and 20,255 acres (8,197 hectares) in Tinian Alternatives 2 and 3. There would be a small chance that an expended projectile would fall outside of the immediate range footprint, within the surface danger zone. There would be an even smaller chance for an expended projectile to fall within the nearshore waters portion or the fringes of the surface danger zone.

2.4.1.8 Airspace Requirements

Special Use Airspace is required under all alternatives in support of both aviation and ground based training. For descriptions of the affected airspace environment as well as the environmental consequences of the proposed action on airspace, see Sections 3.6, Airspace and 4.6, Airspace, respectively. Special Use Airspace (e.g., Restricted Areas, Military Operations Areas, and Warning Areas) is designated by the Federal Aviation Administration when military training activities warrant special procedures to ensure the safety of all users of the national airspace system.
The proposed airspace is needed to support training with live munitions in the RTA by troops on the
ground and by pilots training in air-to-ground combat tactics. The Special Use Airspace would support:
(1) use of live-fire ground-based weapon systems; (2) Offensive Air Support Range and Close Air Support
Range training; (3) use of a Drop Zone at North Field; (4) training in the operation and use of Unmanned
Aircraft Systems; and (5) use of Landing Zones at North Field, Pina (south of Unai Masalok), base camp,
within Range Complex C, and north of Range Complex C. Operations at Tinian International Airport
would operate in accordance with Federal Aviation Administration flight procedures (these are non-live-
fire activities).

Special Use Airspace is required for all Tinian action alternatives to support the activities listed above.
Two types of Special Use Airspace are proposed to meet the safety and control aspects of military
training at the proposed Tinian RTA: (1) Restricted Areas; and (2) a Military Operations Area.
Establishment of Restricted Areas and a Military Operations Area would provide for safe separation
of military training activities from other users (i.e., civilian/commercial/non-participating military) of
the airspace (Figures 2.4-18 and 2.4-19). The establishment of charted Special Use Airspace with overlying
Air Traffic Control Assigned Airspace would accommodate those weapons systems with vertical hazard
altitudes that could be a danger to other airspace users.

Air Traffic Control Assigned Airspace would be requested on an as-needed basis to extend the vertical
boundaries of the Tinian Military Operations Area. One basic airspace design option provides the
necessary coverage for all three Tinian action alternatives and is depicted in Figure 2.4-18. This airspace
design (i.e., Restricted Areas and Military Operations Area) is proposed that would ensure the safety of
non-participating aircraft while allowing for the continued availability of the training facilities needed to
provide realistic, mission-oriented training. The components of the proposed airspace design are
described in the following paragraphs.

2.4.1.8.1.1 Restricted Areas

A Restricted Area is needed to ensure that non-participating aircraft are segregated from training
activities that are considered hazardous to aircraft operations. Training would involve the use of
munitions during ground-based and aviation training.

A Restricted Area is identified by an area on the surface of the earth with a vertical component within
which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Restricted Areas
denote the existence of unusual hazards to aircraft, often invisible, such as ground and air-to-ground
munitions operations. When activated for use, flying within Restricted Areas without prior authorization
from the using or controlling agency (e.g., the U.S. military or Federal Aviation Administration) is subject
to restrictions.

The proposed Restricted Areas would be scheduled for use, and information on active times would be
provided to the public through existing Federal Aviation Administration Notice to Airmen procedures.
Not all training requires activation of this airspace. However, when live-fire is occurring, some or all of
the Restricted Areas would be “turned on” or activated and non-participating aircraft would be
prohibited from entering or traversing the airspace without positive clearance from the controlling
agency.
Legend

- Surface Danger Zones
- Military Lease Area
- International Broadcasting Bureau (Occupied)
- Proposed Actions:
  - Range Complex
  - Landing Zone
  - Surface Radar Site
  - Observation Post
  - Field Artillery Indirect Firing Position
  - Mortar Firing Position
- Tactical Amphibious Landing Beaches
  - Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
  - Landing Craft Air Cushion, small boat and swimmer training
  - Small boat and swimmer training
  - Proposed Perimeter Road/Firebreak/Buffer Area
  - Proposed Access Road
  - Tracked Vehicle Driver’s Course
  - Convoy Course
  - Drop Zone
  - Base Camp Area, Range Control, and Staging Area
  - Munitions Storage Area
  - Munitions Storage Area Fence
  - Convoy Course Engagement Areas
  - Objective Area
  - Vegetation Cleared Area

Figure 2.4-17
Tinian All Action Alternatives Surface Danger Zones

Alternative 1

Alternative 2

Alternative 3
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Figure 2.4-18
Tinian All Action Alternatives
Special Use Airspace: Two-Dimensional Perspective
Figure 2.4-19

Tinian All Action Alternatives
Special Use Airspace: Three-Dimensional Perspective
The boundaries of each proposed Restricted Areas are based on the location of the live-fire areas and safety zone associated with each area. Safety zones are based on the hazards associated with each type of training. The safety zones and hazard areas are based on the types of munitions to be employed, and the maneuvering space for participating aircraft. The boundaries of each Restricted Area are based on the minimum airspace needed to ensure the safety of non-participating aircraft during different phases of military training.

Restricted Area 7203 is proposed under all Tinian action alternatives. R-7203 is divided into eight segments to support management of the airspace when needed to enable deconfliction with civilian air traffic. Proposed restricted areas above and surrounding Tinian are R-7203 East/West/A/B/C/X/Y/Z as depicted in Figures 2.4-18, 2.4-19, and 2.4-20. Restricted Area segments could be activated individually, collectively, or all together as needed to allow for safety of non-participating aircraft during different phases of military training. All Restricted Areas would be charted from the surface to 18,000 feet (5,486 meters) mean sea level (MSL).

- **Restricted Area 7203 East** could be activated together with the Tinian Military Operations Area through the Notices to Airman process for approximately 2 hours per day and up to 2 weeks per month (or up to 135 days per year). The Tinian Military Operations Area and R-7203E would be used primarily to support fighter aircraft during close air support missions. R-7203E would specifically be used by attack helicopters.

- **Restricted Area 7203 West** could be activated through the Notices to Airman process together with the Tinian Military Operations Area and R-7203E for aircraft activity as described for R-7203E above. However, R-7203W would also be activated independently as needed for live-fire training by ground troops. R-7203W would be activated as needed for some part of up to 140 days per year.

- **Restricted Area 7203 A/B/C** would be charted for use daily from 7:00 a.m. to 10:00 p.m. for up to 140 days per year except for periods during Saipan International Airport Scheduled Jetliner flight activity. R-7203A/B/C would support both aircraft activity and live-fire training by ground troops. When needed outside of these hours, R-7203A/B/C would be activated through the Notices to Airman process.

- **Restricted Area 7203 X/Y/Z** would be charted for use daily from 7:00 a.m. to 10:00 p.m. for up to 140 days per year. Restricted Area 7203 X/Y/Z would support both aircraft activity and live-fire training by ground troops. When needed outside of these hours, R-7203X/Y/Z would be activated through the Notices to Airman process.

Restricted Areas would be activated to the appropriate elevation when live-fire training includes caliber weapons such as 5.56 and 7.62 caliber rifles, 60, 81 or 120 millimeter mortars, artillery, demolitions, unmanned aerial systems and/or close air support training events. Each Restricted Area would be activated as needed from the surface to altitudes between 4,000 feet (1,219 meters) and 18,000 feet (5,182 meters) MSL based on the ranges and weapons to be used and the intent to train with participating aircraft. The proposed Restricted Area would be available for joint use as defined in a Letter of Agreement with the Controlling Agency (e.g., Guam Combined Center/Radar Approach Control and/or Saipan Air Traffic Control).
Figure 2.4-20
Tinian All Action Alternatives
Danger Zones

Legend
- Military Lease Area Boundary
- Danger Zones (Over Water Only)
- Restricted Airspace Area 7203
  - R-7203 East
  - R-7203 West
  - R-7203A
  - R-7203B
  - R-7203C
  - R-7203X
  - R-7203Y
  - R-7203Z

Nautical Mile Scale
0 1 2 4

Kilometer Scale
0 1 2 4
Table 2.4-6 provides a summary of proposed annual operations that various aircraft associated with Tinian RTA training activities would be operating in the proposed Military Operating Area and proposed Restricted Areas around Tinian. Table 2.4-6 does not include air operations associated with military transportation (see Section 2.4.1.5.1, Air Transportation) or civilian aviation activities (see Section 3.13, Transportation).

### Table 2.4-6. All Tinian Action Alternatives Proposed Annual Operations in Special Use Airspace

<table>
<thead>
<tr>
<th>Aircraft Type (Example)</th>
<th>Annual Number of Operations*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7:00 a.m. – 10:00 p.m.</td>
</tr>
<tr>
<td>Fighter (F-15E/F-18/F-16/F-35)</td>
<td>6,000</td>
</tr>
<tr>
<td>Transport Tilt-Rotor (MV-22)</td>
<td>160</td>
</tr>
<tr>
<td>Transport Rotary-Wing (CH-53)</td>
<td>150</td>
</tr>
<tr>
<td>Attack Helicopter (AH-1/H-60)</td>
<td>60</td>
</tr>
<tr>
<td>Transport Fixed-Wing (C-130) (Note 2)</td>
<td>1,200</td>
</tr>
<tr>
<td>Unmanned Aerial Systems (RQ-7B Shadow)</td>
<td>160</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,730</strong></td>
</tr>
</tbody>
</table>

*Notes: *One operation is counted each time an aircraft enters a different airspace unit.

1. Each individual aircraft will use one or more Special Use Airspace areas during the same mission. Each mission typically includes multiple aircraft operating at the same time.

2. Numbers represent Tinian Military Operations Areas; restricted area activity would be less.

### 2.4.1.8.1.2 Military Operations Area

A Military Operations Area with an overlying Air Traffic Control Assigned Airspace is needed in support of rotary- and fixed-wing close air support missions. The Military Operations Area/Air Traffic Control Assigned Airspace would serve as a means to separate air traffic flying under Instrument Flight Rules from military activities, and to alert air traffic flying under Visual Flight Rules where military activity is being conducted.

The Military Operations Area is airspace designated to separate or segregate certain nonhazardous military activities from other air traffic and to identify where and when these activities are conducted. The Military Operations Area is specifically defined to contain nonhazardous, military flight activities including, but not limited to, air combat maneuvers, air intercepts, and low altitude tactics. Airspace of this nature is primarily established over land and offshore but not beyond the U.S. 12-nautical miles (about 22-kilometers) territorial limit.

### 2.4.1.8.1.3 Air Traffic Control Assigned Airspace

Air Traffic Control Assigned Airspace is used to extend the vertical extents of a Military Operations Area into Class A airspace. Class A airspace is generally defined as the airspace from 18,000 feet (5,846 meters) MSL up to and including flight level 600 (approximately 60,000 feet [18,288 meters] MSL). Unless otherwise authorized, all operations in Class A airspace are conducted under instrument flight rules. Air Traffic Control Assigned Airspace is requested from the Federal Aviation Administration’s controlling agency by the U.S. military on an as needed basis. The Federal Aviation Administration releases the airspace for military use when it will not interfere with other users of the airspace.

Under all Tinian action alternatives, the proposed Tinian Military Operations Area is defined by a 12-nautical mile (22-kilometer) boundary, from and parallel to the Tinian shoreline. The proposed Tinian
Military Operations Area would start at an altitude of 3,000 feet (914 meters) MSL and stop at an altitude of up to but not including 18,000 feet (5,486 meters) MSL (see Figure 2.4-19). Overlying the proposed Tinian Military Operations Area, an Air Traffic Control Assigned Airspace would be identified and may be requested for use as needed when the proposed Tinian Military Operations Area is active. This overlying airspace has a floor of 18,000 feet (5,486 meters) MSL and extends to a ceiling of 30,000 feet (9,144 meters) above MSL.

It is anticipated that military training aircraft operations within the proposed Tinian Military Operations Area would occur up to 135 days per year for 1-2 hours per day. (DoN 2014a). The Tinian Military Operations Area and Tinian Air Traffic Control Assigned Airspace would be scheduled for use as needed using the Notice to Airmen process.

Sea space directly supporting and contiguous to certain potentially hazardous training activities (i.e., live-fire ranges on land) is required by 33 CFR Part 334, *Navigable Waters* (Danger Zone and Restricted Area Regulations) to be designated as a danger zone, and published for public safety. A danger zone is a defined water area (or areas) used for hazardous operations. Consistent with military safety requirements, access to danger zones is strictly prohibited while live-fire or dangerous military activities are underway, but would be open to the public when no training is occurring in that zone. Certain portions of the proposed Tinian restricted airspace (i.e., the water area under R-7204A) in general define the lateral boundaries of water areas to be designated as danger zones (see Figure 2.4-17). The U.S. Coast Guard publishes a monthly Notice to Mariners for danger zones, informing the maritime community of hazardous operations in the area.

### 2.4.1.9 Sea Space Requirements

Sea space directly supporting and contiguous to certain potentially hazardous training activities (i.e., live-fire ranges on land) is required by 33 CFR Part 334, *Navigable Waters* (Danger Zone and Restricted Area Regulations) to be designated as a danger zone, and published for public safety. A danger zone is a defined water area (or areas) used for hazardous operations. Consistent with military safety requirements, access to danger zones is strictly prohibited while live-fire or dangerous military activities are underway, but would be open to the public when no training is occurring in that zone. Certain portions of the proposed Tinian restricted airspace (i.e., the water area under R-7204A) in general define the lateral boundaries of water areas to be designated as danger zones (see Figure 2.4-20). The U.S. Coast Guard publishes a monthly Notice to Mariners for danger zones, informing the maritime community of hazardous operations in the area.

### 2.4.2 Tinian Alternative 1

Proposed range and supporting infrastructure configurations for Tinian Alternative 1 are shown in Figure 2.4-21. Under Tinian Alternative 1, the facilities to be constructed, training operations, operations and management, transportation, munitions, danger zones, amphibious operations, airspace requirements, and sea space requirements (i.e., the elements common to all alternatives) would be the same as those described in Section 2.4.1, *Elements Common to All Action Alternatives,* but with the distinctions identified in Sections 2.4.2.1, *Construction and Improvements,* and 2.4.2.2, *Training.* Tinian Alternative 1 is depicted in Figures 2.4-2 through 2.4-11, and 2.4-13 through 2.4-23.
Figure 2.4-21
Tinian Alternative 1 Range Complexes

Philippine Sea

Pacific Ocean

Legend

- Proposed Perimeter Road/Firebreak/Buffer Area
- Proposed Access Road
- Tracked Vehicle Driver’s Course
- Convoy Course
- Drop Zone
- Vegetation Cleared Area
- Base Camp Area, Range Control, and Staging Area
- Munitions Storage Area
- High Hazard Impact Area
- Convoy Course Engagement Areas
- Objective Area

Military Lease Area
International Broadcasting Bureau
Range Complex
A
B
C
D
Munitions Storage Area Fence

Proposed Actions:
- Range Areas
- Landing Zone
- Surface Radar Site
- Observation Post
- Field Artillery Indirect Firing Position
- Mortar Firing Position

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

Mount Lasso
Base Camp
Tinian International Airport

86th Street
96th Street
8th Avenue
42nd Street
Masalok Beach Road
Grand Avenue

Riverside Drive
123rd Street
124th Street

Lake Hagol
Unai Lam Lam
Unai Babui
Unai Chulu
Unai Dankulo
Unai Chiget

- Amphibious Assault Vehicle Landing

Figure 2.4-21
Tinian Alternative 1 Range Complexes

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

NORTH
2.4.2.1 Construction and Improvements

Construction and improvements under this alternative would be the same as those described in Section 2.4.1, Elements Common to All Action Alternatives, with the following distinctions:

- **Range Complex D:** A northern Battle Area Complex along with an associated Urban Assault Course would be constructed (Figure 2.4-22) within North Field. The northern Battle Area Complex increases the overall ground disturbance footprint by approximately 22 acres (9 hectares) for a total of 475 acres (192 hectares). Battle Area Complex construction improvements would include target objectives and lines of sight. In addition, approximately 20 one-story, roofless structures related to the Urban Assault Course (included as the final objective of the Battle Area Complex) would be constructed. The addition of the northern Battle Area Complex inclusive of the Urban Assault Course creates approximately 22 acres (9 hectares) of impervious surface. Historic assets at North Field would be protected during construction of the Battle Area Complex. For further discussion of historic assets at North Field, see Sections 3.11 and 4.11, Cultural Resources.

- **Military Lease Area-wide Training Assets:** The Convoy Course would support six engagement areas that would require ground disturbance of 31 acres (13 hectares) and ground disturbance of 66 acres (28 hectares) along the course (Figure 2.4-23). All of this acreage would be considered newly created impervious surface.

2.4.2.2 Training

Training operations under this alternative would be the same as those described in Section 2.4.1, Elements Common to All Action Alternatives, with the following distinctions:

- **Range Complex D:** Training associated with the northern Battle Area Complex and the Urban Assault Course on North Field would involve personnel movement primarily on foot to the target objectives and firing weapons such as pistols, rifles, shotguns, and machine guns at targets. Due to the continued presence of the International Broadcasting Bureau, the Battle Area Complex would be limited to a smaller area (i.e., North Field) than under the other action alternatives. The presence of the International Broadcasting Bureau would require that weapons be fired away from the facility and thus create a constraint to training. The smaller area, as compared to other alternatives, provides a lower degree of training scenario flexibility. Units are physically constrained when using this smaller Battle Area Complex than if training on a larger Battle Area Complex (i.e., Tinian Alternatives 2 and 3). Historic assets at North Field would be protected during training operations in the Battle Area Complex. For further discussion of historic assets at North Field, see Sections 3.11 and 4.11, Cultural Resources.

- **Military Lease Area-wide Training Assets:** Due to the continued presence of the International Broadcasting Bureau, the Convoy Course would be longer and training would offer fewer engagement areas (six compared to 11) and training scenario options compared to the other Tinian action alternatives. Fewer engagement areas equates to a lower number of unique training opportunities, as each zone provides different threat presentations (i.e., fewer instances of improvised explosive devices, roadblocks, and pop-up targets). Decreased engagement areas decreases the training value of this training asset compared to the other action alternatives.
Lake Hagoi
North Field Drop Zone (453 acres)
- Unmanned Aircraft Systems Ground Station
- Forward Arming and Refueling Point

Unai Lam Lam
Battle Area Complex
(Objective Areas 9 acres)
(Lines of Sight 17 acres)

Urban Assault Course
(Objective Area 13 acres)
(Line of Sight 16 acres)

Legend
- Proposed Perimeter Road/Firebreak/Buffer Area
- Proposed Access Road
- Tracked Vehicle Driver's Course
- Convoy Course
- Drop Zone
- Vegetation Cleared Area
- Urban Assault Course Objective Area
- Objective Area
- Lines of Sight

Proposed Actions:
- Range Areas
- Observation Post
- Field Artillery Indirect Firing Position
- Mortar Firing Position
- Tactical Amphibious Landing Beaches
- Small boat and swimmer training

Drop Zone (453 acres)
- Unmanned Aircraft Systems Ground Station
- Forward Arming and Refueling Point

Figure 2.4-22
Tinian Alternatives 1 and 2
Range Complex D

2-93
Figure 2.4-23
Tinian Alternative 1
Convoy Course

Legend
- Military Lease Area
- Convoy Course (66 acres)
- Convoy Course Engagement Areas (31 acres)
A composite of the surface danger zones that would be generated under Tinian Alternative 1 is shown in Figure 2.4-17. When compared to Tinian Alternative 2, this alternative provides good training value but does not provide as much training flexibility. When compared to Tinian Alternative 3, the training flexibility of Tinian Alternative 1 is slightly less.

2.4.3 Tinian Alternative 2

Proposed range and supporting infrastructure configurations for Tinian Alternative 2 are shown in Figure 2.4-24. Under Tinian Alternative 2, transportation, munitions, amphibious operations, and airspace requirements (i.e., some of the elements common to all alternatives) would be the same as those described in Section 2.4.1, Elements Common to All Action Alternatives. However, there are differences in construction and improvements, and training operations when compared to Tinian Alternative 1 (Section 2.4.2, Tinian Alternative 1). These distinctions are described in the following sections.

2.4.3.1 Construction and Improvements

Construction and improvements under this alternative would be the same as those described in Section 2.4.2, Tinian Alternative 1, with the following distinctions:

- **Range Complex C**: The International Broadcasting Bureau would no longer operate at its current location during the 8 to 10 year construction period. After the International Broadcasting Bureau facility is vacated, the buildings would be emptied for use in training, the antennae would be removed, and a southern Battle Area Complex, along with an associated Urban Assault Course, would be constructed (Figure 2.4-25). The addition of the southern Battle Area Complex increases the ground disturbance footprint to construct the target objectives as well as approximately 20 one-story roofless structures for the Urban Assault Course (included as the final objective of the Battle Area Complex). The increase in ground disturbance would be approximately 77 acres (31 hectares) compared to Tinian Alternative 1 for a total ground disturbance of 157 acres (64 hectares). The additional ground disturbance would be considered newly created impervious surface.

- **Military Lease Area-wide Training Assets**: The Convoy Course would support 11 engagement areas (Figure 2.4-26) compared to 6 under Tinian Alternative 1. The additional engagement areas would increase the ground disturbance footprint by approximately 50 acres (20 hectares) and a decrease in course length as compared to that of Tinian Alternative 1 for a total ground disturbance footprint of 143 acres (58 hectares). The additional ground disturbance would be considered newly created impervious surface.
Figure 2.4-24
Tinian Alternative 2 Range Complexes
Figure 2.4-25
Tinian Alternatives 2 and 3
Range Complex C

Legend
- Military Lease Area
- Proposed Actions:
  - Tracked Vehicle Driver’s Course
  - Convoy Course
  - Base Camp Area, Range Control, and Staging Area
  - Convoy Course Engagement Areas
  - Urban Assault Course - Battle Area Complex
  - Urban Assault Course - Infantry Platoon Battle Course
  - Objective Area - Battle Area Complex
  - Objective Area - Infantry Platoon Battle Course
  - Lines of Sight

- Range Areas
- Landing Zone
- Surface Radar Site
- Observation Post
- Field Artillery Indirect Firing Position
- Mortar Firing Position

0 1,000 2,000
0 200 400

0,000 Feet

0,000 Meters

Tinian International
Airport

Base Camp

8th Avenue

96th Street

Mount Lasso

Urban Assault Course
(Objective Area 11.5 acres)
(Line of Sight 42.9 acres)

Urban Assault Course
(Objective Area 29.1 acres)
(Line of Sight 44.5 acres)

Infantry Platoon Battle Course
(Objective Areas 29.1 acres)
(Line of Sight 44.5 acres)

Battle Area Complex
(Objective Areas 51.5 acres)
(Line of Sight 229.4 acres)

Multipurpose Automated
-Field Fire Range
Unknown Distance Range
(31.0 acres)
Figure 2.4-26
Tinian Alternatives 2 and 3
Convoy Course

Legend
- Military Lease Area
- Convoy Course (62 acres)
- Convoy Course Engagement Areas (81 acres)
2.4.3.2 Training

Training operations under this alternative would be the same as those described in Section 2.4.2, Tinian Alternative 1, with the following distinctions:

- Two Battle Area Complexes would be operable and allow for greater training options and flexibility when compared to Tinian Alternative 1. A northern Battle Area Complex would be located in Range Complex D (same as Tinian Alternative 1). It would emphasize fire and movement towards training objectives. A southern Battle Area Complex would be located in Range Complex C. It would emphasize fire, movement, and maneuvering towards training objectives. Both Battle Area Complexes could be in use at the same time thus providing more flexibility in training than Tinian Alternative 1.

- The addition of the southern Battle Area Complex could impact the way training could occur on the Infantry Platoon Battle Course (and the associated Urban Assault Course) within Range Complex C; however, as described in Section 2.4.1.3, Training Operations, with coordination, both training facilities could be used simultaneously. Similarly, the addition of a second Battle Area Complex in Range Complex C could impact the way training would simultaneously occur within the Military Lease Area due to the increase in the surface danger zones associated with training on Range Complex C. It is anticipated that Range Control personnel and training exercise planners would coordinate training activities to maximize the number of training activities during a given training period.

- Convoy Course training would involve a convoy’s movement along Military Lease Area roads past 11 engagement areas, which provide more training options when compared to Tinian Alternative 1. Increased engagement areas equates to a greater number of unique training opportunities, thus increasing the training value of this training facility. The addition of five engagement areas would impact simultaneity of training in the vicinity of each zone. This is because when an engagement zone is in use, non-participating activities within the surface danger zones would cease. It is anticipated that Range Control personnel and training exercise planners would coordinate training activities to maximize the number of training activities during a given training exercise.

- A composite of the surface danger zones that would be generated under Tinian Alternative 2 is shown in a side-by-side comparison with the other alternatives in Figure 2.4-17. The Alternative 2 surface danger zones would be larger than Tinian Alternative 1, due to the presence of the southern Battle Area Complex. Internal surface danger zones associated with individual training features are the basis for generation of the composite surface danger zones. The internal surface danger zones under Tinian Alternative 2 are the largest among the three alternatives, due to the presence of the northern and southern Battle Area Complexes and the 11 Convoy Course engagement areas.
2.4.4 Tinian Alternative 3

Proposed range and supporting infrastructure configurations for Tinian Alternative 3 are shown in Figure 2.4-27. Under Tinian Alternative 3, transportation, munitions, amphibious operations, and airspace requirements (i.e., some of the elements common to all alternatives) would be the same as those described in Section 2.4.1, Elements Common to All Action Alternatives. However, there are differences in construction and improvements and training operations when compared to Tinian Alternative 1 (Section 2.4.2, Tinian Alternative 1).

2.4.4.1 Construction and Improvements

Construction and improvements under this alternative would be the same as those described in Section 2.4.2, Tinian Alternative 1, with the following distinctions:

- **Range Complex C**: Range Complex C would be the same as that described in Section 2.4.3, Tinian Alternative 2.

- **Range Complex D**: The northern Battle Area Complex and the associated Urban Assault Course (the final objective of the Battle Area Complex) included in Tinian Alternative 1 would not be established (see Figure 2.4-12). The overall ground disturbance footprint would be reduced by approximately 22 acres (9 hectares) compared to Tinian Alternative 1 for a total ground disturbance footprint of 453 acres (183 hectares).

- **Military Lease Area-wide Training Assets**: The Convoy Course would be the same as that described in Section 2.4.3, Tinian Alternative 2.

2.4.4.2 Training

Training under this alternative would be the same as those described in Section 2.4.2, Tinian Alternative 1, with the following distinctions:

- Battle Area Complex training would be limited to a single southern Battle Area Complex within Range Complex C, as there would be no northern Battle Area Complex in Range Complex D. Compared to the northern Battle Area Complex (Tinian Alternatives 1 and 2), the southern Battle Area Complex is larger and offers a wider array of training options. This factor provides greater potential training value under Tinian Alternative 3 than that found under Tinian Alternative 1.

- Aviation training at Range Complex D would be less constrained because there would be no Battle Area Complex or Urban Assault Training (i.e., no live-fire training) within Range Complex D.
Figure 2.4-27
Tinian Alternative 3 Range Complexes

Legend

Proposed Actions:
- Range Areas
- Landing Zone
- Surface Radar Site
- Observation Post
- Field Artillery Indirect Firing Position
- Mortar Firing Position

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

Proposed Perimeter Road/Firebreak/Buffer Area
Proposed Access Road
Tracked Vehicle Driver's Course
Convoy Course
Drop Zone
Base Camp Area, Range Control, and Staging Area
Munitions Storage Area
High Hazard Impact Area
Convoy Course Engagement Areas
Objective Area
Vegetation Cleared Area

Legend

Military Lease Area
International Broadcasting Bureau
Range Complex
A
B
C
D
Munitions Storage Area Fence

Philippine Sea

Pacific Ocean

Unai Lam Lam
Unai Babai
Unai Chulu
Lake Hagoi
International Broadcasting Bureau (Not Occupied)
Lamanobt Bay
Unai Chiget
Tinian International Airport

Figure 2.4-27
Tinian Alternative 3 Range Complexes

0 0.5 1 2
0 0.5 1 2

Miles
Kilometers

NORTH
Convoy Course training would be the same as described under Tinian Alternative 2 (see Section 2.4.3.2, Training).

- A composite of the surface danger zones that would be generated under Tinian Alternative 3 is shown in a side-by-side comparison of the alternatives in Figure 2.4-17. The Tinian Alternative 3 surface danger zones would be larger than Tinian Alternative 1 due to the presence of the southern Battle Area Complex and additional engagement areas associated with the Convoy Course. Although the composite of the surface danger zones is the same under Tinian Alternative 2, the individual surface danger zones associated with the ranges under Tinian Alternative 3 are smaller due to the absence of the northern Battle Area Complex.

### 2.4.5 Tinian No-Action Alternative

Section 1502.14(d) of Council on Environmental Quality regulations implementing NEPA requires an EIS/OEIS to analyze the no-action alternative. No action means that the proposed action would not take place. Analysis of the no-action alternative provides a benchmark, enabling decision-makers to compare the magnitude of the environmental effects of the proposed action or alternatives versus the potential impacts if no action were implemented. In many projects, a no-action alternative is the same as the description of the existing condition. However, in the case of this proposed action, the no-action alternative would not be a static situation but represents the continuation of having military training exercises on Tinian as well as the implementation of training ranges and operations that have been documented in recent Records of Decisions for other NEPA actions.

The no-action alternative would continue current training activities on Tinian, including those contained in other Department of Defense documents such as the Mariana Islands Range Complex EIS/OEIS (July 2010 Record of Decision, DoN 2010b), and would complete construction of four live-fire ranges on Tinian contained in the September 2010 Record of Decision in the Guam and CNMI Military Relocation EIS/OEIS (DoN and Department of the Army 2010). These activities are summarized in Table 2.4-7 and below.

<table>
<thead>
<tr>
<th>Training Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mariana Islands Range Complex EIS/OEIS</strong> (see Tables 2-7 and 2-8 in the EIS/OEIS)</td>
<td>The battalion and its combat and service support units deploy to field locations to conduct tactical training activities under simulated combat conditions.</td>
</tr>
<tr>
<td><strong>Field Training Exercise</strong></td>
<td>Training conducted to gain a tactical advantage over the enemy; it is not aimed at seizing the beach but expanding the battle space.</td>
</tr>
<tr>
<td><strong>Ship to Objective Maneuver</strong></td>
<td>Training activities are conducted when directed by the Departments of State and Defense, or other appropriate authority whereby noncombatants are evacuated from foreign countries to safe havens or to the U.S., when their lives are endangered by war, civil unrest, or natural disaster.</td>
</tr>
<tr>
<td><strong>Noncombatant Evacuation Operation</strong></td>
<td>This training provides helicopter support for Command and Control, assault escort, troop lift/logistics, reconnaissance, search and rescues, medical evacuation, reconnaissance team insertion/extract, and helicopter coordinator duties.</td>
</tr>
<tr>
<td><strong>Reconnaissance and Surveillance</strong></td>
<td>Activity conducted to evaluate the battlefield and enemy forces, and to gather intelligence.</td>
</tr>
</tbody>
</table>
Table 2.4-7. Summary of No-Action Alternative Training on Tinian Exclusive Military Use Area by U.S. Air Force, Army, Marine Corps, Navy, and Guam National Guard/Reserve

<table>
<thead>
<tr>
<th>Training Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combat Search and Rescue</td>
<td>Train rescue forces personnel in the tasks needed to be performed to affect the recovery of distressed personnel during war or military operations other than war.</td>
</tr>
</tbody>
</table>

Current Training Activities Occurring on Tinian Categorical Exclusion

- **Geiger Fury**: The Marine Corps conducts aviation and expeditionary force training exercises on Tinian and Pagan. For components not specifically covered under the Mariana Islands Range Complex EIS/OEIS, Joint Region Marianas prepared a Categorical Exclusion document, conducted Section 106 consultation, and ensured compliance with all regulations.

- **Forager Fury**
- **Forager Fury II**
- **Forager Fury III**

**Guam and CNMI Relocation EIS/OEIS** (see Table 2.3-1 in the Guam and CNMI Relocation EIS)

- **Known Distance Range**: This range trains personnel on the skills necessary to identify, engage, and hit stationary targets from a known distance with a rifle.

- **Automated Combat Pistol/Military Police Firearms Qualification**: This range is designed to meet training and qualification requirements with combat pistols and revolvers and used to train and test personnel on the skills necessary to identify, engage, and hit stationary infantry targets.

- **Field Firing Range**: This range supports training in target engagement techniques with the rifle, including identifying, engaging, and hitting stationary infantry targets.

- **Platoon Battle Course**: A range designed for training and qualifying infantry platoons, either mounted or dismounted, on movement techniques and operations. This course trains and tests platoons on the skills necessary to conduct tactical movement techniques, detect, identify, engage, and defeat stationary and moving infantry targets in a tactical array.

**2.4.5.1 Mariana Islands Range Complex**

The Mariana Islands Range Complex consists of three primary components: ocean surface and undersea areas, training land areas, and Special Use Airspace.

1. The ocean surface and undersea areas extending from waters south of Guam to north of Pagan and from the Pacific Ocean east of the Mariana Islands to the middle of the Philippine Sea to the west, encompassing 501,873 square nautical miles (1,299,851 square kilometers) of open ocean and littorals (coastal areas).

2. The range complex including training area/facilities on Guam, Rota, Tinian, Saipan, and Farallon de Medinilla, encompassing 64 square nautical miles (220 square kilometers) of land.

The Special Use Airspace consisting of Warning Area 517 (W-517), restricted airspace over Farallon de Medinilla (R-7201), and Air Traffic Control Assigned Airspace encompassing 63,000 square nautical miles (216,360 square kilometers) of airspace, including over Tinian.

The *Mariana Islands Range Complex Final EIS/OEIS* (DoN 2010c) documented the intent to have increased training activities in the Mariana Islands Range Complex as a result of upgrades and modernization of existing training areas and the requirement to meet new training and capability requirements for personnel and platforms. The increase involves an overall increase in the number and types of events (including major exercises, the Intelligence, Surveillance and Reconnaissance/Strike Air Force initiative at Andersen Air Force Base, other services and agencies (Marine Corps, U.S. Coast Guard,
Department of Homeland Security, and the participation of the allied forces in major exercises in the Mariana Islands Range Complex. Activities will also increase as a result of the acquisition to and development of new Portable Underwater Tracking Range capabilities supporting Anti-Submarine Warfare, and new facility capabilities supporting Military Operations in Urban Terrain training.

On pages 2-31 to 2-41 of the *Mariana Islands Range Complex Final EIS/OEIS* (DoN 2010c), there is more detailed descriptions of the above referenced training activities in the Mariana Islands Range Complex.

### 2.4.5.2  Current Training Operations on Tinian

Since issuance of the *Mariana Islands Range Complex EIS/OEIS* (July 2010 Record of Decision, DoN 2010b) and the *Guam and CNMI Military Relocation EIS/OEIS* (DoN and Army 2010), the Department of Defense has held a number of training operations on Tinian beginning in 2012. As described below, the “Fury” series of exercises held on Tinian generally featured communications set up and air traffic control at North Field, training at West Field, tactical water purification system set up for generating potable water, fuel bladders for refueling aircraft, clearing of vegetation for runways (except for Forager Fury II), and 72-hour surge operations for intense training activity (except for Forager Fury III).

#### 2.4.5.2.1  Geiger Fury

Held on Tinian from 13 May to 8 June 2012, Geiger Fury was an exercise for about 200 Marines in landing in a remote area and establishing an airfield that can refuel aircraft. The expeditionary exercise involved setting up a forward operating base, reviving (clearing vegetation on) an abandoned airfield (Baker), practicing arrestments of F/A-18 landings at West Field, and landing a KC-130J Hercules aircraft on Runway Baker in North Field. The training involved three full squadrons of F/A-18s and a squadron of wing support. To refuel aircraft, the exercise installed a Tactical Air Fueling Dispensing System able to hold up to 60,000 gallons (227,125 liters) of fuel.

#### 2.4.5.2.2  Forager Fury I

Conducted on Tinian from 27 November to 12 December 2012, Forager Fury I involved training Marines on tactical aviation and aviation ground support in order to further develop a distributed expeditionary combat capability within the Mariana Islands Range Complex. It included F/A-18 Hornet jet squadrons, wing support detachments, and elements of III Marine Expeditionary Force, 1st Marine Aircraft Wing, 9th Engineer Support Battalion, 3rd Marine Logistics Group and Marine Medium Tilt-rotor Squadron 265. Forager Fury I did not involve clearing new runways; it continued training on the previously cleared West Field runway.

#### 2.4.5.2.3  Forager Fury II

Forager Fury II was conducted on Tinian from 02 to 20 December 2013. This eighteen day exercise featured approximately Marines, Airmen and Sailors establishing a forward arming and refueling point at two locations for rapid refueling of fixed-wing and rotary aircraft and returning them to a simulated fight protecting Tinian from enemy aircraft while responding to a ground invasion on Guam. The exercise featured F/A-18A++ Hornets, F/A-18Cs, F/A-18Ds, KC-130J Super Hercules, and MV-22B Ospreys. The exercise also involved clearing 161 acres of overgrowth vegetation on Tinian from the Echo and Delta runways at North Field and their interconnecting access roads.
2.4.5.2.4 Valiant Shield

Valiant Shield was a biennial joint forces exercise of about 450 Marines, Navy, and Guam National Guardsmen training for detecting, locating, tracking, and engaging units at sea, in the air, on land, and in cyberspace in response to a range of mission areas. This exercise was held from 15 to 23 September 2014 on Tinian with some participants arriving on 22 August.

2.4.5.2.5 Forager Fury III

From 24 September to 6 October 2014, Forager Fury III had approximately 517 Marines on Tinian undergoing tactical aviation and aviation ground support training for fixed-wing and rotary aircraft. The mission included setting up a forward operating base, preparing an airstrip, and providing support for all units. The exercise involved clearing Echo Field, landing a KC130J Super Hercules, unloading hundreds of pieces of gear, transporting fuel and fueling equipment, practicing expeditionary arrested landings, refueling, and parking aircraft, such as Navy SH-60S helicopter. Participants also trained in defending forward deployed operations.

2.4.5.3 Additional Ranges and Training

Under the September 2010 Record of Decision in the Guam and CNMI Military Relocation Final EIS/OEIS (DoN and Department of the Army 2010), training operations on Tinian would support up to company-level (200 Marines or larger) sustainment training for Marine Corps forces on Guam. Company and battalion level live-fire and non-live-fire trainings areas already exist and are utilized on these leased Tinian parcels. These leased parcels would also be developed to accommodate four new limited live-fire training ranges capable of handling small unit combat skills training. The use of ranges on Tinian will be as an expeditionary setting, operating on a largely self-sustaining basis with very little infrastructure and support staff (Joint Guam Program Office Record of Decision, pages 9-10). Since the 2010 Record of Decision, these four proposed ranges have not been programmed into budgeting or undergone detailed planning. It also should be noted that the footprint where these live-fire training were proposed in the 2010 Record of Decision would be used for different purposes under the proposed action of this EIS/OEIS. As a result, the four proposed live-fire training ranges under the 2010 Record of Decision are not in addition to those proposed in this proposed action. The following provides some details of each of the ranges documented in the 2010 Record of Decision. Figure 2.4-28 displays the location of these approved ranges. For more information on impacts and mitigation measures of these proposed actions, refer to the Guam and CNMI Military Relocation Final EIS (DoN 2010d).

2.4.5.3.1 Rifle Known Distance Range (5.56 millimeter, 1,000 yards [914 meters])

This range is intended for rifle marksmanship training and target engagement techniques. It would be used to train personnel on the skills necessary to identify, engage, and hit stationary targets in a static array from a known distance. This range would supplement the Known Distance range on Guam (refer to Volume 2, Chapter 2, Section 2.3 of the 2010 Final EIS) by providing capability for the required eventual use of up to 1,000 yards (914 meters). Twenty-five firing points would be constructed, with a range width of 100 yards (91 meters) and a length of 1,000 yards (914 meters). Firing line berms and back-stop berms would be constructed, along with sanitary facilities provided for shooters and target pullers.
Figure 2.4-28
Tinian No-Action Alternative
(Four Ranges in 2010 Record of Decision)
The range area would be subject to grading for line of sight and management of vegetation by periodic cutting. The total distance of ground disturbing activities is approximately 1,050 yards (960 meters) by 100 yards (91 meters), or 22 acres (9 hectares). The notional surface danger zone for this range, limited to firing of 5.56-millimeter ammunition, would extend 2.17 miles (3.5 kilometers) horizontally, with a vertical hazard distance of 388 yards (355 meters).

2.4.5.3.2 Automated Combat Pistol/Military Police Firearms Qualification Course

This range is intended to meet training and qualification requirements with combat pistols and revolvers and used to train and test personnel on the skills necessary to identify, engage, and hit stationary infantry targets. All targets would be fully automated for scored training. This range would supplement the Pistol Known Distance Qualification Course located on Guam. The range would be suitable for 9-millimeter and .45 caliber weapons. Up to 25 firing points would be constructed, with a maximum range distance of 50 yards (46 meters). The total distance of ground disturbing activities would be approximately 55 yards by 50 yards (50 meters by 46 meters), or 0.6 acre (0.2 hectare). The notional surface danger zone for this range would extend 1.12 miles (1.8 kilometers horizontally, with a vertical hazard of 109 yards [100 meters]).

2.4.5.3.3 Platoon Battle Course

This range is intended for the training and qualification requirements of infantry platoons, either mounted or dismounted, on movement techniques and operations. This course would be used to train and test platoons on the skills necessary to conduct tactical movement techniques, detect, identify, engage, and defeat stationary and moving infantry targets in a tactical array. Targets would not be fully automated and would not have the capability to execute computer driven/scored training scenarios. This course would provide the capacity for small units up to approximately 40 personnel to train in tactical scenarios, engaging targets at varying distances and angles while moving. There is no such range on Guam because the required range footprint and surface danger zones exceed available land areas. Weapons that would be used on this range are those found at the platoon level that is 5.56-millimeter carbines and rifles and Squad Automatic Weapons. The range footprint would be approximately 1,312-yards (1,200-meters) long and 656 yards (600 meters) wide, encompassing approximately 178 acres (72 hectares). Within that footprint, target pits, access ways, and back stops would be constructed.

For operation of the targets and safety management of the range, the notional surface danger zone would extend 2.17 miles (3.5 kilometers) from the farthest firing position down range, with a vertical hazard distance of 388 yards (355 meters). The notional surface danger zone for this range reflects control of the target engagement distance to maintain lateral limits of fire to 30 degrees on either flank of the range.

2.4.5.3.4 Field Firing Range

This range is intended to support training target engagement techniques with the rifle, including identifying, engaging, and hitting stationary infantry targets. This would be a scored range with automated targets for use with the 5.56-millimeter rifle, but also would be suitable for the M4 Carbine and Squad Automatic Weapons. The proposed range would be approximately 219-yards (200-meter) wide by 547-yards (500-meters) long, or approximately 25 acres (10 hectares). The length of the surface danger zone is approximately 2.17-miles (3.5-kilometers) long from the firing line and 388-yards (355-
meters) vertically. More information can be found in Volume 3, of the Guam and CNMI Military Relocation Final EIS/OEIS (DoN 2010d), for further details on the anticipated environmental impacts, and the September 2010 Record of Decision in the Guam and CNMI Military Relocation EIS/OEIS (DoN and Army 2010) for further details on mitigation measure commitments regarding these ranges.

In conclusion, under the no-action alternative in this EIS/OEIS, the suite of proposed Tinian RTA and Pagan RTA would not be constructed. The identified training deficit would persist, and the existing Western Pacific RTAs would remain insufficient to support U.S. Pacific Command Service Components’ Title 10 training requirements for the region. Per Council on Environmental Quality regulations, the no-action alternative is carried forward for analysis in this EIS/OEIS.

### 2.4.6 Summary Comparison of Tinian Alternatives

Table 2.4-8 provides a summary comparison of the proposed action elements for each of the three Tinian action alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Comparison of Tinian Action Alternatives</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Differences</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Lacks a southern Battle Area Complex.</td>
<td></td>
<td>• Includes a southern Battle Area Complex.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Includes a northern Battle Area Complex.</td>
<td>• Lacks a northern Battle Area Complex.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 6 Convoy Course engagement areas.</td>
<td></td>
<td>• 11 Convoy Course engagement areas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• International Broadcasting Bureau present. Limits some weapons employment in Range Complexes C and D.</td>
<td>• International Broadcasting Bureau absent. Allows for full array of weapons employment in Range Complexes C and D.</td>
<td>• International Broadcasting Bureau absent. Allows for full array of weapons employment in Range Complexes C.</td>
<td>• No extensive development of land, sea and air live-fire training ranges and exercises.</td>
<td>• Continued limited military training exercises in the MLA pursuant to recent regional NEPA document.</td>
</tr>
<tr>
<td>• Surface danger zones supports live-fire ranges over land and over water.</td>
<td>• Surface danger zones larger than Alternative 1.</td>
<td></td>
<td>• Possible future development of four live-fire training ranges..</td>
<td>• Surface danger zones support live-fire training; smaller than the action alternatives.</td>
</tr>
</tbody>
</table>
### Table 2.4-8. Summary Comparison of Action Tinian Alternatives

#### Comparison of Tinian Action Alternatives

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Simultaneous Use</strong></td>
<td>• Simultaneous use of training assets coordinated with Range Control and training exercise planners to maximize training for participants.</td>
<td>• Presence of two Battle Area Complexes provides most training options.</td>
<td>• Presence of one (southern) Battle Area Complex limits training options.</td>
<td>• Limited existing periodic training exercises would not require extensive management of simultaneous use</td>
</tr>
<tr>
<td></td>
<td>• Presence of one (northern) Battle Area Complex limits training options.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Training Value</strong></td>
<td>• International Broadcasting Bureau presence limits some of the firing directions that could be used in Range Complexes C and D.</td>
<td>• International Broadcasting Bureau absence allows for full array of weapons employment in Range Complex C and D.</td>
<td>• International Broadcasting Bureau absence allows for full array of weapons employment in Range Complex C.</td>
<td>• Limited training value, but continued importance of Tinian MLA for periodic training is critical</td>
</tr>
<tr>
<td></td>
<td>• Fewer Convoy Course engagement areas.</td>
<td>• The full array of RTA training facilities available providing greater flexibility in training activities across all range complexes.</td>
<td>• The southern Battle Area Complex affords more training options than the northern Battle Area Complex when compared to Alternative 1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No southern Battle Area Complex in Range Complex C.</td>
<td>• Increased number of trainees actively training at any given time compared to Alternatives 1 and 3.</td>
<td>• Affords a lesser degree of training value when compared to Alternative 2, but more than Alternative 1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• A lesser degree of training options when compared to Alternatives 2 and 3.</td>
<td>• Greatest training value when compared to Alternatives 1 and 3.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Elements Common to All Tinian Action Alternatives

<table>
<thead>
<tr>
<th>Training Facilities Construction</th>
<th>Alternatives 1, 2, and 3</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Camp</strong></td>
<td>Includes headquarters, administrative, and range control facilities; permanent barracks and temporary facilities for personnel; security facilities; warehouse; equipment storage; weapons armory; staging area; a Landing Zone; and utilities infrastructure.</td>
<td>Not Planned</td>
</tr>
<tr>
<td><strong>Munitions Storage Area</strong></td>
<td>Includes controlled entry, fencing, assembly, holding and storage facilities, explosive safety stand-off, and communications infrastructure.</td>
<td>Not Planned</td>
</tr>
<tr>
<td><strong>Airport Improvements</strong></td>
<td>Includes tactical aircraft parking ramp, cargo aircraft parking ramp, connecting taxiways, ordnance arming and de-arming pads, hot cargo pad/combat aircraft loading area, expeditionary/temporary refueling area, arresting gear pads, munitions holding pads, taxiway crossings, access roads connecting to the airfield, field carrier landing practice pad, and landing helicopter dock pad, primarily on the north side of the airport.</td>
<td>Not Planned</td>
</tr>
<tr>
<td>Training Facilities Construction</td>
<td>Alternatives 1, 2, and 3</td>
<td>No-Action Alternative</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td><strong>Port Improvements</strong></td>
<td></td>
<td><strong>Not planned</strong></td>
</tr>
<tr>
<td>Includes on-shore boat ramp improvements, biosecurity facility, bulk fuel storage, upgrades of access roads from the port to the Military Lease Area for heavy equipment and vehicle movement, tracked vehicle transit, and utilities infrastructure.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Access Road Improvements, Fence Lines, Gates | **Limited upgrades** | **Limited upgrades** |
| Access road improvements throughout the Military Lease Area. Fencing along the southern Military Lease Area boundary and around the base camp, airfield, munitions storage area, and the High Hazard Impact Area. |

| **Utility Improvements** | **Not planned** | **Not planned** |
| Electrical power—distribution system from the power plant to facilities in the Military Lease Area, base camp, Munitions Storage Area, range/target activities, Range Control, etc. Lines would be either underground or overhead. |
| Potable Water—new dedicated military water supply system to support proposed action within the Military Lease Area plus improvements to existing Commonwealth Utilities Corporation water system to serve the proposed Port of Tinian facilities. |
| Wastewater—new wastewater treatment plant and disposal facilities at the base camp with an underground sewer system; septic system at the Munitions Storage Area; portable toilets across the RTA, Port and Tinian International Airport for trainee use that would be transferred to the base camp treatment and disposal system; holding tank for wastewater generated at the biosecurity building at the port; treatment and disposal for vehicle wash water at the proposed vehicle wash down facility at Port of Tinian. |
| Communications—install overhead and underground lines to the base camp, Range Control facilities, Munitions Storage Area, port facilities, IT&E cable landing facility on Broadway. |
| Solid Waste—proposed base camp transfer station and recycling center. |

| Tactical Amphibious Beach Landing | **Not planned** | **Not planned** |
| Construct an underwater tactical amphibious beach landing area for Amphibious Assault Vehicles at Unai Chulu. Construction would modify the seafloor (i.e., limestone, coral reef) by contouring landing area to create a pile-armored ramp. |

<table>
<thead>
<tr>
<th>Range Operations and Maintenance</th>
<th>Alternatives 1, 2, and 3</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>Approximately 95 personnel would work year-round supporting RTA operations and maintenance activities.</td>
<td><strong>Not planned</strong></td>
</tr>
<tr>
<td>Public Access</td>
<td>Common to all alternatives would be the prohibition of public access at any time to the High Hazard Impact Area (includes portions of Broadway Avenue), Munitions Storage Area, base camp, the Range Observation Posts and Surface Radar sites. Only certain portions of the Military Lease Area would be open during the training periods. As training cycles are better defined, an access plan would be developed and published for public information.</td>
<td><strong>Public access would be limited during periodic training exercises (Broadway Avenue to remain open when ranges are not in use.)</strong></td>
</tr>
<tr>
<td>Security</td>
<td>Fences and monitoring systems would ensure safety and security within Military Lease Area boundaries. Only certain portions of the Military Lease Area would be open during the training periods. As training cycles are better defined, an access plan would be developed and published for public information.</td>
<td><strong>Existing security during periodic military training exercises</strong></td>
</tr>
</tbody>
</table>
### Table 2.4-8. Summary Comparison of Action Tinian Alternatives

<table>
<thead>
<tr>
<th></th>
<th>Alternatives 1, 2, and 3</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Range Operations and Maintenance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biosecurity</td>
<td>Biosecurity protocols would be established for personnel, cargo, and equipment arriving on Tinian. Specific protocols for logistics movements and tactical movements would be developed. Washdown and inspection areas would be established.</td>
<td>Biosecurity would be done for periodic training exercises</td>
</tr>
<tr>
<td>Emergency Services</td>
<td>Military fire and safety services would be established as well as medical emergency procedures.</td>
<td>No emergency services established</td>
</tr>
<tr>
<td>Transportation</td>
<td>Various roads and trails would be improved. Aircraft and marine operations would be conducted for arriving and departing personnel, equipment, cargo, and fuel.</td>
<td>Limited upgrades</td>
</tr>
<tr>
<td><strong>Munitions</strong></td>
<td>Total: 4,882,013 rounds/year</td>
<td>Total: 3,280,000 rounds/year*</td>
</tr>
<tr>
<td><strong>Amphibious Training Beaches</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operations</strong></td>
<td>The following amphibious operations would occur:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Unai Chulu – Amphibious Assault Vehicle landings, Landing Craft Air Cushion vessel landings, swimmer training and insertions, and small boat landings</td>
<td>• Administrative landings of Amphibious Assault Vehicles at the Port of Tinian</td>
</tr>
<tr>
<td></td>
<td>• Unai Babui and Unai Masalok would be used for Landing Craft Air Cushion vessel landings, swimmer training and insertions, and small boat landings.</td>
<td>• Swimmer training and insertions and small boat landings</td>
</tr>
<tr>
<td></td>
<td>• Unai Lam Lam would be used for swimmer training and insertions, and small boat landings.</td>
<td></td>
</tr>
<tr>
<td><strong>Airspace Requirement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operations</strong></td>
<td>Special Use Airspace would be established.</td>
<td>Limited to actions in periodic military training exercises</td>
</tr>
<tr>
<td></td>
<td>• Restricted Area 7203 East/West/A/B/C/X/Y/Z would be established and activated from the surface to various altitudes based on the training being conducted, up to a maximum of 18,000 feet (5,486 meters) MSL.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tinian Military Operations Area would extend 12 nautical miles (22 kilometers) from the Tinian shoreline. The floor would start at 3,000 feet (914 meters) MSL and extend to a ceiling of up to a maximum of 18,000 feet (5,486 meters).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• An Air Traffic Control Assigned Airspace would be activated whenever military operations are occurring in the Military Operations Area. This overlying airspace starts at the Military Operations Area ceiling (at 18,000 feet [5,486 meters]) and extends to 30,000 feet (9,144 meters).</td>
<td></td>
</tr>
<tr>
<td><strong>Sea Space Requirement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operations</strong></td>
<td>Danger zones would be established using the Tinian Restricted Area boundaries. These danger zones would be activated when corresponding airspace is activated.</td>
<td>Limited to actions in periodic military training exercises</td>
</tr>
</tbody>
</table>
### Table 2.4-8. Summary Comparison of Action Tinian Alternatives

<table>
<thead>
<tr>
<th>Comparison of Tinian All Action Alternatives: Ground Disturbance and Newly Created Impervious Surfaces</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Ground Disturbance/Newly Created Impervious Surface</strong></td>
<td>Total: 1,902 acres (771 hectares)/662 acres (270 hectares)</td>
<td>Total: 2,025 acres (820 hectares)/784 acres (319 hectares)</td>
<td>Total: 2,003 acres (811 hectares)/763 acres (310 hectares)</td>
<td>225 acres (91 hectares)* plus periodic short term and minor ground disturbances</td>
</tr>
<tr>
<td><strong>Base Camp</strong></td>
<td>257 acres (104 hectares) only 30 acres (12 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Munitions Storage Area</strong></td>
<td>38 acres (15 hectares) only 8 acres (3 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Airfield Improvements (Tinian International Airport)</strong></td>
<td>41 acres (17 hectares) only 41 acres (17 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Port of Tinian Improvements</strong></td>
<td>5 acres (2 hectares) only 5 acres (2 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Roadway Improvements</strong></td>
<td>133 acres (53 hectares) only 133 acres (53 hectares) would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Range Complex A</strong></td>
<td>527 acres (213 hectares)</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Range Complex B</strong></td>
<td>47 acres (20 hectares) all of which would be considered newly created impervious surface</td>
<td>Same as Alternative 1</td>
<td>Same as Alternative 1</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
### 2.5 PAGAN ALTERNATIVES

Two Pagan combined level RTA alternatives (herein after referred to as the “Pagan action alternatives”) that, when combined with a Tinian action alternative, meet the purpose and need were identified. The following describes the Pagan action alternatives including elements common to all alternatives and details relating to each of the action alternatives and a no-action alternative. Figure 2.5-1 provides an aerial photograph showing the island and key place names.

#### 2.5.1 Elements Common to All Action Alternatives

Elements common to both Pagan action alternatives include: (1) Land Use Agreements, (2) Construction and Improvements; (3) Training Operations; (4) Operations and Management; (5) Transportation; (6) Munitions; (7) Danger Zones; (8) Amphibious Operations; (9) Airspace Requirements; and (10) Sea Space Requirements. As with Tinian, best management practices could be incorporated into the proposed action and common to both Pagan action alternatives.

##### 2.5.1.1 Land Use Agreements

Land use agreements will be required to implement the proposed action on Pagan. Pagan is owned entirely by the CNMI government. There are no federal lands on the island. The federal government would seek to acquire a real estate interest for the entire island of Pagan (approximately 11,794 acres [4,443 hectares]) from the CNMI government. A full discussion of proposed land acquisition and land uses on Pagan is provided in Section 4.7, *Land and Submerged Land Use*. 

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Table 2.4-8. Summary Comparison of Action Tinian Alternatives

<table>
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<tr>
<th>Comparison of Tinian All Action Alternatives: Ground Disturbance and Newly Created Impervious Surfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative 1</strong></td>
</tr>
<tr>
<td><strong>Range Complex C</strong></td>
</tr>
<tr>
<td><strong>Range Complex D</strong></td>
</tr>
<tr>
<td><strong>Military Lease Area-wide</strong></td>
</tr>
</tbody>
</table>

*Note:* *DoN 2010d*
South Beach

North Beach

Laguna Sanhalom

Laguna Sanhiyon

Blue Beach

Red Beach

Green Beach

South Pagan Volcano

Minami Saki (South Point)

Kutake Yashi

Mount Maru

Mount Togari

Mount Pagan

Gold Beach

Laguna Sanhalom

Figure 2.5-1
Pagan Location Map

Philippine Sea

Pacific Ocean

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
2.5.1.2 Construction and Improvements

Construction and improvements at Pagan RTA would commence only upon completion of required real estate actions. Construction is anticipated to span 8 to 10 years. Construction improvements may be part of initial training exercises on Pagan, and subsequent training events would include maintenance. Construction and improvements for the Pagan action alternatives include two broad categories: (1) support facilities and infrastructure, and (2) training facilities. These are further described below:

**Support Facilities and Infrastructure Construction.** Support facilities to be constructed include an expeditionary base camp/bivouac area, airfield, expeditionary military training trails, and a temporary Munitions Storage Area. These are described in Sections 2.5.1.2.1, Expeditionary Base Camp/Bivouac Area, through 2.5.1.2.4, Military Training Trails.

**Training Facilities Construction.** The combined level RTA is composed of High Hazard Impact Area(s), maneuver areas, amphibious training beaches, and Landing Zones, regardless of the alternative. To provide the reader with an easier way to identify the various RTA training facilities, they were grouped into two range complexes based on geographic proximity. The complexes are labeled North and South Range Complexes and are described in Sections 2.5.1.2.5, North Range Complex Construction and 2.5.1.2.6, South Range Complex Construction. The following provides a general description of the complexes; the depictions and differences in their composition are highlighted under each of the action alternative descriptions (Section 2.5.2, Pagan Alternative 1, and Section 2.5.3, Pagan Alternative 2).

2.5.1.2.1 Expeditionary Base Camp/Bivouac Area

An area adjacent to the existing airfield is planned for an expeditionary base camp/bivouac area. It would be large enough to provide space for up to 2,200 personnel, with additional surge capacity to accommodate up to 4,000 personnel (Figure 2.5-2). There would be no permanent buildings; only minimal facilities (e.g., established tent pads). A bivouac area would consist of crushed and compacted lava rock.

Training units would provide their own power sources such as mobile diesel engine electric power generator sets. Potable water sources would be employed by the units, either carried with them or produced through methods such as a reverse osmosis (sea water can be desalinated with a Marine Corps Tactical Water Purification System, or similar system). Wastewater would be managed with the use of field sanitation devices and expeditionary procedures described in the Marianas Training Manual. The primary sanitation device for human waste disposal would be a chemical toilet, which includes individual waste bags, Disposa-john, individual field toilet, and a drop-box toilet. Human waste collected in chemical toilets would be transported to approved disposal facilities. The estimated maximum domestic wastewater flow generated on Pagan would be 17,400 gallons per day (65,866 liters per day) from a maximum of 4,000 military training personnel. Temporary burn-out latrines and urinals with soakage pits can also be constructed.
![Map of Pagan Island with proposed actions and features annotated.]

- ** Proposed Primary Munitions Supply Route
- ** Proposed Airfield Elements
  - Airfield Runway
  - Forward Arming and Refueling Point
  - Hot Cargo Pad
  - Overrun
  - Runway Apron
  - Turnaround
  - Hot Cargo Pad (Explosive Siting)

** Proposed Military Training Trail Network (39 acres)**
- Primary Perimeter Military Training Trail
- Other Potential Military Training Trail (Existing Trail)
- Other Potential Military Training Trail (No Existing Trail)

** Proposed Bivouac/Base Camp Area (42 acres)**

** Munitions Storage Area Features (2 acres)**
- Munitions Storage Area
- Notional Safety Arcs
- Chain Link Barbed Wire Fence

** Proposed Bivouac Area, Munitions Storage, and Airfield Improvements**

** Figure 2.5-2 **

** Pagan All Action Alternatives **

** Bivouac Area, Munitions Storage, and Airfield Improvements **

** 2-116 **
Ground disturbance associated with the base camp/bivouac area would be approximately 42 acres (17 hectares); it is assumed that through repeated use that the ground disturbed area would take on an impervious quality and is considered newly created impervious surface. It should be noted that this area is included in the 484 acres (196 hectares) associated with the ground disturbance for the airfield clear zone (see Section 2.5.1.2.2, Expeditionary Airfield).

### 2.5.1.2.2 Expeditionary Airfield

Under the proposed action, a grass expeditionary airfield would be improved to allow its use for aviation training and transport of personnel and supplies (see Figure 2.5-2). It is anticipated that Pagan airfield will be a public use airport owned and operated by the Commonwealth Ports Authority. To make the current 1,500-feet (457-meter) grass runway capable of accommodating fixed-wing C-130/C-17 it would need to be extended to 6,500 feet (1,220 meters). Airfield improvements would include the following: (1) airfield runway extension and strengthening; (2) turnarounds at both end of the runway; (3) a hot cargo pad; (4) overrun areas at each end of the runway; (5) parking apron; (6) runway apron; and (7) Forward Arming and Refueling Point. Near the airfield, a Drop Zone would be identified for equipment, cargo, and personnel delivery. The proposed Forward Arming and Refueling Point would be specified to provide aircraft refueling, as well as ordnance arming and de-arming operations. Because of the recurrent nature of the training, a concrete fuel bladder containment berm is planned. Bulk fuel would be delivered by KC-130s providing about 5,000 gallons (18,930 liters) of fuel per delivery. Necessary approvals for the proposed airfield would be coordinated with the Federal Aviation Administration.

Ground disturbance associated with the expeditionary airfield would be approximately 41 acres (17 hectares) which would be included in overall airfield clear zone of 484 acres (196 hectares). Due to compaction from repeated use, the expeditionary airfield is considered newly created impervious surface. However, the majority of the airfield clear zone (401 acres [162 hectares]) would not be compacted from use and not considered impervious. The airfield clear zone would have 100% vegetation maintenance (see Appendix F, Geology and Soils Technical Memo, for details on vegetation maintenance).

The portion of lava flow covering the existing airfield would be removed. Approximately 615,000 cubic yards (470,000 cubic meters) of lava rock would be removed under the construction activities associated with the airfield, and would be reused as gravel or fill material where possible.

### 2.5.1.2.3 Munitions Storage Area

A Munitions Storage Area would be established north of the airfield (see Figure 2.5-2). It would consist of: (1) security fencing; (2) open magazines; (3) a munitions assembly pad; (4) a munitions storage area; (5) a load/unload dock (pad); and (6) a biosecurity pad. The Munitions Storage Area would be secured by chain-link fencing with barbed wire. Utilities support (power, lights, and communications) would be expeditionary in nature, furnished by the training units. Ground disturbance associated with construction of the Munitions Storage Area would be approximately 35 acres (14 hectares) of that; it is assumed that through paved areas and repeated use that 5 acres (2 hectares) of the ground disturbed area would take on an impervious quality and is considered newly created impervious surface.
2.5.1.2.4 Military Training Trails

A military training trail network would be constructed including access military training trails to the High Hazard Impact Area, a perimeter military training trail system and other access corridors (Figure 2.5-3). On Pagan, the term “road” is not applicable, as the vehicular travel paths would not be constructed like a traditional road, but rather 16-foot-wide (5-meter) corridors would be cleared for vehicular maneuvering and mobility, as described below. A 22-mile (35-kilometer) gravel military training trail system is planned around the perimeter of the northern half of Pagan. Approximately 6 miles (10 kilometers) of this system would utilize existing all-terrain vehicle trails. The existing trails would be cleared, widened, stabilized, and improved. The other portion of the perimeter military training trail system would be constructed over terrain where no trails exist. During training activities, personnel would conduct the following improvements to provide military training trails: vegetation clearing, terrain cutting/filling, lava removal/compaction, and soil compaction. Culverts (water channels under trails) and low water crossings would also be inserted along fingers and draws in terrain, as appropriate, to allow proper stormwater management, drainage and minimize erosion and landslide potential while maintaining trail function. Heavy equipment that would be used to construct this military training trail network includes road graders, vibratory compactors, dozers, tractors rubber-tired articulated multi-purpose with buckets, dump trucks, and backhoe loaders. Clearing using chainsaws, weed-eaters, and other construction equipment and construction techniques that support timber cutting and clearing would be needed for vegetation clearing of medium to light tropical pine (ironwood) forest. In total, approximately 37 acres (15 hectares) would be cleared and graded to support wheeled and tracked vehicles movement (Figure 2.5-3). It is assumed that through repeated use that the military training trails would take on an impervious quality and are considered newly created impervious surface.

2.5.1.2.5 North Range Complex Construction

The North Range Complex would include construction or establishment of the training assets listed below.

**High Hazard Impact Area Construction.** A High Hazard Impact Area would be developed and would be centered on Mount Pagan. Due to the nature of its use, this High Hazard Impact Area would require only minimal ground disturbance to create target placements. A total of eight target areas would be constructed, primarily on areas without vegetation and thus requiring minimal vegetation removal and ground disturbance. If vegetation is present, it would be removed only to the extent that is needed to place the target. Targets for the Anti-Air Warfare Range would be located in the High Hazard Impact Area over Mount Pagan.

The footprint and target placement for each alternative is discussed in Section 2.5.2, Pagan Alternative 1, and Section 2.5.3, Pagan Alternative 2.
Figure 2.5-3
Pagan All Action Alternatives
Military Training Trail Improvements
Maneuver Areas Construction. Construction ground disturbance associated with the maneuver areas include the creation of a firing point for Field Artillery Direct Fire Range (10 acres [4 hectares]) training; 11 firing points for Field Artillery Indirect Fire Range training and 5 firing points for Mortar Range training. The footprint for the firing points for each alternative is discussed in Section 2.5.2, Pagan Alternative 1, and Section 2.5.3, Pagan Alternative 2. It is assumed that through repeated use that the firing points would take on an impervious quality and are considered newly created impervious surface.

Amphibious Training Beaches Construction. Up to six beaches would be used to conduct amphibious training (Green, Red, Blue, South, Gold, and North). No construction activities would occur at proposed amphibious training beaches.

Landing Zones Construction. There are 11 Landing Zones proposed across northern Pagan (nine of which correspond with Field Artillery Indirect Fire Range firing positions). The total ground clearance would be 36 acres (15 hectares). It is assumed that through repeated use that the Landing Zones would take on an impervious quality and are considered newly created impervious surface.

Field Artillery Direct Fire Range. Construction of the Field Artillery Direct Fire Range would involve construction of one firing position on the southern perimeter of the High Hazard Impact Area. Anticipated ground disturbance associated with the firing position is 10 acres (4 hectares). This is considered new impervious surface.

Field Artillery Indirect Fire Range. The Field Artillery Indirect Fire Range would involve construction of 11 firing positions around the Pagan North Range Complex. Nine of these firing positions correspond with Landing Zones. Anticipated ground disturbance associated with the firing positions is 110 acres (45 hectares). This is considered new impervious surface.

Mortar Range. The Mortar Range would involve construction of five firing positions around the perimeter of the northern High Hazard Impact Area. Anticipated ground disturbance associated with the firing positions is 60 acres (24 hectares). This is considered new impervious surface.

2.5.1.2.6 South Range Complex Construction

The South Range Complex would be used as a non-live-fire maneuver area. There would be no construction-related ground clearance undertaken.

2.5.1.3 Training Operations

2.5.1.3.1 North Range Complex Training Operations

Training operations within the North Range Complex would include the following:

2.5.1.3.1.1 High Hazard Impact Area Training Operations

The High Hazard Impact Area centered on Mount Pagan would be used for ground, air, and naval surface fire support live-fire and inert munitions expenditures. Specifically, this area would support the following ground-based training: (1) Field Artillery Indirect Fire Range; (2) Field Artillery Direct Fire Range; and (3) Mortar Range. In addition, this High Hazard Impact Area would support the following air-to-ground training: (1) Offensive Air Support Range; (2) Close Air Support Range; (3) Anti-Air Warfare Range; and (4) Combined Arms Training to Support Close Air Support and Naval Gunfire Support.
Training. It would also support the ship-to-shore naval gunfire training (i.e., Combined Arms Training to Support Close Air Support and Naval Gunfire Support Training).

2.5.1.3.1.2 Maneuver Areas Training Operations

Training in the northern maneuver areas includes, but is not limited to: (1) patrolling, establishing defensive positions, and firing live-fire weapons into and/or around the High Hazard Impact Area; and, (2) integrating supporting arms (including aviation, artillery, and naval gunfire assets). Where possible, mounted wheeled vehicle maneuvering would be accomplished in the northern maneuver area as well. Vehicles would move along military training trails as well as other terrain that they could safely navigate (excluding “No Maneuver Areas”). As such, personnel would move along the landscape, call for supporting arms, and train in a manner similar to combat conditions. Unlike the Tinian RTA (comprised of designated maneuver and firing locations), the Pagan RTA challenges the command and control element of units to determine, design, and execute the most effective tactics by maneuvering units (varying in size) and securing objectives in dynamic battlefield scenarios. On Pagan, each unit would be authorized to develop unique scenarios and engagement areas. Units would be required to identify engagement area locations, direction of attack, targets/threats to be engaged, and types of weapon and ammunition to be used during an engagement. Developed scenarios, along with operational risk management, would be submitted to range control for approval prior to implementation. This flexibility allows units to develop scenarios that best prepare them for their assigned mission while ensuring range control can protect biological, natural and cultural resources.

Temporary objective areas could be set up within the live-fire maneuver area. Prior to training, temporary objective areas would be evaluated by the appropriate subject matter experts to ensure natural and cultural resources would not be impacted by the training scenario.

Use of the military training trail over the land bridge west of Laguna Sanhiyon would be limited to foot traffic during normal military activities. Vehicles would typically use the military training trail to the east of Laguna Sanhiyon and only use the land bridge in the event of an emergency.

2.5.1.3.1.3 Amphibious Training Operations

Up to six beaches (Red, Green, Blue, Gold, North, South) would be used to conduct live-fire tactical amphibious training. Three beaches, Green, Red, and Blue, would be used by Amphibious Assault Vehicles and Landing Craft Air Cushion training operations. Landing Craft Air Cushion training operations would also occur at South Beach. Green, Red, Blue, Gold, North, and South beaches would support small boat and combat swimmer training. Targets along the beachfront would be established for tactical training (primarily at Red Beach) and a path maintained to provide access to the trail/road network. Amphibious forces would maneuver from naval ships via water or air to various locations on Pagan, based on the training exercise design. Simulated enemy forces would be “activated” by exercise controllers and maneuvering forces would fire at targets in a synchronized fashion.

2.5.1.3.1.4 Landing Zones Training Operations

Tilt-rotor and rotary-wing aircraft such as CH-53, UH-1, and AH-1 would take off and land from Landing Zones proposed across northern Pagan (see Figure 2.5-2). Fixed-wing aircraft would use the airfield as would rotor and tilt-rotor aircraft. Live-fire would be allowed at Landing Zones.
2.5.1.3.1.5 Drop Zone
Drop zone training would occur at the airfield or any open field.

2.5.1.3.1.6 Unmanned Aircraft Systems Operating Area
Unmanned aircraft (i.e., drones) would include shoulder mounted systems that would take off wherever it is feasible, including areas away from the airfield.

2.5.1.3.1.7 Terrain Flight Maneuver Area
This type of training would occur while aircraft are in transit. This type of training is live-fire/non-live-fire. It includes flying over terrain below 200 feet (60 meters).

2.5.1.3.1.8 Field Artillery Direct Fire Range
The Field Artillery Direct Fire Range would support artillery training and allow personnel to set up weapons and ordnance at the direct firing position and engage targets positioned in a direct line-of-fire in the northern High Hazard Impact Area. Personnel would traverse the open terrain to access to the Field Artillery Direct Fire Range firing position.

2.5.1.3.1.9 Field Artillery Indirect Fire Range
The Field Artillery Indirect Fire Range would support artillery and large mortar training. Personnel would set up artillery and ordnance at indirect firing positions located between a minimum and maximum distance from the High Hazard Impact Area. The array of targets in the High Hazard Impact Area would not typically be visible from the indirect firing positions. A forward observer would provide target location information back to the personnel at the firing position, shifting fire trajectories to bring the impacts onto targets. Personnel would access the Field Artillery Indirect Fire Range firing positions by foot over open terrain, by military training trails or by Landing Zones.

2.5.1.3.1.10 Mortar Range
The Mortar Range would provide training for mortar teams. Firing positions adjacent to the High Hazard Impact Area would allow weapon system engagement with the array of targets therein. Personnel would traverse open terrain on foot to access to the Field Artillery Direct Fire Range firing position.

2.5.1.3.2 South Range Complex Training Operations
Training operations within the South Range Complex includes the following:

2.5.1.3.2.1 Maneuver Area Training Operations
In the south Pagan non-live-fire maneuver area, small units, a platoon or less, of special operations personnel (Navy SEALS, Marine Corps Special Forces, Army Rangers, etc.) would move toward an objective or Observation Post. From the Observation Post, units would direct forces and supporting arms in the north Pagan range. No force on force engagements (i.e., no weapons would be fired) would be conducted in the south Pagan training area. Troops would access South Pagan via air insertion (e.g., helicopter using fast rope) or using small boat (raiding craft) and swimmers. No tactical Landing Zones would be created in the south. Units would either walk out of the southern area or be extracted by helicopters using Special Control Insertion/Extraction, or small boats.
2.5.1.3.3 Amphibious Operations

On Pagan, six beaches are proposed for amphibious training: Red, Blue, Green, North, Gold and South beaches. All would experience amphibious operations, small boat landings, and swimmer training; however, only Green, Red, and Blue beaches would be used for Amphibious Assault Vehicle and Landing Craft Air Cushion vessel landings. South Beach would also be used for Landing Craft Air Cushion vessel landings.

The number of daily amphibious landings may vary based on many factors such as the training scenario and objectives, weather/sea state, and vehicle availability. In general, amphibious training on Pagan would be more focused and involve greater use over shorter periods of time than Tinian amphibious training. The majority of landings would occur at the beginning and end of training cycles (i.e., a week-long exercise or 2 week exercise) throughout the 16 weeks of military training, consistent with the combined level of training emphasis, with daily variations as noted in the following subsections.

2.5.1.3.3.1 Tactical Amphibious Assault Vehicle Training

For Amphibious Assault Vehicles, a typical light training day may consist of 16 vehicles landing and departing two times in a 24-hour period, on specified beaches. A typical heavy training day may consist of 16 vehicles landing and departing four times in a 24-hour period, on a specified beach. Generally, these heavy and light training days occur at various intervals over individual two week training cycles at Pagan, but would coincide with training for an initial amphibious assault, followed by land maneuver training, and ending with movement from the shore back to ships.

2.5.1.3.3.2 Landing Craft Air Cushion Vessel Training

For Landing Craft Air Cushion vessels, similar training frequencies would occur. A typical light training day may consist of two vessels landing and departing four times in a 24-hour period, and a typical heavy training day may consist of two vessels would land and depart eight times. These typical days would occur at the beginning and end of the respective training cycles.

2.5.1.3.3.3 Small Boat and Swimmer Training

For small boat, a typical light training day may consist of four boats landing and departing four times, and a typical heavy training day would be four boats landings and departing ten times each.

2.5.1.3.3.4 Combat Swimmer Training

Combat swimmer training to occur on Red, Blue, Green, North, Gold and South beaches, could occur two ways: (1) insertion, and, (2) scout swimmers (initial terminal guidance) to guide small boats (not Amphibious Assault Vehicles and Landing Craft Air Cushion) to the landing beach. A typical group of swimmers is four, but could be as large as 16. As far as average frequency, a typical group of four swimmers would train daily, on any given beach, during the 16 weeks of live-fire training on Pagan.

Table 2.5-1 provides the average annual number of amphibious operations under the Pagan action alternatives.
Table 2.5-1. All Pagan Action Alternatives Proposed Amphibious Operations

<table>
<thead>
<tr>
<th>Type of Amphibious Landing</th>
<th>Proposed Annual Landing Events**</th>
<th>Number of Vehicles/Landing**</th>
<th>Annual Total Landings*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphibious Assault Vehicle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine Unit-landings</td>
<td>28</td>
<td>14</td>
<td>2,842</td>
</tr>
<tr>
<td>Foreign Allies-landing</td>
<td>28</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Major Joint Exercises-landings</td>
<td>35</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Landing Craft Air Cushion-Landings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine Unit</td>
<td>80</td>
<td>4</td>
<td>904</td>
</tr>
<tr>
<td>Foreign Allies</td>
<td>40</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Major Joint Exercises</td>
<td>30</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Small Boats-Landings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special Operations Forces</td>
<td>12</td>
<td>2</td>
<td>3,192</td>
</tr>
<tr>
<td>Marine Units</td>
<td>36</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Foreign Allies</td>
<td>6</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Major Joint Exercises</td>
<td>24</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Notes: *Total number of vehicles landing annually.
**An event is a single vehicle landing or a single vehicle departure.

Source: DoN 2014a.

2.5.1.3.4 Airfield Training Operations

All Pagan action alternatives would include airfield operations for training at the Pagan airfield and proposed Landing Zones. For the purposes of this EIS, Landing Zones are considered crude airfields for field use by rotary-wing aircraft. Airfield training operations would include take-offs and landings, helicopter and tilt-rotor aircraft training at Landing Zones, and the base for Unmanned Aircraft Systems operations. Table 2.5-2 provides a summary of annual training operations by aircraft type and time of day associated with the airfields at the Pagan airfield.

Table 2.5-2. All Pagan Alternatives Proposed Annual Airfield Military Operations

<table>
<thead>
<tr>
<th>Aircraft Type (example)</th>
<th>7:00 a.m. - 10:00 p.m.</th>
<th>10:00 p.m. - 7:00 a.m.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Tilt-rotor</td>
<td>480</td>
<td>120</td>
<td>600</td>
</tr>
<tr>
<td>Transport Rotary-wing</td>
<td>1720</td>
<td>440</td>
<td>2,260</td>
</tr>
<tr>
<td>Attack Helicopter</td>
<td>760</td>
<td>200</td>
<td>960</td>
</tr>
<tr>
<td>Transport Fixed Wing</td>
<td>800</td>
<td>200</td>
<td>1,000</td>
</tr>
<tr>
<td>Unmanned</td>
<td>240</td>
<td>60</td>
<td>300</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,000</strong></td>
<td><strong>1,020</strong></td>
<td><strong>5,120</strong></td>
</tr>
</tbody>
</table>

Table 2.5-3 presents annual aircraft operations that include conducting air-to-ground operations and flight maneuvers in overlying airspace, and personnel and cargo transport at Landing Zones done by fixed-wing, rotary-wing, and tilt-rotor aircraft. The number of aircraft per operation and the average number of minutes an aircraft would spend in transit and within the mission-specific area is presented.
### Table 2.5-3. All Pagan Action Alternatives Proposed Typical Annual Landing Zone Operations

<table>
<thead>
<tr>
<th>Aircraft Type (example)</th>
<th>Annual Number of Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7:00 a.m. - 10:00 p.m.</td>
</tr>
<tr>
<td>Transport Tilt-Rotor (MV-22)</td>
<td>160</td>
</tr>
<tr>
<td>Transport Rotary-Wing (CH-53)</td>
<td>480</td>
</tr>
<tr>
<td>Attack Helicopter (AH-1/H-60)</td>
<td>320</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>960</strong></td>
</tr>
</tbody>
</table>

Notes: Number of operations include all Landing Zones.

2.5.1.4 Operation and Management of Pagan Range and Training Area

2.5.1.4.1 Operation of Pagan Range and Training Area

No personnel would reside permanently on Pagan. Combined level RTA ground, amphibious, and aviation training activities would occur up to 16 weeks per year (non-consecutive weeks of live-fire training), with a typical training duration of 1 to 2 weeks. Training would potentially occur 7 days per week. The RTA would be used about 50% during the hours 7:00 a.m. to 10:00 p.m. and 50% during the hours 10:00 p.m. to 7:00 a.m. (DoN 2014a). It is anticipated the expeditionary base camp/bivouac area would accommodate up to 2,200 personnel at any one time, with additional surge capacity for joint exercises. Due to the presence of an active volcano on Pagan, operational risk management would be employed to determine feasibility of proposed training schedules.

Munitions brought to Pagan via marine transportation would be moved east from the shore approximately 1.6 miles (2.6 kilometers) inland along a munitions supply route to this area for storage, preparation and use in support of specific training exercises. Munitions brought to Pagan via aircraft would offload to a hot cargo pad adjacent to the airfield, and then be transported to the Munitions Storage Area. No munitions would remain on Pagan between exercises.

2.5.1.4.1.1 Security

Under either alternative, the entire island of Pagan would be considered a military training area during training exercises. Requisite access restrictions consistent with military safety and security requirements would be implemented.

2.5.1.4.1.2 Public Access

During training periods, public access would be restricted from accessing areas within the Pagan RTA encumbered by surface danger zones for safety reasons. Depending upon the type of training and training scenario, portions of the island and surrounding waterways may be available for public access. During non-training periods, access would not be restricted with the exception of the High Hazard Impact Areas which, once it is activated, would be permanently off limits due to the presence of unexploded ordnance. A fence would be constructed where physically possible and signs would be posted to delineate the boundary of the High Hazard Impact Area. Unauthorized persons would be prohibited from entering High Hazard Impact Areas by use of positive controls to include fencing and/or posting of Unexploded Ordnance hazard warning signs. Appropriate measures would be used to restrict access to areas known or suspected to contain Unexploded Ordnance. Risk management would be used
to determine the type and extent of marking and/or fencing required. Primary factors to consider in making this risk decision are accessibility of the public to restricted locations.

Combined level training groups would schedule their live-fire training through a schedule system approximately 6 months prior to the training event (DoN 2014d), and training periods would be published electronically by the U.S. military using current methods of public notification and signs will be posted. Public notices for daily training events would be published as well. This prior planning would allow sufficient lead time for commercial travel and tourism companies to engage in potential markets for those individuals seeking to visit Pagan. As training cycles are refined, a public RTA access plan would be developed to address individual requests for access.

2.5.1.4.1.3 Biosecurity

The Department of Defense will require development and implementation of detailed Hazard Analysis and Critical Control Point plans tailored for individual construction, transport, and logistics activities related to CJMT actions. For all training activities, general Hazard Analysis and Critical Control Point plans would be developed prior to initiation of training, and implementation would be required for each training event. The Department of Defense will require a biosecurity education program for 100% of contractors, Department of Defense civilian and military personnel, and foreign military on native versus non-native species, including the brown treesnake; prevention and control methods; and reporting requirements. To address non-native species risk pathways, Department of Defense funded the development of a Regional Biosecurity Plan. When the plan is completed, for recommendations applicable to CJMT activities, the Department of Defense will work cooperatively with appropriate agencies to develop and implement interdiction and control protocols. Finally, Joint Region Marianas has established a comprehensive brown treesnake interdiction program to ensure that military activities, including the transport of personnel and equipment from Guam, do not contribute to the spread of brown treesnakes within the CNMI. Brown treesnake interdiction requirements contained in Navy Region Marianas and Joint Region Marianas instructions will be implemented for CJMT activities. Additional biosecurity details are provided in Section 4.9, Terrestrial Biology and Appendix D, Best Management Practices.

2.5.1.4.1.4 Emergency Services

Units would be accompanied by their associated medical/emergency medical personnel and equipment. A medical evacuation plan would be prepared to cover how a critically injured person would receive medical treatment.

A fire management plan specific to proposed CJMT activities would be prepared prior to initiation of live-fire training on Pagan. This fire management plan would address the preventative and immediate actions required for fire hazards connected with RTA training. Water resources and labor would be identified. Evacuation plans would also be developed in case of emergencies related to natural causes such as extreme weather events, earthquakes, increased volcanic activity, or tsunami events.

2.5.1.4.1.5 Operational Range Management

Live-fire ranges would be managed in accordance with current Marine Corps range management policies and procedures. The RTA on Pagan would be managed in accordance with Marine Corps Order 3550.10, Policies and Procedures for Range Training Area Management. These policies and procedures would be
reviewed and coordinated with Joint Region Marianas regional range management. All service policies include the following:

- A Range Safety Program will be established per Marine Corps Order 3570.1C, Range Safety detailing procedures for RTA safety, emergency response (medical and fire), explosive ordnance disposal, training mishap investigations, safety training, and range inspections.
- RTA procedures for scheduling, collecting utilization data and reporting range use.
- Controls for RTA airspace in accordance with Federal Aviation Administration regulations and agreements, with an objective of use by multiple agencies with minimal interference and maximum safety.
- Controls for monitoring danger zones to ensure safety of mariners in nearshore waters.
- Management of movement and access into and within the RTA.
- Coordination of all RTA communications.
- Provision of range maintenance including vegetation maintenance, operational range clearance and clearance of unexploded ordnance.
- Maintenance of ranges, targets, training devices, fencing, gates and signage.
- Coordination of vehicle and transportation operations and maintenance.
- Procedures for environmental protection.
- Provide administration and personnel management.

2.5.1.4.1.6 Environmental Protection

In the ongoing periodic training use and maintenance of the proposed ranges, basic environmental protection features that would be incorporated into the RTA Management Plan would include:

- Fire condition monitoring for firefighting readiness and modification of training as appropriate as part of RTA management procedures.
- Specific regulations and information provided for using units to protect the environment as part of RTA procedures.
- Adherence to protective measures established in natural and cultural resource management plans.
- Adherence to RTA procedures and information provided under Marine Corps Order P3550.10 for using units to protect the environment.
- Clear marking of ranges and transit routes necessary to reach these areas. Restricting vehicular activities to designated/previously identified areas.
- Adherence to existing policies and management activities to conserve soils, including applicable stormwater pollution prevention plans.

2.5.1.4.1.7 Range Environmental Vulnerability Assessment

Department of Defense Instruction 4715.14 is the overarching policy that establishes the requirement for the Marine Corps Range Environmental Vulnerability Assessment program (Department of Defense 2005).

This policy requires the military services to assess the potential environmental impacts of military munitions use on existing operational ranges and determine whether there has been a release or a substantial threat of a release of munitions constituents (i.e., chemical components of munitions) to an
off-range area. If a release occurs off-range, the policy also requires the military services determine whether or not the release poses an unacceptable risk to human health and/or the environment based upon the known characteristics of the chemical(s). The Range Environmental Vulnerability Assessment process includes data collection, analysis, documentation and follow-on activities, as needed. See Section 4.3, Water Resources and Section 4.16, Hazardous Materials and Waste for additional description of Range Environmental Vulnerability Assessment and its application to the proposed action.

2.5.1.4.1.8 Vegetation Management at Pagan Range and Training Area

To sustain continual RTA operations, vegetation control would be required. The degree of management would differ depending on the requirements for each individual range or training location. For example, accommodating firebreaks and equipment laydowns versus maneuver areas dictate the degree of vegetation maintenance needed. On Pagan, while a majority of the island is either covered in lava or too steep to use for training, management regimes would be followed where appropriate. A description of proposed vegetation maintenance areas and management for Pagan is provided in Appendix F, Geology and Soils Technical Memo.

2.5.1.5 Transportation

A major consideration for proposed training on Pagan is transporting personnel to the island. The primary mode of transportation for personnel, equipment, and cargo would be amphibious craft landing at designated amphibious training beaches as no docking facilities currently exist or are contemplated at Pagan under the proposed action. Air movement would be a secondary mode of transportation to the island, as the current airfield would be lengthened and upgraded to support fixed-, rotary-, and tilt-wing aircraft operations. No combat equipment would be permanently staged on Pagan, all units would arrive with their own equipment to train and survive as they would under combat conditions (DoN 2014a).

2.5.1.5.1 Air Transportation

Marine fixed-wing aircraft (KC-130) and Air Force Air Mobility Command C-17, C-130, rotary-wing (CH-53) and tilt-rotor aircraft (MV-22) from ships may provide personnel and equipment lift to and from Pagan; however, these operations would occur in association with training. Air transport operations to and from Pagan are not anticipated. Estimated annual aircraft operations associated with training are provided in Section 2.5.1.3.4, Airfield Training Operations. Biosecurity protocols would be instituted for aircraft carrying military equipment and/or personnel arriving and departing Pagan.

2.5.1.5.2 Ground Transportation

On Pagan, a military training trail network (see Figure 2.5-3) would be constructed. It would connect the expeditionary base camp/bivouac area and airfield to North Range Complex. Given the terrain, there are three major approaches for ground movement available throughout North Range Complex: (1) a clockwise rotation, starting from the airfield heading north to the northwest tip of the island; (2) a counterclockwise rotation, starting at the landing strip heading east and then north until reaching the High Hazard Impact Area; and (3) moving south starting at the airfield, head east, and then due south along the isthmus.
### 2.5.1.5.3 Marine Transportation

Equipment and personnel movement would primarily be accomplished by military vessels. Cargo and personnel would be transferred to smaller craft (e.g., Amphibious Assault Vehicles, Landing Craft Air Cushion) able to land directly on beaches. These smaller craft would launch from larger vessels offshore, as no port facilities exist for vessel docking. There is no commercial marine vessel service to Pagan. Section 2.5.1.3.3, Amphibious Operations provides a summary of annual amphibious operations for the Pagan action alternatives Munitions.

### 2.5.1.6 Munitions

Under the Pagan action alternatives, munitions would be brought in by the units, stored temporarily, and used during training exercises. Any remaining munitions would be packed and return with the units. In general, there would be no perceptible differences for munitions expended between the alternatives. This is because neither alternative precludes the ability to expend munitions. Table 2.5-4 provides a breakdown of annual munitions expenditures. Both action alternatives would have the same munitions expenditures; these are presented below. The potential for military expended materials falling outside of designated ranges complexes is discussed in Section 2.5.1.7, Danger Zones. It is assumed that ground-based operations would occur up to 50% during the hours of 10:00 p.m. to 7:00 a.m. Aircraft and naval operations are anticipated to occur up to 55% of the time during the hours of 7:00 a.m. to 10:00 p.m. and up to 45% during the hours of 10:00 p.m. to 7:00 a.m.

<table>
<thead>
<tr>
<th>Munitions Type</th>
<th>Quantity (individual munition)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Munitions Associated with Ground-Based Training</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Field Artillery Fire Range</strong></td>
<td></td>
</tr>
<tr>
<td>155 mm HE</td>
<td>592</td>
</tr>
<tr>
<td>155 mm Illumination</td>
<td>40</td>
</tr>
<tr>
<td>155 mm Smoke</td>
<td>320</td>
</tr>
<tr>
<td>120 mm HE</td>
<td>200</td>
</tr>
<tr>
<td>120 mm Smoke</td>
<td>200</td>
</tr>
<tr>
<td>120 mm Illumination</td>
<td>40</td>
</tr>
<tr>
<td><strong>Small Arms</strong></td>
<td></td>
</tr>
<tr>
<td>5.56 mm</td>
<td>382,575</td>
</tr>
<tr>
<td>.50 cal</td>
<td>36,800</td>
</tr>
<tr>
<td>7.62 mm</td>
<td>192,080</td>
</tr>
<tr>
<td><strong>Grenade/Mortar/Rocket</strong></td>
<td></td>
</tr>
<tr>
<td>40 mm HE</td>
<td>10,460</td>
</tr>
<tr>
<td>60 mm HE</td>
<td>480</td>
</tr>
<tr>
<td>60 mm Illumination</td>
<td>80</td>
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<tr>
<td>60 mm Smoke</td>
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</tr>
<tr>
<td>81 mm Smoke</td>
<td>40</td>
</tr>
<tr>
<td>83 mm HE</td>
<td>8</td>
</tr>
<tr>
<td>Tube-launched Optically-tracked Wire-guided Missile</td>
<td>4</td>
</tr>
<tr>
<td>AT-4 HE</td>
<td>4</td>
</tr>
<tr>
<td>20 mm Target Practice Bullets</td>
<td>160</td>
</tr>
</tbody>
</table>
### Table 2.5-4. All Pagan Action Alternatives Proposed Representative Annual Munitions Expenditures

<table>
<thead>
<tr>
<th>Munitions Type</th>
<th>Quantity (individual munition)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air-Delivered Munitions</strong></td>
<td></td>
</tr>
<tr>
<td>25 pound Aviation Ordnance (Inert)</td>
<td>1,000</td>
</tr>
<tr>
<td>500 pound Aviation Ordnance (Inert)</td>
<td>175</td>
</tr>
<tr>
<td>500 pound Aviation Ordnance (HE)</td>
<td>175</td>
</tr>
<tr>
<td>1,000 pound Aviation Ordnance (HE)</td>
<td>175</td>
</tr>
<tr>
<td>2,000 pound Aviation Ordnance (HE)</td>
<td>175</td>
</tr>
<tr>
<td>2.75 inch Rocket (HE)</td>
<td>500</td>
</tr>
<tr>
<td>2.75 inch Rocket (Illumination)</td>
<td>50</td>
</tr>
<tr>
<td>2.75 inch Rocket (Smoke)</td>
<td>75</td>
</tr>
<tr>
<td>5 inch Rocket (HE)</td>
<td>150</td>
</tr>
<tr>
<td>20 mm Target Practice Bullet</td>
<td>1,000</td>
</tr>
<tr>
<td>25 mm Target Practice Bullet</td>
<td>11,250</td>
</tr>
<tr>
<td>7.62 mm Bullet</td>
<td>34,000</td>
</tr>
<tr>
<td>.50 cal Bullet</td>
<td>20,000</td>
</tr>
<tr>
<td>Laser Guided Training Round (Inert)</td>
<td>250</td>
</tr>
<tr>
<td><strong>Naval Ship Delivered Munitions</strong></td>
<td></td>
</tr>
<tr>
<td>5 inch (HE)</td>
<td>150</td>
</tr>
<tr>
<td><strong>Air-to-Air Munitions and Expendables (Warning Areas Only)</strong></td>
<td></td>
</tr>
<tr>
<td>AIM-7</td>
<td>5</td>
</tr>
<tr>
<td>AIM-9</td>
<td>5</td>
</tr>
<tr>
<td>AIM-120</td>
<td>3</td>
</tr>
<tr>
<td>Chaff</td>
<td>2,400</td>
</tr>
<tr>
<td>Flares</td>
<td>2,400</td>
</tr>
</tbody>
</table>

*Legend: mm = millimeter; cal = caliber; HE = high explosive, AIM= Air Intercept Missile; AT=Anti-Tank.*

*Note: All munitions listed are representative and can be substituted with a similar munition on a one-for-one basis if the substituted munitions are of equal or lesser net explosive weight. Assuming operational parameters (i.e., firing positions, target areas) remain the same and the substituted munitions are of equal or lesser net explosive weight, it is assumed to have a comparable noise profile as the listed munition.*

#### 2.5.1.7 Danger Zones

Under both Pagan action alternatives, three-dimensional areas will be designed that delineate portions of the earth’s surface and overlying airspace in which personnel and/or equipment may be endangered by ground weapons firing or detonation activities because of ricochet or fragmentation hazard. The size and configuration of the three dimensional area, called a “surface danger zone,” is dependent on the performance characteristics of a given weapons system, training requirements, range configuration, and geographical location. As described in Section 2.5.1.8, **Airspace Requirements**, the Federal Aviation Administration would establish Special Use Airspace restrictions above these areas in accordance with Federal Aviation Administration rule-making authority. As described in **Section 2.5.1.9, Sea Space Requirements**, when a surface danger zone extends over the water, the area would be established via the U.S. Army Corps of Engineers rule-making process.
In accordance with the Operational Risk Management process outlined in OPNAV Instruction 3500.39C and Marine Corps Order 3500.27B (DoN 2010a, 2011), the project Range Control staff would implement a variety of mechanisms to manage risk within the surface danger zone, including:

- Develop and clearly mark surface danger zones, which determine the restricted land, airspace, and sea space requirements to laterally and vertically contain projectiles, fragments, debris, and components resulting from the firing of weapons. Surface danger zones over navigable waterways may be marked by buoys if practical; these areas will be noted on nautical charts and are off limits during live-fire training events.
- As part of the pre-training activities, public and non-participating personnel would be cleared from the training area.
- Continually assess the live-fire range operations and update/revise safety measures as needed.

Figures 2.5-4 and 2.5-6 show composite danger zones and surface danger zones for each of the Pagan alternatives.

The surface danger zones associated with training operations on Pagan would overlap nearshore waters by approximately 47,259 acres (19,125 hectares) in on Pagan Alternative 1, and 39,828 acres (16,118 hectares) in Pagan Alternative 2 (Figure 2.5-4). There would be a small chance that an expended projectile would fall outside of the immediate range footprint, within the surface danger zone. There would be an even smaller chance for an expended projectile to fall within the nearshore waters portion, or the fringes of the surface danger zone.

### 2.5.1.8 Airspace Requirements

Aviation training would occur under both Pagan alternatives. To support this training, several major land-based training components are needed. These include: (1) target areas within a High Hazard Impact Area to support Offensive Air Support Range training and Close Air Support Range training; (2) a Drop Zone, Forward Arming and Refueling Points, and Unmanned Aerial System operations at the airfield; and (3) Landing Zones throughout the island. Terrain Flight Maneuver Area training would occur in the airspace above Pagan.

To provide safe separation of military activities from civil/commercial flights, designated airspace is required. One basic airspace design option provides the necessary coverage for both Pagan alternatives. As depicted in Figures 2.5-5 and 2.5-6, two types of Special Use Airspace are proposed to meet the safety and control aspects of military training.
Warning Area. This Special Use Airspace is assigned and designed to separate non-participating military and civil/commercial aircraft from hazardous air-to-ground and ship-to-shore operations (see Figures 2.5-5 and 2.5-6) in international airspace (outside of the U.S. 12-nautical mile [19 kilometers] territorial sea but within the U.S. Exclusive Economic Zone). The airspace would be designated Warning Area 14 Low and Warning Area 14 High. Each area would be a quadrilateral with a dimension of roughly 60 nautical miles by 80 nautical miles (111 kilometer engagement areas by 148 kilometers), from the center of Pagan. Airspace vertical boundaries for Warning Area 14 Low would start at the sea surface and extend up to a ceiling of 30,000 feet (9,144 meters). Warning Area 14 High would have a floor of 30,000 feet (9,144 meters) and a ceiling of 60,000 feet (18,288 meters) MSL (or in other terms, up to Flight Level 600).

Restricted Area. This Special Use Airspace is identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions by the Federal Aviation Administration. Restricted areas denote the existence of unusual hazards to aircraft, often invisible, such as artillery firing, aerial gunnery, or guided missiles. Flying within this type of Special Use Airspace, without prior authorization from the using or controlling agency (e.g., the Joint Region Marianas or Federal Aviation Administration, respectively) may be extremely hazardous to the aircraft and its occupants. A proposed restricted area above and surrounding Pagan, designated R-7204 A, B, C and D, would extend horizontally 12 nautical miles (22 kilometers) from Pagan’s shoreline. This Restricted Area would have a floor starting at the sea surface and extend up to a ceiling of 60,000 feet (18,288 meters) MSL (or Flight Level 60,000 feet).

Monthly, Notices to Airmen are issued by the Federal Aviation Administration for Special Use Airspace operations, informing pilots of hazardous operations in the area. Table 2.5-5 outlines anticipated operations in Warning Area-14 and R-7204 A, B, and C. These numbers are based on 16 weeks of operations.

Table 2.5-5. All Pagan Action Alternatives Aircraft Operations Proposed in Special Use Airspace

<table>
<thead>
<tr>
<th>Aircraft Type (example)</th>
<th>Annual Number of Operations*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7:00 a.m. – 10:00 p.m.</td>
</tr>
<tr>
<td>Fighter (F-18/F-16/F-35)</td>
<td>1,880</td>
</tr>
<tr>
<td>Transport Tilt-Rotor (MV-22)</td>
<td>80</td>
</tr>
<tr>
<td>Transport Rotary-Wing (CH-53)</td>
<td>290</td>
</tr>
<tr>
<td>Attack Helicopter (AH-1/H-60)</td>
<td>130</td>
</tr>
<tr>
<td>Transport Fixed Wing (C-130)</td>
<td>720</td>
</tr>
<tr>
<td>Unmanned Aerial Systems (RQ-7B Shadow)</td>
<td>320</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,420</strong></td>
</tr>
</tbody>
</table>

*Note: *One operation is counted each time an aircraft enters a different airspace unit.*
Figure 2.5-5
Pagan All Action Alternatives
Special Use Airspace: Two-Dimensional Perspective
2.5.1.9 Sea Space Requirements

Sea space directly supporting and contiguous to certain potentially hazardous training activities (i.e., live-fire ranges on land) is required by 33 CFR Part 334, *Navigable Waters* (Danger Zone and Restricted Area Regulations) to be designated as a danger zone, and published for public safety. A danger zone is a defined water area (or areas) used for hazardous operations. Consistent with military safety requirements, access to danger zones is strictly prohibited while live-fire or dangerous military activities are underway, but would be open to the public when no training is occurring in that zone. Certain portions of the proposed Pagan restricted airspace (i.e., the water area under R-7204 A, B, and C) in general define the lateral boundaries of water areas to be designated as danger zones (\(\)) . The U.S. Coast Guard publishes a monthly Notice to Mariners for danger zones, informing the maritime community of hazardous operations in the area.

2.5.2 Pagan Alternative 1

Proposed range complexes for Pagan Alternative 1 are shown on Figure 2.5-7. Proposed training facilities for Pagan Alternative 1 are shown in Figures 2.5-8 and 2.5-9. The composite surface danger zone for Pagan Alternative 1 is shown in Figure 2.5-4. Under this alternative, construction improvements, training operations, operations and management, transportation, munitions, amphibious operations, airspace requirements, and sea space requirements (i.e., the elements common to all alternatives) would be the same as those described in Section 2.5.1, *Elements Common to All Action Alternatives* with the exception of a few distinctions.

2.5.2.1 Construction and Improvements

Construction and improvements under this alternative would be the same as those described in Section 2.5.1, *Elements Common to All Action Alternatives*, with the following distinctions:

- North Range Complex would support two High Hazard Impact Areas. The northern High Hazard Impact Area, centered on Mount Pagan, would encompass approximately 4,192 acres (1,696 hectares); however, ground disturbance would be limited to eight target areas (“boxes”) totaling 384 acres (155 hectares). In general, the actual metal targets would be placed in flat areas that are free of vegetation. The target boxes, which collectively total 384 acres (155 hectares), would each be considered 100% ground disturbed once the High Hazard Impact Area is activated due to the use of high explosive munitions in the impact area. Target areas are not considered impervious surfaces. A 98-foot (30-meter) firebreak would be established along the perimeter of the High Hazard Impact Area.

- The second High Hazard Impact Area, located across the isthmus, would encompass 375 acres (152 hectares); however, 64 acres (26 hectares) would be disturbed to incorporate targets and to create a fire break. The target box would be considered 100% ground disturbed once the High Hazard Impact Area is activated because of the repeated use of high explosive munitions in the impact area. Target areas are not considered impervious surface areas.
Figure 2.5-7
Pagan Alternative 1
Range Complexes
High Hazard Impact Area which contains targets used for the following ranges:
1. Field Artillery Indirect Fire Range
2. Mortar Range
3. Field Artillery Direct Fire Range
4. Combined Arms Training Range
to support Close Air Support and Naval Gunfire Support Training
5. Offensive Air Support Range
6. Close Air Support Range

Terrain Flight Maneuver Area
Range located over the island

Dedicated Live-Fire Maneuver Area
(Heavy Forces, Light Forces, Amphibious Forces)

Legend
- Field Artillery Direct Fire Range Firing Position
- Field Artillery Indirect Firing Position
- Mortar Range Firing Position
- Helicopter Landing Zone
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training
- Target Area

Proposed Actions:
- Field Artillery Direct Fire Range Firing Position
- Field Artillery Indirect Firing Position
- Mortar Range Firing Position
- Helicopter Landing Zone
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training
- Target Area

Airfield Runway/Bivouac Area
High Hazard Impact Area (4,192 acres)
Dedicated Live-Fire Maneuver Area (3,922 acres)

Proposed Military Training Trail Network (140 acres)
- High Hazard Impact Area
- Restricted Access Military Training Trail
- Primary Perimeter Military Training Trail (Existing Trail)
- Primary Perimeter Military Training Trail (No Existing Trail)
- Other Potential Military Training Trail (Existing Trail)
- Other Potential Military Training Trail (No Existing Trail)

Figure 2.5-8
Pagan Alternative 1
North Range Complex

0 0.25 0.5 1 Miles
0 0.25 0.5 1 Kilometers

North Beach
Laguna
Sanhalom
Laguna
Sanhiyon
Blue Beach
Combined Arms Live-Fire Beach
Red Beach
Combined Arms Live-Fire Beach
Green Beach
South Beach
Gold Beach

Battle Sight Zero Range
(no acreage - this is a temporary range)
Terrain Flight Maneuver Area
Range located over the island

South Range Complex

Proposed Actions:
- Field Artillery Indirect Firing Position
- Mortar Range Firing Position
- Target Area
- Non-Live-Fire Maneuver Area (3,198 acres)
- Dedicated Live-Fire Maneuver Area (3,922 acres)
- Proposed Military Training Trail Network (140 acres)
- Other Potential Road
  (No Existing Road/Trail)

Figure 2.5-9
Pagan Alternative 1
South Range Complex
• A total of 1 firing point associated with the Field Artillery Direct Firing Range, 11 firing points associated with the Field Artillery Indirect Fire Range, and 6 firing points associated with the Mortar Range would be constructed under Pagan Alternative 1 for a total of 180 acres (73 hectares). It is assumed that through repeated use that the firing points would take on an impervious quality and is considered newly created impervious surface.

• Eleven Landing Zones would be constructed under Pagan Alternative 1. Anticipated ground disturbance associated with Landing Zones would total 36 acres (15 hectares). It is assumed that through repeated use that the additional Landing Zones would take on an impervious quality and are considered newly created impervious surface.

• The 3,921 acres (1,587 hectares) of dedicated live-fire maneuver area would not require construction.

2.5.2.2 Training

Training operations under this alternative would be the same as those described in Section 2.5.1, Elements Common to All Action Alternatives, with the following distinction:

• North Range Complex would provide two High Hazard Impact Areas. The northern High Hazard impact area centered on Mount Pagan (4,192 acres [1,696 hectares]) would provide flexibility in terms of the number and types of weapons used to support live-fire combined arms training scenarios. The second High Hazard Impact Area located on the isthmus (375 acres [152 hectares]), would offer additional flexibility for ground-based training and when both High Hazard Impact Areas are used, they offer greater training scenario complexity, therefore, increasing training value. The remaining area in the North Range Complex supports live-fire maneuver area (3,921 acres [1,587 hectares]). Non-live-fire maneuver area would be limited to the South Range Complex.

Due to the larger land area encumbered by the two High Hazard Impact Areas, there would be less area available to conduct ground maneuvering under this alternative compared to Pagan Alternative (described later). The smaller maneuver area (3,921 acres [1,587 hectares]), as compared to the other alternative, provides a lower degree of training scenario flexibility. Units are more physically constrained when using this smaller maneuver area. This alternative provides greater combined arms training value but less ground maneuver flexibility as compared to Pagan Alternative 2.

2.5.3 Pagan Alternative 2

Proposed range complexes for Pagan Alternative 2 are shown on Figure 2.5-10. Pagan Alternative 2 range complex configurations are depicted in Figures 2.5-11 and 2.5-12. The surface danger zone for Pagan Alternative 2 is shown in Figure 2.5-4. Under Pagan Alternative 2, transportation, munitions, amphibious operations, airspace requirements, and sea space requirements (i.e., some of the elements common to all alternatives) would be the same as those described in Section 2.5.1, Elements Common to All Action Alternatives. However, there are differences in construction and improvements, training operations, and range operation when compared to Pagan Alternative 1 (Section 2.5.2).
North Beach
Gold Beach
Green Beach
South Pagan
Volcano
Mount Pagan
Laguna
Sanhiyon
Laguna
Sanhalom
Mount Maru
Minami Saki
(South Point)
Philippine
Sea
Pacific
Ocean
South
Pagan
Volcano
South Beach
Kutake Yashi
North Beach
Legend
Range Complex
North
South
Proposed Actions:
Field Artillery Direct Fire Range Firing Position
Field Artillery Indirect Firing Position
Mortar Range Firing Position
Helicopter Landing Zone
Tactical Amphibious Landing Beaches
Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
Landing Craft Air Cushion, small boat and swimmer training
Small boat and swimmer training
Target Area
Airfield Runway/Bivouac Area
High Hazard Impact Area
Dedicated Live-Fire Maneuver Area
Non-Live-Fire Maneuver Area
Figure 2.5-10
Pagan Alternative 2
Range Complexes
2-142
Terrain Flight Maneuver Area
Range located over the island

North Beach
Laguna
Sanhalom
Laguna
Sanhiyon
Blue Beach
Combined Arms
Live-Fire Beach
Red Beach
Combined Arms
Live-Fire Beach
Green
Beach
South Beach
Gold
Beach

Battle Sight Zero Range
(no acreage - this is a
temporary range)

No firing of weapons
beyond this point

Legend

Proposed Actions:

Field Artillery Direct Fire Range Firing Position
Field Artillery Indirect Firing Position
Mortar Range Firing Position
Helicopter Landing Zone
Tactical Amphibious Landing Beaches
Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
Landing Craft Air Cushion, small boat and swimmer training
Small boat and swimmer
Target Area
Airfield Runway/Bivouac Area

High Hazard Impact Area
(Dedicated Live-Fire Maneuver Area
(Heavy Forces, Light Forces, Amphibious Forces)

Dedicated Live-Fire Maneuver Area

Non-Live-Fire Maneuver Area

Restricted Access Military Training Trail
Primary Perimeter Military Training Trail
(Existing Trail)
Primary Perimeter Military Training Trail
(No Existing Trail)
Other Potential Military Training Trail
(Existing Trail)
Other Potential Military Training Trail
(No Existing Trail)

Proposed Military Training Trail Network (540 acres)

High Hazard Impact Area

Restricted Access Military Training Trail
Primary Perimeter Military Training Trail
(Existing Trail)
Primary Perimeter Military Training Trail
(No Existing Trail)
Other Potential Military Training Trail
(Existing Trail)
Other Potential Military Training Trail
(No Existing Trail)

Figure 2.5-11
Pagan Alternative 2
North Range Complex

2-143
Philippine Sea

Mount Maru

Mount Togari

Kutake Yashi

Minami Saki (South Point)

South Pagan Volcano

Terrain Flight Maneuver Area

Range located over the island

Legend

- **South Range Complex**
- **Proposed Actions:**
  - Field Artillery Indirect Firing Position
  - Helicopter Landing Zone
  - Dedicated Live-Fire Maneuver Area (5,064 acres)
  - Non-Live-Fire Maneuver Area (3,198 acres)
  - Proposed Military Training Trail Network (140 acres)
  - Other Potential Military Training Trail (No Existing Trail)

Figure 2.5-12
Pagan Alternative 2
South Range Complex
2.5.3.1  Construction and Improvements

Construction and improvements under this alternative would be the same as those described in Section 2.5.2, Pagan Alternative 1, with the following distinctions:

- North Range Complex would support only one High Hazard Impact Area (3,424 acres [1,386 hectares]) compared to two under Pagan Alternative 1. The target placements and thus the ground disturbance on the (northern) High Hazard Impact Area would be the same as under Pagan Alternative 1. However, Pagan Alternative 2 would not have a High Hazard Impact Area on the isthmus; therefore, construction ground disturbance from target areas would be 64 acres (26 hectares) less than under Pagan Alternative.
- A total of five firing positions associated with the Mortar Range would be constructed under Pagan Alternative 2, which is one less than under Pagan Alternative 1 resulting in 10 fewer acres (4 fewer hectares) of ground disturbance from firing positions compared with Pagan Alternative 1. It is assumed that through repeated use that the firing positions would take on an impervious quality and is considered newly created impervious surface.
- Thirteen Landing Zones would be constructed under Pagan Alternative 2; this is two more than under Pagan Alternative 1. The additional ground disturbance from landing zones would be 7 acres (3 hectares). It is assumed that through repeated use that the additional Landing Zones would take on an impervious quality and are considered newly created impervious surface.
- Pagan Alternative 2 requires 67 acres (27 hectares) less total ground disturbance than Alternative 1. The 5,064 acres (2,049 hectares) of dedicated live-fire maneuver area would not require construction.

2.5.3.2  Training

Training operations under this alternative would be the same as those described in Section 2.5.2, Pagan Alternative 1, with the following distinctions:

- North Range Complex would include a smaller High Hazard Impact Area centered on Mount Pagan (3,424 acres [1,386 hectares]), and no High Hazard impact area on the isthmus in comparison to Pagan Alternative 1. Pagan Alternative 2 would therefore include 1,144 acres (463 hectares) less area for live-fire combined arms training than found under Pagan Alternative 1, and therefore afford less area for certain naval, ground, and aircraft live-fire weapons employment. However, maneuver area would proportionally increase to 5,064 acres (2,049 hectares) thus allowing for greater ground maneuver training by providing 1,143 acres (463 hectares) more live-fire maneuver area than Pagan Alternative 1.

The smaller impact area of Pagan Alternative 2, when compared to Pagan Alternative 1, provides less flexibility for aviation munitions delivery training. Targets would be spaced closer (less target dispersion and therefore less variability of potential training scenarios), and due to the narrowing of the impact area, the direction of attack may be more limited in comparison to Pagan Alternative 1. The South Range Complex in Pagan Alternative 2 would offer the same non-live-fire training value as under Pagan Alternative 1.
2.5.4 Pagan No-Action Alternative

Since the mandate from the CNMI government about the prohibition of residents from Pagan because of the volcano eruption in 1981, the island has not been officially occupied and there is limited visitation. The no-action alternative for Pagan assumes the continuation of this occupancy prohibition and limited activity. Therefore, the no-action alternative essentially reflects existing conditions as described in Chapter 3.

The limited visitations under the no-action alternative would continue the infrequent eco-tourism cruise visits. Helicopters or small planes may transport visitors to and from the island. This would be a low impact activity with no permanent pier or wharf construction with visitation facilitated by small boat landings from a larger vessel moored offshore. It is also assumed that these would be day trips with no permanent accommodations on the island. Another probable and low impact activity on Pagan would be periodic visits for scientific or related research conducted by federal and CNMI organizations. Unlike Tinian where the military has long held training exercises on leased land, visits by the military, while not excluded, would be minimal under the no-action alternative and would entail infrequent search and rescue type training exercises following coordination and approval from the CNMI government.

2.5.5 Summary Comparison of Pagan Alternatives

The summary table below provides a comparison of Pagan combined level action alternatives. It is assumed that training throughput (total personnel) and munitions usage would be the same for both alternatives; however, the type of training and maneuvering capability would vary.

Table 2.5-6 provides a summary comparison of the proposed action and no action elements.

<table>
<thead>
<tr>
<th>Comparison of Pagan Alternatives</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Differences</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two High Hazard Impact Areas (on Mount Pagan and isthmus).</td>
<td>•</td>
<td>• One High Hazard Impact Area (Mount Pagan) and, as a result, smaller surface danger zones.</td>
<td>• Very limited military training and minimal human visitation and related activities</td>
</tr>
<tr>
<td>Larger High Hazard Impact Area on Mount Pagan.</td>
<td>•</td>
<td>• Smaller High Hazard Impact Area on Mount Pagan.</td>
<td></td>
</tr>
<tr>
<td>11 Landing Zones</td>
<td>•</td>
<td>• 13 Landing Zones</td>
<td></td>
</tr>
<tr>
<td>6 Mortar Range Firing Positions</td>
<td>•</td>
<td>• 5 Mortar Range Firing Positions</td>
<td></td>
</tr>
<tr>
<td><strong>Simultaneous Use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both the North and South Complex Ranges could be used at the same time</td>
<td>•</td>
<td>• Same as Alternative 1, however, the North Range Complex would only have one High Hazard Impact Area</td>
<td>• Not applicable</td>
</tr>
<tr>
<td><strong>Training Value</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This alternative provides greater combined arms training value but less ground maneuver flexibility</td>
<td>•</td>
<td>• Lesser live-fire training options, flexibility in attack approach and more limited options for</td>
<td>• Military presence on Pagan would continue to be limited and coordinated with the CNMI government</td>
</tr>
</tbody>
</table>
Table 2.5-6. Summary Comparison of Pagan Alternatives

**Comparison of Pagan Action Alternatives**

<table>
<thead>
<tr>
<th></th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>as compared to Alternative 2</td>
<td></td>
<td>weapons deployment due to smaller northern High Hazard Impact Area on Mount Pagan and lack of a High Hazard Impact Area on the isthmus</td>
<td>Greater ground maneuver flexibility compared to Alternative 1</td>
</tr>
</tbody>
</table>

**Elements Common to All Pagan Action Alternatives**

<table>
<thead>
<tr>
<th>Training Facilities Construction</th>
<th>Alternatives 1 and 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expeditionary Base Camp/Bivouac Area</td>
<td>Includes bivouac area for tents “housing” personnel. Staging areas for equipment and vehicles, and temporary infrastructure such as water tanks, portable toilets, and diesel generators.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Airfield Improvements</td>
<td>Includes extending the runway, space for aircraft turnaround and parking, refueling, and munitions loading space.</td>
<td>No activities</td>
</tr>
<tr>
<td>Military Training Trail Network</td>
<td>Includes a 22-mile (35 kilometer) military training trail network from the expeditionary base camp/bivouac area to the North Range Complex.</td>
<td>No activities</td>
</tr>
<tr>
<td>South Range Complex</td>
<td>No construction footprint.</td>
<td>No activities</td>
</tr>
</tbody>
</table>

**Range Operations and Maintenance**

| Security | As training cycles are defined in detail, an access plan will be developed and published for public information. | Not applicable |
| Public Access | Prohibition of public access at all times to the High Hazard Impact Area(s). Portions of the island and surrounding waterways may be available for public access depending on the type of training and the training scenario. Public access would be allowed when training is not occurring. | Access would be limited and coordinated with the CNMI government |
| Biosecurity | Biosecurity measures would be established to wash down and inspect equipment arriving on and upon departure from Pagan. | Biosecurity would be done as needed |
| Emergency Services | Establishing fire, safety, and medical emergency procedures for all visiting personnel. | Not applicable |
| Munitions | Total: approximately 700,298 rounds/year | Not applicable |

**Amphibious Training Beaches**

<table>
<thead>
<tr>
<th>Operations</th>
<th>Alternatives 1 and 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following amphibious training would occur:</td>
<td></td>
<td>Not applicable</td>
</tr>
<tr>
<td>• Red, Green, Blue (Shomshon, Palapala, Apan Beaches) – Amphibious Assault Vehicle, Landing Craft Air Cushion vessel, small boat, and combat swimmer training.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• South (Regussa beach) would be used for Landing Craft Air Cushion vessel s, small boat, and combat swimmer training.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Gold (Unai Dikidiki Beach) would be used for small boat and combat swimmer training.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 2.5-6. Summary Comparison of Pagan Alternatives

#### Elements Common to All Pagan Action Alternatives

<table>
<thead>
<tr>
<th>Amphibious Training Beaches</th>
<th>Alternatives 1 and 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Access to Beaches</td>
<td>Access allowed to Pagan beaches when no training is occurring</td>
<td>No limits to public access beyond those imposed by the CNMI government</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Airspace Requirement</th>
<th>Alternatives 1 and 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
</table>
| Operations           | Special Use Airspace would be established.  
- Warning Area -14, a quadrilateral with a dimension of roughly 60 nautical miles by 80 nautical miles (111 kilometers by 148 kilometers), from the center of Pagan. The floor would start at the surface and extend to a ceiling of 59,999 feet (18,288 meters) MSL.  
- Restricted Area -7204, extends horizontally 12 nautical miles (22 kilometers) from Pagan’s shoreline with a floor starting at the surface to a ceiling of 60,000 feet (18,300 meters) MSL. | Not applicable |

<table>
<thead>
<tr>
<th>Sea Space Requirement</th>
<th>Alternatives 1 and 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations</td>
<td>Danger zones would be established using the Pagan Restricted Area boundaries. These danger zones would be activated when corresponding airspace is activated.</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

#### Comparison of Pagan All Action Alternatives: Ground Disturbance and Newly Created Impervious Surfaces

<table>
<thead>
<tr>
<th>Element</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Ground Disturbance/Newly Created Impervious Surface</td>
<td>Total: 764 acres (310 hectares)/350 acres (142 hectares)</td>
<td>Total: 697 acres (282 hectares)/347 acres (140 hectares)</td>
<td>Minimal disturbance/no increase in impervious surfaces</td>
</tr>
<tr>
<td>Expeditionary Base Camp/Bivouac Area</td>
<td>42 acres (17 hectares) all of which is considered newly created impervious surface</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>Expeditionary Airfield</td>
<td>41 acres (17 hectares) all of which is considered newly created impervious surface</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>Munitions Storage Area and Supply Route</td>
<td>42 acres (17 hectares)/only 12 acres (5 hectares) is considered newly created impervious surface</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>Military Training Trails</td>
<td>39 acres (16 hectares) all of which is considered newly created impervious surface</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td>North Range Complex (Landing Zones, Firing Positions, Target Areas)</td>
<td>600 acres (243 hectares)/216 acres (88 hectares)</td>
<td>533 acres (241 hectares)/213 acres (86 hectares)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>South Range Complex</td>
<td>0 acre (0 hectare)</td>
<td>0 acre (0 hectare)</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
2.6 **ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS**

In addition to the no-action alternative, the following alternatives were considered but eliminated from further analysis because they did not meet the purpose of and need for the proposed action.

### 2.6.1 Alternatives Outside of the CNMI

The 2012 *Training Needs Assessment: An Assessment of Current Training Ranges and Supporting Facilities in the U.S. Pacific Command Area of Responsibility* (DoN 2013b), examined the unmet training requirements of four areas that make up the majority of the Pacific region force structure: Hawaii, Japan, Korea, and the Mariana Islands. The Assessment concluded that the Mariana Islands region has significantly more unmet training requirements than the other areas (i.e., Hawaii, Japan, Korea) (see Section 1.3.5, *Training Needs Assessment*). The 2013 *CNMI Joint Military Training Requirements and Siting Study* (DoN 2013a), concluded that within the Mariana Islands, Guam training opportunities are limited to the existing activities plus future individual skills training for the Marine forces and that there is no additional capacity to address the U.S. Pacific Command’s unmet training requirements. Therefore, land, sea, and airspace on and around Guam were excluded from further consideration in meeting the identified unfilled training requirements.

### 2.6.2 Alternatives with a Single Location within the CNMI

Both unit level and combined level training must be included in the proposed action to meet unfilled training requirements in the Mariana Islands. Combined level training brings several units (U.S. and allied nations) together working as a team towards a single objective. Combined level training also involves maneuvering and use of live-fire ranges and training areas; however, because of the greater number of troops and tasks, this training requires larger areas. Separate range complexes are required to support each type of training because of the nature of unit and combined training along with the frequency of this training. Neither Tinian nor Pagan alone can support both levels of training identified as unfilled training requirements (as detailed in Section 2.3.1, *Operational Siting Criteria*). Therefore, use of only one island (Tinian or Pagan) does not meet the purpose and need, and this alternative was dismissed from further analysis.

### 2.7 PREFERRED ALTERNATIVE

The combination of Tinian Alternative 2 and Pagan Alternative 2 is the preferred alternative.

Tinian Alternative 2 was selected as the preferred alternative for Tinian because it is operationally superior and results in similar environmental impacts as the other alternatives. The training flexibility of Tinian Alternative 2 is greater than that of the other action alternatives because it contains two Battle Area Complexes and a Convoy Course with a greater number of engagement areas. The environmental impacts for Tinian Alternative 2 are similar to those of the other two action alternatives.

Pagan Alternative 2 was selected as the preferred alternative for Pagan because it is operationally similar to Pagan Alternative 1 but results in less environmental impacts. Operationally, Pagan Alternative
2 provides a lesser degree of combined arms training than Pagan Alternative 1; however, Pagan Alternative 2 offers a larger maneuver area within the North Range Complex due to a smaller High Hazard Impact Area on Mount Pagan and lack of a second High Hazard Impact Area on the isthmus. This operational distinction for Pagan Alternative 2 results in less environmental impacts with regard to natural resources (particularly terrestrial biological resources).
CHAPTER 3

AFFECTED ENVIRONMENT

Table of Contents

CHAPTER 3  AFFECTED ENVIRONMENT ................................................................. I
ACRONYMS AND ABBREVIATIONS ............................................................................. VI
3.1 INTRODUCTION .................................................................................................... 3-1
3.2 GEOLOGY AND SOILS ......................................................................................... 3-1
3.3 WATER RESOURCES ............................................................................................. 3-24
3.4 AIR QUALITY ......................................................................................................... 3-43
3.5 NOISE .................................................................................................................... 3-46
3.6 AIRSPACE ............................................................................................................. 3-57
3.7 LAND AND SUBMERGED LAND USE ................................................................. 3-75
3.8 RECREATION ......................................................................................................... 3-94
3.9 TERRESTRIAL BIOLOGY ....................................................................................... 3-110
3.10 MARINE BIOLOGY .............................................................................................. 3-144
3.11 CULTURAL RESOURCES ..................................................................................... 3-196
3.12 VISUAL RESOURCES ........................................................................................... 3-203
3.13 TRANSPORTATION .............................................................................................. 3-219
3.14 UTILITIES ............................................................................................................ 3-230
3.15 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE .................................... 3-243
3.16 HAZARDOUS MATERIALS AND WASTE .......................................................... 3-271
3.17 PUBLIC HEALTH AND SAFETY .......................................................................... 3-294
# List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2-1</td>
<td>Regional Geologic Map of the Mariana Islands</td>
<td>3-4</td>
</tr>
<tr>
<td>3.2-2</td>
<td>Tinian Physiographic and Topographic Map</td>
<td>3-6</td>
</tr>
<tr>
<td>3.2-3</td>
<td>Tinian Geologic Units</td>
<td>3-8</td>
</tr>
<tr>
<td>3.2-4</td>
<td>Proposed Amphibious Training Beaches on Tinian</td>
<td>3-10</td>
</tr>
<tr>
<td>3.2-5</td>
<td>Tinian Soil Classes Associated with the Affected Environment</td>
<td>3-13</td>
</tr>
<tr>
<td>3.2-6</td>
<td>Tinian Prime Farmland Soil Classes Associated with the Affected Environment</td>
<td>3-16</td>
</tr>
<tr>
<td>3.2-7</td>
<td>Pagan Topographic Map</td>
<td>3-17</td>
</tr>
<tr>
<td>3.2-8</td>
<td>Pagan Generalized Geologic Map</td>
<td>3-19</td>
</tr>
<tr>
<td>3.2-9</td>
<td>Pagan Pozzolan Deposits</td>
<td>3-20</td>
</tr>
<tr>
<td>3.3-1</td>
<td>Tinian Surface Waters and Flood Zones</td>
<td>3-28</td>
</tr>
<tr>
<td>3.3-2</td>
<td>Graphic Depiction of a Freshwater Lens above a Saltwater Wedge – Standard,</td>
<td>3-32</td>
</tr>
<tr>
<td></td>
<td>Vertical Pumping Well</td>
<td></td>
</tr>
<tr>
<td>3.3-3</td>
<td>Graphic Depiction of a Freshwater Lens above Saltwater Wedge – Horizontal,</td>
<td>3-32</td>
</tr>
<tr>
<td></td>
<td>Maui-Type Pumping Well</td>
<td></td>
</tr>
<tr>
<td>3.3-4</td>
<td>Tinian Groundwater Wells, Elevation, and Flow Direction</td>
<td>3-33</td>
</tr>
<tr>
<td>3.3-5</td>
<td>Pagan Surface Waters and Groundwater Well Locations</td>
<td>3-38</td>
</tr>
<tr>
<td>3.5-1</td>
<td>Sensitive Noise Receptor Locations – Tinian and Saipan</td>
<td>3-49</td>
</tr>
<tr>
<td>3.5-2</td>
<td>Baseline Noise Contours at Tinian International Airport</td>
<td>3-54</td>
</tr>
<tr>
<td>3.6-1</td>
<td>Cross Section of Airspace Classes and Relationships</td>
<td>3-60</td>
</tr>
<tr>
<td>3.6-2</td>
<td>Special Use and Other Airspace Designated for Military Use</td>
<td>3-61</td>
</tr>
<tr>
<td>3.6-3</td>
<td>Commuter Flight Routes</td>
<td>3-65</td>
</tr>
<tr>
<td>3.6-4</td>
<td>Annual Airport Operations at Tinian International Airport</td>
<td>3-66</td>
</tr>
<tr>
<td>3.6-5</td>
<td>Tinian and Saipan Regional Airspace</td>
<td>3-67</td>
</tr>
<tr>
<td>3.6-6</td>
<td>Annual Operations at Saipan International Airport</td>
<td>3-68</td>
</tr>
<tr>
<td>3.6-7</td>
<td>Existing Mariana Islands Airspace Designated for Military Use</td>
<td>3-69</td>
</tr>
<tr>
<td>3.6-8</td>
<td>Regional Airports and Commercial Aviation Routes</td>
<td>3-72</td>
</tr>
<tr>
<td>3.7-1</td>
<td>Region of Influence for Land and Submerged Land Use</td>
<td>3-76</td>
</tr>
<tr>
<td>3.7-2</td>
<td>Tinian Land Jurisdiction Control</td>
<td>3-82</td>
</tr>
<tr>
<td>3.7-3</td>
<td>Tinian Land Jurisdiction Control and Management</td>
<td>3-83</td>
</tr>
<tr>
<td>3.7-4</td>
<td>Tinian CNMI Areas of Particular Concern</td>
<td>3-85</td>
</tr>
<tr>
<td>3.7-5</td>
<td>Tinian and Saipan Existing Land Use</td>
<td>3-86</td>
</tr>
<tr>
<td>3.7-6</td>
<td>Military Land Use on Tinian</td>
<td>3-88</td>
</tr>
<tr>
<td>3.7-7</td>
<td>Pagan CNMI Areas of Particular Concern</td>
<td>3-92</td>
</tr>
<tr>
<td>3.8-1</td>
<td>Tinian Recreation Resources and Places of Interest</td>
<td>3-96</td>
</tr>
<tr>
<td>3.9-1</td>
<td>Vegetation Communities – Tinian Military Lease Area</td>
<td>3-114</td>
</tr>
<tr>
<td>3.9-2</td>
<td>Estimated Tinian Monarch Population (1982 – 2013)</td>
<td>3-120</td>
</tr>
<tr>
<td>3.9-3</td>
<td>Occurrence of Special-status Species - Tinian Military Lease Area</td>
<td>3-125</td>
</tr>
</tbody>
</table>

---
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.9-4</td>
<td>Past and Current Occurrences of Mariana Common Moorhen within the Military Lease Area</td>
<td>3-127</td>
</tr>
<tr>
<td>3.9-5</td>
<td>Vegetation Communities – Pagan</td>
<td>3-135</td>
</tr>
<tr>
<td>3.9-6</td>
<td>Occurrence of Special-status Species – Pagan</td>
<td>3-141</td>
</tr>
<tr>
<td>3.10-1</td>
<td>Typical Reef Zonation</td>
<td>3-148</td>
</tr>
<tr>
<td>3.10-2</td>
<td>Tinian Marine Habitat Overview</td>
<td>3-152</td>
</tr>
<tr>
<td>3.10-3</td>
<td>Unai Chulu Coral Cover</td>
<td>3-158</td>
</tr>
<tr>
<td>3.10-4</td>
<td>Unai Babui Coral Cover</td>
<td>3-160</td>
</tr>
<tr>
<td>3.10-5</td>
<td>Unai Lam Lam Coral Cover</td>
<td>3-162</td>
</tr>
<tr>
<td>3.10-6</td>
<td>Unai Masalok Coral Cover</td>
<td>3-164</td>
</tr>
<tr>
<td>3.10-7</td>
<td>Pagan Marine Habitat Overview</td>
<td>3-176</td>
</tr>
<tr>
<td>3.10-8</td>
<td>Green Beach Coral Cover</td>
<td>3-180</td>
</tr>
<tr>
<td>3.10-9</td>
<td>Red Beach Coral Cover</td>
<td>3-182</td>
</tr>
<tr>
<td>3.10-10</td>
<td>Blue Beach Coral Cover</td>
<td>3-184</td>
</tr>
<tr>
<td>3.10-11</td>
<td>South Beach Coral Cover</td>
<td>3-187</td>
</tr>
<tr>
<td>3.10-12</td>
<td>Gold Beach Coral Cover</td>
<td>3-189</td>
</tr>
<tr>
<td>3.11-1</td>
<td>Major Historic Events for Tinian and Pagan</td>
<td>3-198</td>
</tr>
<tr>
<td>3.11-2</td>
<td>North Field National Historic Landmark</td>
<td>3-200</td>
</tr>
<tr>
<td>3.12-1</td>
<td>Tinian Key Observation Points</td>
<td>3-205</td>
</tr>
<tr>
<td>3.12-2</td>
<td>Pagan Visual Resources</td>
<td>3-216</td>
</tr>
<tr>
<td>3.13-1</td>
<td>Tinian International Airport Facilities</td>
<td>3-222</td>
</tr>
<tr>
<td>3.13-2</td>
<td>Tinian Existing Roads and Average Daily Traffic</td>
<td>3-224</td>
</tr>
<tr>
<td>3.13-3</td>
<td>Port of Tinian Cargo Tonnage Handled</td>
<td>3-227</td>
</tr>
<tr>
<td>3.14-1</td>
<td>Tinian Power Distribution</td>
<td>3-233</td>
</tr>
<tr>
<td>3.14-2</td>
<td>Tinian Potable Water Distribution</td>
<td>3-236</td>
</tr>
<tr>
<td>3.14-3</td>
<td>Tinian Wastewater Systems</td>
<td>3-238</td>
</tr>
<tr>
<td>3.14-4</td>
<td>Tinian Solid Waste Facility</td>
<td>3-240</td>
</tr>
<tr>
<td>3.15-2</td>
<td>Compensation and Gross Domestic Product</td>
<td>3-250</td>
</tr>
<tr>
<td>3.15-3</td>
<td>CNMI Total Visitors, 2000-2013</td>
<td>3-252</td>
</tr>
<tr>
<td>3.15-4</td>
<td>Percent Change in Total Visitors to the CNMI, 2000-2013</td>
<td>3-252</td>
</tr>
<tr>
<td>3.15-5</td>
<td>Tinian Fishing Areas and Type of Fishing</td>
<td>3-256</td>
</tr>
<tr>
<td>3.15-6</td>
<td>Minority and Low-income Population Areas</td>
<td>3-267</td>
</tr>
<tr>
<td>3.15-7</td>
<td>Schools and Highly Populated Areas</td>
<td>3-270</td>
</tr>
<tr>
<td>3.16-1</td>
<td>Tinian Areas of Potential Environmental Concern and Military Munitions Response Program Sites</td>
<td>3-279</td>
</tr>
<tr>
<td>3.16-2</td>
<td>Probable Munitions Presence Locations</td>
<td>3-293</td>
</tr>
<tr>
<td>3.17-1</td>
<td>Tinian Military Lease Area</td>
<td>3-296</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>3.2-1</td>
<td>Soil Classifications Associated with the Affected Environment</td>
<td>3-14</td>
</tr>
<tr>
<td>3.3-1</td>
<td>Tinian Surface Water Features</td>
<td>3-27</td>
</tr>
<tr>
<td>3.3-2</td>
<td>Summary of Potential Wetlands of the Bateha and Mahalang Complexes</td>
<td>3-29</td>
</tr>
<tr>
<td>3.3-3</td>
<td>Tinian – Tinian Municipal Well Water Quality</td>
<td>3-35</td>
</tr>
<tr>
<td>3.3-4</td>
<td>Tinian Impaired Coastal Waters</td>
<td>3-36</td>
</tr>
<tr>
<td>3.3-5</td>
<td>Pagan Surface Water Quality Data Summary</td>
<td>3-39</td>
</tr>
<tr>
<td>3.3-6</td>
<td>Pagan Surface Water Quality Sample Report</td>
<td>3-40</td>
</tr>
<tr>
<td>3.5-1</td>
<td>Noise Zones and Sensitive Land Use Compatibility</td>
<td>3-50</td>
</tr>
<tr>
<td>3.5-2</td>
<td>General Land Use Compatibility by Noise Zone</td>
<td>3-51</td>
</tr>
<tr>
<td>3.5-3</td>
<td>Large Caliber Weapons and Explosives Risk of Complaints Levels</td>
<td>3-51</td>
</tr>
<tr>
<td>3.5-4</td>
<td>Baseline Noise Levels at Representative Points of Interest</td>
<td>3-55</td>
</tr>
<tr>
<td>3.6-1</td>
<td>Current Use of Air Traffic Control Assigned Airspace</td>
<td>3-70</td>
</tr>
<tr>
<td>3.9-1</td>
<td>Terrestrial Biology Field Studies on Tinian and Pagan</td>
<td>3-112</td>
</tr>
<tr>
<td>3.9-2</td>
<td>Tinian Vegetation Communities (acres)</td>
<td>3-113</td>
</tr>
<tr>
<td>3.9-3</td>
<td>Occurrence of Federally Endangered Species Act-Listed and Proposed Species and CNMI-Listed Species on Tinian</td>
<td>3-124</td>
</tr>
<tr>
<td>3.9-4</td>
<td>Bird Species Observed on Tinian and Protected under the Migratory Bird Treaty Act</td>
<td>3-132</td>
</tr>
<tr>
<td>3.9-5</td>
<td>Vegetation Communities – Pagan</td>
<td>3-134</td>
</tr>
<tr>
<td>3.9-6</td>
<td>Occurrence of Federally Endangered Species Act-Listed and Proposed Species and CNMI-Listed Species on Pagan</td>
<td>3-140</td>
</tr>
<tr>
<td>3.9-7</td>
<td>Bird Species Occurring on Pagan and Protected under the Migratory Bird Treaty Act</td>
<td>3-143</td>
</tr>
<tr>
<td>3.10-1</td>
<td>Estimates of Select Total Physical Features Compared to Tinian</td>
<td>3-150</td>
</tr>
<tr>
<td>3.10-2</td>
<td>Essential Fish Habitat and Habitat Areas of Particular Concern for Management Unit Species of the Western Pacific Region</td>
<td>3-153</td>
</tr>
<tr>
<td>3.10-3</td>
<td>CNMI Marine Invertebrate Species of Special Conservation Need of Tinian</td>
<td>3-166</td>
</tr>
<tr>
<td>3.10-4</td>
<td>Special-status Coral Species of Tinian</td>
<td>3-167</td>
</tr>
<tr>
<td>3.10-5</td>
<td>Special-status Fish Species of Tinian</td>
<td>3-168</td>
</tr>
<tr>
<td>3.10-6</td>
<td>Special-status Sea Turtle Species of Tinian</td>
<td>3-168</td>
</tr>
<tr>
<td>3.10-7</td>
<td>Marine Mammals Species with Reported Occurrence in the Region of Influence Surrounding Tinian</td>
<td>3-173</td>
</tr>
<tr>
<td>3.10-8</td>
<td>Estimates of Select Total Physical Characteristics Compared to Pagan</td>
<td>3-175</td>
</tr>
<tr>
<td>3.10-9</td>
<td>Marine Invertebrates Identified by the CNMI Division of Fish and Wildlife Marine Species of Special Conservation Need in Pagan</td>
<td>3-191</td>
</tr>
<tr>
<td>3.10-10</td>
<td>Special-status Coral Species of Pagan</td>
<td>3-191</td>
</tr>
<tr>
<td>3.10-11</td>
<td>Special-status Sea Turtle Species of Pagan</td>
<td>3-192</td>
</tr>
<tr>
<td>3.11-1</td>
<td>Contributing Features to the North Field National Historic Landmark</td>
<td>3-199</td>
</tr>
<tr>
<td>3.15-1</td>
<td>CNMI Labor Force, Employment, and Unemployment, 2010</td>
<td>3-248</td>
</tr>
<tr>
<td>3.15-2</td>
<td>Employment by Industry, 2010</td>
<td>3-248</td>
</tr>
<tr>
<td>3.15-3</td>
<td>CNMI Income by Occupation, 2011</td>
<td>3-249</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>3.15-4</td>
<td>CNMI Government Revenues by Source, 2002-2009 (Millions of $’s)</td>
<td></td>
</tr>
<tr>
<td>3.15-5</td>
<td>Farms, Land in Farms, and Land Use by Municipality, 2002 and 2007</td>
<td></td>
</tr>
<tr>
<td>3.15-6</td>
<td>Tinian Cattle Ranching Data, December 2012-February 2013</td>
<td></td>
</tr>
<tr>
<td>3.15-7</td>
<td>Tinian Fishing Areas and Type of Fishing</td>
<td></td>
</tr>
<tr>
<td>3.15-8</td>
<td>Minority Population Areas (&gt; 50%) by Census Tract</td>
<td></td>
</tr>
<tr>
<td>3.15-9</td>
<td>Low-income Population Areas (&gt;20%) by Census Tract</td>
<td></td>
</tr>
<tr>
<td>3.15-10</td>
<td>Children in the CNMI and Tinian, 2010</td>
<td></td>
</tr>
<tr>
<td>3.15-11</td>
<td>Percentage of Children Below the Poverty Line</td>
<td></td>
</tr>
<tr>
<td>3.16-1</td>
<td>Sites of Potential Environmental Concern Associated with Agricultural Activities within the Tinian Military Lease Area</td>
<td></td>
</tr>
<tr>
<td>3.16-2</td>
<td>Sites of Potential Environmental Concern Associated with World War II Activities within the Tinian Military Lease Area</td>
<td></td>
</tr>
<tr>
<td>3.16-3</td>
<td>Sites of Potential Environmental Concern within the Tinian Military Lease Area</td>
<td></td>
</tr>
<tr>
<td>3.16-4</td>
<td>Potential Historical Hazardous Waste Sites and Munitions and Explosives of Concern Areas on Pagan</td>
<td></td>
</tr>
<tr>
<td>3.17-1</td>
<td>CNMI Five Year (2008-2012) Collision Summary</td>
<td></td>
</tr>
</tbody>
</table>
### Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>percent</td>
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<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
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<tr>
<td>CJMT</td>
<td>Commonwealth of the Northern Mariana Islands Joint Military Training</td>
</tr>
<tr>
<td>CNMI</td>
<td>Commonwealth of the Northern Mariana Islands</td>
</tr>
<tr>
<td>DDT</td>
<td>dichlorodiphenyltrichloroethane</td>
</tr>
<tr>
<td>DoN</td>
<td>Department of the Navy</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
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<tr>
<td>MSL</td>
<td>mean sea level</td>
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<tr>
<td>NAVFAC</td>
<td>Naval Facilities Engineering Command</td>
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<tr>
<td>n.d.</td>
<td>not date</td>
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<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<tr>
<td>NMC-CREES</td>
<td>Northern Marianas College Cooperative Research, Extension and Education Service</td>
</tr>
<tr>
<td>OEIS</td>
<td>Overseas EIS</td>
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<td>U.S.</td>
<td>United States</td>
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</table>
CHAPTER 3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

According to the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations [CFR] § 1502.15) “the Environmental Impact Statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration.” Potential impacts cannot be determined without first understanding the existing conditions in the affected environment. For this reason, the impact analysis process involves two steps—identifying the affected environment and detailing the potential environmental consequences resulting from the alternatives. The geographic extent of the affected environment is determined by the potential for impacts to affect components of the human, natural, and cultural environment. From this point forward, these human, natural, and cultural components are referred to collectively as resource categories. Depending on the resource category, the extent of the affected environment/region of influence may differ. For instance, the proposed action may have impacts on soils within specific areas of the Military Lease Area; however, air pollutants generated by the proposed action would include areas downwind of the proposed action and could possibly influence the regional air quality. Following the affected environment discussion, Chapter 4 details the magnitude of potential impacts or “environmental consequences” of the proposed action on the resource categories.

3.2 GEOLOGY AND SOILS

Section 3.2 describes the geology and soils in the region of influence for the proposed action. The geology and soils of the islands of Tinian and Pagan including the adjacent marine geology and sediments (out to a distance of 1,000 feet [300 meters]) comprise the region of influence for this resource. This distance from shore for marine geology and sediments is based on the footprint of amphibious training under the proposed action. Geology and soils include the natural physical characteristics of the land forms (topography), the underlying soils and rocks (structural geology), and any associated geologic hazards.

3.2.1 Definition

The discussion of this resource includes an overall description of the regional geological setting as well as a description of the topography, geology (geologic units and hazards), and soils associated with the region of influence (i.e., Tinian and Pagan). These terms are defined below.

- **Topography** - the natural and man-made features of a place or region that show relative positions and elevations at the earth’s surface.
- **Geology** - the bedrock materials, mineral deposits, and fossil remains of an area.
- **Geologic Unit** - a volume of rock of identifiable origin or age that is defined by the distinctive, dominant, easily mapped, and recognizable physical characteristics and features that characterize it.
Geologic Hazards - one of several types of adverse geologic conditions capable of causing damage or loss of property and life. This includes adverse results of seismic activity (e.g., earthquakes or fault ruptures), liquefaction, volcanic activity, landslides, tsunamis, and sinkholes.

Soils - unconsolidated earthen materials overlying rock.

Erodibility - it is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff.

Runoff Rate - speed at which water that is not absorbed by the soil travels over and off the surface.

Impervious Surfaces - surfaces covered or compacted to the point that water cannot be absorbed by the soil.

Karst - landscape underlain by limestone that has been eroded by dissolution, producing ridges, towers, fissures, sinkholes, and other characteristic landforms.

Sink Hole - a depression or hole in the ground caused by some form of collapse of the surface layer.

3.2.2 Regulatory Framework

The regulatory framework governing geologic and soil resources is listed below. A complete listing of applicable regulations is provided in Appendix E, Applicable Federal and Local Regulations. The United States (U.S.) Army Corps of Engineers and the U.S. Environmental Protection Agency are the primary federal agencies with jurisdiction over geological and soil resources. Within the Commonwealth of the Northern Mariana Islands (CNMI), the CNMI Bureau of Environmental and Coastal Quality is the administrative authority for the Clean Water Act. The U.S. Department of Agriculture is the regulatory entity with oversight of the Farmland Protection Policy Act. The Department of Defense adheres to Unified Facility Criteria 3-310-04 which provide planning, design, construction, sustainment, restoration, and modernization criteria. Federal and local regulations and codes that serve to protect, conserve, and manage geological and soil resources are listed below.

3.2.2.1 Federal Regulations and Codes

- Clean Water Act
- Farmland Protection Policy Act, 7 U.S. Code § 4201 regulated by the U. S. Department of Agriculture
- Unified Facility Criteria 3-310-04

3.2.2.2 CNMI Regulation

- CNMI Earthmoving and Erosion Control Regulations
- Water Quality Standards
- Drinking Water Regulations
- Well Drilling and Well Operation Regulations
3.2.3 Methodology

Reports, studies, and data sets prepared by or for the federal government, the CNMI government, and independent researchers which address natural resources (e.g., geology, soils, groundwater) and infrastructure (e.g., utilities) on Tinian and Pagan were reviewed for information related to the existing condition of geological and soil resources. All topography, geologic units, geologic hazards, and soils identified during literature review which could be potentially affected by the proposed action are described below. Federal and CNMI regulations were reviewed for regulations that serve to protect, conserve, and manage geological and soil resources.

3.2.4 Regional Geologic Setting

The islands of Tinian and Pagan are located on a volcanic arc adjacent to the Mariana Trench subduction boundary where tectonic plates converge. “Tectonic plates” are massive pieces of the earth’s crust and upper mantle that move and come in contact with each other on the Earth’s surface. A “subduction boundary” occurs where the edge of a denser plate moves under a less dense tectonic plate. The Mariana Trench and the Mariana Islands are part of an active subduction zone where the more dense Pacific Oceanic (tectonic) Plate, moving northwest, passes beneath the less dense Philippine Plate, moving west-northwest (Figure 3.2-1). These plates are constantly moving, resulting in many geologic phenomena (i.e., earthquakes, tsunamis, and volcanic activity) that originate where the moving plates encounter each other. During the past century, more than 40 earthquakes of magnitude 6.5 to 8.1 on the Richter Scale have occurred in the Mariana Trench region (Trusdell et al. 2006) and several of the islands feature active volcanoes.

The geology of individual islands in the Mariana Islands is largely dependent on the degree of volcanic activity present. The older, southern islands, including Tinian, generally consist of a volcanic core that was covered by coralline limestone in layers up to several hundred feet thick, which formed as the volcanic core was exposed above the ocean surface. Uplifting of the Philippine Plate resulted in the limestone caps being pushed several hundred feet above sea level. In some locations, the volcanic cores of these southern islands are exposed by the results of either volcanic activities or erosion of the limestone. The younger (northern) islands, including Pagan, generally consist of exposed volcanic cones (i.e., conical hill produced by volcanic eruptions) and calderas (i.e., large crater formed by volcanic explosion or collapse).
Figure 3.2-1
Regional Geologic Map of the Mariana Islands

Source: National Oceanic and Atmospheric Administration National Geophysical Data Center 2013
3.2.5 Tinian

3.2.5.1 Topography

Tinian is about 12 miles (19 kilometers) long and 6 miles (10 kilometers) wide. It is composed of a series of limestone plateaus separated by steep slopes and cliffs (Young 1989). The surface landforms can be divided into five major physiographic areas described below and shown on Figure 3.2-2 (Doan et al. 1960; Gingerich 2002).

- **Southeastern Ridge**: This land feature is the southernmost topographic feature on the island and includes Mount Kastiyu, the highest part of the island at 614 feet (187 meters). It has steep slopes and cliffs as high as 500 feet (150 meters).

- **Median (Marpo) Valley**: A low, broad depression located north of the Southeastern Ridge, this area has a maximum elevation of 150 feet (46 meters). This area includes San Jose Village.

- **Central Plateau**: This land area extends northward from Marpo Valley and includes all of central Tinian and portions of northern Tinian. The plateau is broad and gently sloping with the majority of the vertical relief at its southern and northern boundaries. This area includes the Tinian International Airport and portions of the Military Lease Area.

- **North-Central Highland**: This land area is located within the northern part of the Central Plateau and midway between the east and west coasts of the island. The maximum elevation is 545 feet (166 meters) at Mount Lasso.

- **North Lowland**: This land area is located at the very northern part of the island. It is generally flat with an average elevation of about 100 feet (30 meters), except for Lake Hagoi, where the elevation is approximately at sea level.
Figure 3.2-2
Tinian Physiographic and Topographic Map

Legend
- International Broadcasting Bureau
- Military Lease Area
- Contours (feet)

Physiographic Zones
- Southeastern Ridge
- Median (Marpo) Valley
- Central Plateau
- North-Central Highland
- Northern Lowland

Source: Gingerich 2002
3.2.5.2 Geology

3.2.5.2.1 Geologic Units

Tinian represents an extinct volcanic core (greater than 38 million years old) covered by younger limestone formations (5 to 23 million years old) and recent beach and reef deposits. The island is composed mainly of coralline and algal limestone overlying volcanic rock. The volcanic rock is only observable at ground surface in two localized areas in the vicinity of Mount Lasso (Figure 3.2-3) (Gingerich 2002). The limestone is highly porous, so water easily flows through it (Gingerich 2002). The raised limestone plateaus that characterize the island are evidence of uplifting caused by movement along high-angle normal faults. Figure 3.2-3 shows the four major geologic units that comprise Tinian. They are explained below.

- **Tinian Pyroclastic (volcanic) Rock**: These fine-grained to coarse-grained ash and angular fragments represent volcanic explosive materials ejected from an ancient (extinct) volcano that forms the core of the island. These rocks are exposed on the North-Central Highland and Southeastern Ridge and cover about 2 percent (%) of the surface of the island. These materials are generally highly weathered and are altered to clay in surface exposures. Because of its texture and density, this rock unit has low permeability (i.e., water does not flow easily through it).

- **Tagpochau Limestone**: These rocks are exposed on approximately 15% of the island’s surface, generally in the North-Central Highland and the southern part of the Southeastern Ridge. This formation reaches thicknesses of up to 600 feet (180 meters). It is composed of fine to coarse-grained, partially recrystallized broken limestone fragments and approximately 5% reworked volcanic fragments and clays. This formation is very porous and water flows easily through it.

- **Mariana Limestone**: This formation covers approximately 80% of the island’s surface, forming nearly all of the North Lowlands, the Central Plateau, and the Marpo Valley. This formation reaches thicknesses up to 450 feet (140 meters). It is composed of fine to coarse-grained fragmented limestone, with some fossil and algal remains, and small amounts of clay particles. Small voids and caverns are common in surface exposures. The Mariana Limestone has a higher coral content than the Tagpochau Limestone but is similarly porous, allowing water to readily flow through it.

- **Beach Deposits, Alluvium, Colluvium, and Marsh**: These deposits cover less than 1% of the island’s surface and reach a thickness of up to 15 feet (5 meters). The deposits are made up of poorly consolidated sediments, mostly sand and gravel deposited by waves. However, they do contain clays and silt deposited inland at Lake Hagoi and Makpo Marsh, as well as loose soil and rock material found at the base of slopes.
Figure 3.2-3
Tinian Geologic Units

Sources: Gingerich 2002; Water and Environmental Research Institute 2002
3.2.5.2.1.1 Coastal Geology

The majority of the Tinian coastline is characterized by limestone cliffs (Photo 3.2-1) with sea-level caverns, notches, cuts, and slumped materials (i.e., materials that have collapsed or fallen) commonly bordered by intertidal limestone benches (elevated flat areas). Beach deposits are mostly medium-to-coarse grain calcareous sands, gravels, and rubble interspersed over exposed limestone. Submarine topography is characterized by limestone with interspersed coral colonies and occasional submerged boulders. A more thorough discussion of the coral reef is presented in Section 3.10, Marine Biology.

There are four beaches proposed for different types of amphibious training (see Section 2.4.1.3.6), all of which are located within the Military Lease Area. They are described below, depicted on Figure 3.2-4, and further described in Section 3.10, Marine Biology.

- **Unai Babui**: Located on the leeward (western) side of the island, it is approximately 200 feet (60 meters) long with a land area of approximately 0.08 acre (0.03 hectare).
- **Unai Chulu**: Located on the leeward (western) side of the island, it is approximately 790 feet (240 meters) long with a land area of approximately 3 acres (1 hectare).
- **Unai Lam Lam**: Located on the leeward (western) side of the island, it is approximately 55 feet (17 meters) long with a land area of approximately 0.1 acre (0.04 hectare).
- **Unai Masalok**: Located on the windward (eastern) side of the island, it comprises three beaches covering a distance of 1,600 feet (370 meters) and 0.2 acre (0.1 hectare).

3.2.5.2.1.2 Karst Geology

Karst is a distinctive landscape formed when water dissolves rocks. This creates large voids, such as sinkholes and caves, as well as smaller features characterized by rough surfaces, little soil, and small cavities known as epikarst. The epikarst commonly acts as a conduit for surface water (such as rainfall) to the underlying groundwater aquifer by percolation or channelization through connected subsurface voids or cavities.

Photo 3.2-1. View of typical Tinian coastline with limestone cliffs
Epikarst that is not ordinarily saturated by groundwater or surface water may provide a large amount of water storage in voids and cavities. The fast flow of water through the joints and channels of epikarst does not allow for adsorption (by soil), uptake (by plants), or microbial processes to occur that would ordinarily remove pollutants contained in surface waters before they reach groundwater (Islam 2005). Karst geology on Tinian includes epikarst, closed depressions (e.g., sinkholes), caves, and freshwater discharge features (Stafford et al. 2005). Epikarst is present in all of the limestone rock formations on Tinian and its characteristics vary based on proximity to the coast. Coastal epikarst is jagged as result of the effects of sea spray, while inland epikarst surface features become less extreme (Stafford et al. 2005). Sinkholes, a type of epikarst, can occur naturally or as a result of excavation, change in drainage patterns, or lowering of the groundwater table (Islam 2005); sinkholes can occur anywhere within the limestone formations on Tinian. Caves can form in limestone deposits in the mixing zone of the salty groundwater and fresh groundwater lens. These caves are present along portions of Tinian’s coast.

There are three main types of closed depressions on Tinian: (1) dissolutional (when water dissolves rock); (2) constructional (caused by faulting or certain rock formations); and (3) man-made or modified (e.g., excavations such as quarries, borrow pits, or landfills). Twenty closed depressions were identified during the 2005 karst survey (Stafford et al. 2005), in both inland and nearshore locations on Tinian: 7 of them were identified as dissolutional, 8 constructional, and 5 man-made or modified. Figure 3.2-3 provides the locations of the closed depressions identified in the karst survey.

### 3.2.5.2.2 Geologic Hazards

Potential geologic hazards on Tinian include seismic activity (e.g., earthquakes along faults), liquefaction, landslides, tsunamis, and karst features (e.g., sinkholes). Additional information on these hazards is provided in the following sub-sections.

#### 3.2.5.2.2.1 Seismic Activity

An earthquake is caused by the sudden slip of a fault that results in ground shaking and radiated seismic energy caused by the slip; volcanic or magmatic activity; or other sudden stress change in the earth’s crust (U.S. Geological Survey 2013). Faults on Tinian are shown in Figure 3.2-3. In addition, there are several nearby faults along the ocean floor that could potentially cause significant earthquakes felt on Tinian. There have been 13 destructive earthquakes in the Mariana Islands during the past two centuries (Mueller et al. 2013) with the majority of the recorded impacts (i.e., property damage, injuries) felt on Guam (approximately 130 miles [225 kilometers] to the south).

#### 3.2.5.2.2.2 Liquefaction

When loose sand and silt is saturated or partially saturated with water and shaken by an earthquake it can behave like a liquid; this is known as earthquake liquefaction. The soil can lose its ability to support structures, flow down gentle slopes, and erupt to the ground surface to form sand boils (i.e., upward movement of sand). This can cause damage to buildings, roads, and pipelines. Three factors are required for liquefaction to occur: (1) loose, granular sediment is present; (2) the sediment is saturated or partially saturated by groundwater (i.e., water fills the spaces between sand and silt grains); and (3) strong shaking occurs (i.e., from a strong earthquake). Typically, liquefaction occurs in areas where there are loose soils with poor drainage. On Tinian, these conditions could be present on fill land located near the coast (e.g., Port of Tinian).
3.2.5.2.2.3 Landslides

The term landslide includes a wide range of ground movement such as rock falls, deep failure of slopes, and shallow debris flows. Earthquakes of magnitude 4.0 and greater are known to trigger landslides (U.S. Geological Survey 2013). Tinian has numerous fault scarps depicted as “fault lines” on Figure 3.2-3. These are related to the uplift of the limestone formations as a result of tectonic activity in the region. In general, the consolidated nature of the limestone and volcanic units reduce the potential for slope failure; however, there is a potential for slope failure to occur due to wet tropical weather on Tinian combined with weathered rock and steep cliffs along the island’s perimeter, and areas of land disturbance.

3.2.5.2.2.4 Tsunamis

A tsunami is a sea wave that can result from large-scale seafloor displacements associated with large earthquakes, major submarine landslides, or volcanic eruptions. The Mariana Islands have had recorded tsunami events dating back to 1700 (Uslu et al. 2013). Doan et al. (1960) notes that Tinian is not likely to be vulnerable to tsunamis originating from distant earthquakes or landslides due to the geographic location and the close proximity to Saipan. However, Tinian may be vulnerable to those generated by disturbances along the volcanic axis (Mariana Islands) associated with the subduction zone at the Mariana Trench. Shocks emanating from this region have the potential to generate tsunamis capable of impacting the Tinian Harbor area and the low-lying Median Valley, or other areas not protected by coastal cliffs. On March 11, 2011, evacuations were ordered for low-lying areas in the CNMI in response to the earthquake and ensuing tsunami in Japan, no damage was reported.

3.2.5.2.2.5 Karst Features

Tinian exhibits several different types of karst features including naturally formed dissolution-type closed depressions or sinkholes, human modified depressions, and limestone caves. Figure 3.2-3 illustrates the location of karst features on Tinian mapped by Stafford et al. (2004). Due to the porous nature of the limestone formations that underlie much of the island, other unmapped karst features are likely to be present. These include sinkholes, caves, recharge features (i.e., voids in the rock that allow water to seep into the subsurface), and discharge features (i.e., voids in the rock where groundwater seeps out of the subsurface).

3.2.5.3 Soils

Soil classes across Tinian were identified by the U.S. Department of Agriculture Soil Conservation Service in 1985 (Young 1989). Figure 3.2-5 shows the horizontal distribution of these soil classes and Table 3.2-1 describes the soil characteristics within the affected environment (i.e., Military Lease Area, Tinian International Airport, and Tinian Harbor). Appendix F, Geology and Soils Technical Memo provides a detailed table and map showing the soil units associated with the soil classifications.
Figure 3.2-5
Tinian Soil Classes
Associated with the Affected Environment

Legend
- International Broadcasting Bureau
- Military Lease Area
- Fill Land
- Quarry
- Soils with High Erosion Factors
  - 12. Chinen Clay Loam, 15 to 30% Slopes
  - 16. Chinen-Rock Outcrop Complex, 15 to 30% Slopes
  - 33. Lasiac Clay, 30 to 60% Slopes
  - 42. Rock Outcrop - Takpochao Complex, 60 to 99% Slopes

Soil Classes
- Banaderu-Rock Outcrop
- Chacha
- Chinen-Takpochao
- Chinen-Urban Land
- Dandan-Chinen
- Inarajan
- Kagman-Saipan
- LaoLao-Akina
- Luta
- Mesei Variant
- Sapap-Dandan
- Shioya
- Takpochao-Chinen-Rock Outcrop
- Takpochao Variants-Shioya

Source: Young 1989
Table 3.2-1. Soil Classifications Associated with the Affected Environment

<table>
<thead>
<tr>
<th>Soil Class</th>
<th>Soil Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banaderu-Rock Outcrop</td>
<td>Shallow, well drained, nearly level to moderately steep soils, and rock outcrop.</td>
<td>Limestone Plateaus</td>
</tr>
<tr>
<td>Chacha</td>
<td>Shallow and deep, and poorly drained, and found on steep slopes, plateaus, and hills.</td>
<td>Limestone Uplands</td>
</tr>
<tr>
<td>Chinen-Takpochao</td>
<td>Very shallow and shallow, well drained, nearly level to strongly sloping soils; on plateaus and side slopes.</td>
<td>Limestone Plateaus</td>
</tr>
<tr>
<td>Chinen-Urban Land</td>
<td>Shallow, well-drained, nearly level soils and urban areas.</td>
<td>Limestone Plateaus</td>
</tr>
<tr>
<td>Dandan-Chinen</td>
<td>Shallow and moderately deep, well drained, nearly level to strongly sloping soils.</td>
<td>Limestone Plateaus</td>
</tr>
<tr>
<td>Inarajan</td>
<td>Very deep, poorly drained soils.</td>
<td>Valley Bottoms and Coastal Plains</td>
</tr>
<tr>
<td>Kagman-Saipan</td>
<td>Deep and very deep, well drained, nearly level to strongly sloping soils.</td>
<td>Limestone Plateaus</td>
</tr>
<tr>
<td>Laolao-Akina</td>
<td>Moderately deep, well drained, strongly sloping to steep soils; on volcanic uplands.</td>
<td>Uplands</td>
</tr>
<tr>
<td>Luta</td>
<td>Very shallow, well drained, nearly level to strongly sloping soils.</td>
<td>Limestone Plateaus</td>
</tr>
<tr>
<td>Mesei Variant</td>
<td>Moderately deep, very poorly drained, level soils.</td>
<td>Depressional Areas</td>
</tr>
<tr>
<td>Rock Outcrop-Takpochao-Luta</td>
<td>Shallow and very shallow, well drained, strongly sloping to extremely steep soils and rock outcrop; on limestone escarpments.</td>
<td>Uplands</td>
</tr>
<tr>
<td>Saipan-Dandan</td>
<td>Moderately deep and very deep, well drained, nearly level to gently sloping soils.</td>
<td>Limestone Plateaus</td>
</tr>
<tr>
<td>Shioya</td>
<td>Very deep, excessively drained, level to nearly level soils; on coastal strands.</td>
<td>Coastal Limestone Sands</td>
</tr>
<tr>
<td>Takpochao-Chinen-Rock Outcrop</td>
<td>Shallow, well drained, strongly sloping to extremely steep soils and rock outcrop; on limestone escarpments and plateaus.</td>
<td>Uplands</td>
</tr>
<tr>
<td>Takpochao variant-Shioya</td>
<td>Very shallow to very deep excessively drained, levels to gently sloping soils; on coastal stands and plateaus.</td>
<td>Lowlands</td>
</tr>
</tbody>
</table>


Soil types and characteristics affect the potential for soils to erode. The U.S. Department of Agriculture defines soil erosion as the “removal of material from the surface soil, which is the part of the soil having an abundance of nutrients and organic material vital to plant growth.” Natural causes of soil erosion include wind and water. Human and wildlife activities can accelerate soil erosion (Muckel 2004). There are several soil units in the vicinity of the proposed action (i.e., Military Lease Area, Tinian International Airport, and Tinian Harbor) that are characterized as having the greatest susceptibility for soil erosion. These soil units are generally located in areas with steep slopes and include the following: (1) Chinen Clay Loam (15-30% slopes); (2) Chinen-Rock Outcrop Complex (15-30% slopes); (3) Laolao Clay (30-60% slopes); and (4) Rock Outcrop-Takpochao Complex (60-99% slopes). These soil units are shown in Figure 3.2-5 and are further described in Appendix F, Geology and Soils Technical Memo.

Most of the soil units located in the vicinity of the proposed action are characterized by slow water runoff or the potential for water to pond. These characteristics can cause issues with flooding or problems with construction if adequate grading and drainage are not provided for structures and roads. These soil types are largely located on relatively gentle slopes. Their locations and further description are provided in Appendix F, Geology and Soils Technical Memo.
Prime farmland soils are soils that are best suited to producing sustained high yields of crops (Young 1989). Two prime farmland soil units have been identified in the vicinity of the proposed action (Figure 3.2-6): (1) Dandan-Saipan clays, (0-5% slope) and (2) Saipan clay (0-5% slope). Appendix F, Geology and Soils Technical Memo provides a description of these soil units.

### 3.2.6 Pagan

#### 3.2.6.1 Topography

Pagan is about 10 miles (16 kilometers) long and 4 miles (6 kilometers) wide. The island consists of two stratovolcanoes joined by an isthmus (narrow strip of land) with a width of 1,980 feet (660 meters). Pagan’s main topographic features are Mount Pagan (or North Pagan Volcano), 1,870 feet (570 meters) above mean sea level (MSL) (Photo 3.2-2) and South Pagan Volcano, 1,771 feet (540 meters) above MSL (Figure 3.2-7) which are connected by the narrow isthmus. There are two lakes situated on the west side of Mount Pagan: Upper Lake or Laguna Sanhalom and Lower Lake or Laguna Sanhiyon. Figure 3.2-7 provides a topographic map of Pagan with four slope classes: (1) 0-5%; (2) 6-15%; (3) 16-30%; and (4) greater than 30%. The steepest slopes are located at Mount Pagan (sloping to the west towards the two lakes), along the isthmus leading to South Pagan Volcano, and around much of South Pagan Volcano. The gentlest slopes are located immediately south and southwest of Mount Pagan.

A well-defined valley system exists but there are no streams associated with these valleys. These valley systems were most likely developed during torrential downpours or soon after volcanic eruptions (Corwin et al. 1957). Most large valleys are directed down original volcanic slopes in a radial pattern. Terrain features described by Corwin et al. (1957) include plains and basin floors, lava fields, caldera backslopes, dissected ridges, cinder cones, volcanoes, rugged highlands, and major escarpments.
Figure 3.2-6
Tinian Prime Farmland Soil Classes
Associated with the Affected Environment

Source: Young 1989
Figure 3.2-7
Pagan Topographic Map

Legend

Contours (feet)

Slope Class (%)

0-5
6-15
16-30
31+

North Beach
Gold Beach
South Beach
Green Beach
Blue Beach
Mount Pagan
Laguna Sanhion
Laguna Sanhalom
Red Beach
Blue Beach
Green Beach
Mount Maru
Mount Togari
South Pagan Volcano
Minami Saki (South Point)
Kutake Yashi

Philippine Sea
Pacific Ocean

0 1 2 0.5 Miles
0 0.5 1 2 Kilometers

3-17
3.2.6.2 Geology

Mount Pagan and South Pagan Volcano are exposed volcanic cones formed within the calderas of two ancient stratovolcanoes (Banks et al. 1984) (Figure 3.2-8). A stratovolcano, also known as a composite volcano, is a conical volcano built up by many layers (strata) of hardened lava and pyroclastic materials such as volcanic ash. The structure of the two stratovolcanoes is located primarily beneath the ocean surface (i.e., submarine flanks). The northern portion of the island where Mount Pagan is located is a partially collapsed caldera. Mount Pagan is the larger and more active of the two exposed volcanoes (Banks et al. 1984). Few detailed studies of the geology and historic eruption activities of Pagan have been done. The oldest exposed lava flows on Pagan appear to be less than 700,000 years old (Banks et al. 1984). Trusdell et al. (2006) notes reports of eruptions in the 1600s, 1872-73, the 1920s, and on May 15, 1981. On May 15, 1981, a large eruption occurred from Mount Pagan that sent columns of gas and volcanic ash 8 miles (13 kilometers) into the stratosphere. As a result of this explosive eruption and continuing volcanic activity, Pagan residents were evacuated from the island and it has not been resettled. Since 1981, a number of eruptions, ash, and low-level gas and steam plumes have been confirmed from Mount Pagan in 1987, 1988, 1992, 1993, 1996, 2006, 2010, 2011, and 2012 (Smithsonian Institution National Museum of Natural History 2014).

3.2.6.2.1 Geologic Units

A generalized geologic map was prepared by Corwin et al. (1957) (Figure 3.2-8) which shows geologic units on Pagan. Geologic units mapped included Quaternary-age lavas and ash deposits that pre-date and post-date the existing Mount Pagan and South Pagan Volcano. Limited portions of the shoreline included recent raised reef deposits (i.e., shown as sedimentary deposits in Figure 3.2-8). A more recent effort by the U.S. Geological Survey (Trusdell et al. 2006) mapped and conducted age-dating of various deposits on the northern portion of the island. All units and surface deposits of Mount Pagan are basalt, andesite, or a combination of the two. Rock outcrops include cinder or spatter cones, lava flows (a’a which is jagged or pahoehoe which is smooth) (Photo 3.2-3), or consolidated or unconsolidated pyroclastic (ash) deposits. In these deposits, pozzolan, a siliceous and aluminous material is found. Pozzolan, like that found on Pagan, is a material used in cement and concrete. The pozzolan deposits on Pagan were mapped by the U.S. Geological Survey in 2006 (Trusdell et al. 2006) and revised in 2007 (Ding and Wilson 2007). The pozzolan deposits found on Pagan are depicted by thickness contours on Figure 3.2-9 (Ding and Wilson 2007). The estimated volume of pozzolan is described in Section 3.15, Socioeconomics and Environmental Justice.
Figure 3.2-8
Pagan Generalized Geologic Map

Legend

- Contours (feet)
- Sedimentary Deposits
- Recent - A.D. 1981
- Recent - A.D. 1872-1873
- Recent - A.D. 1925
- Holocene (150-10,000 years old)
- Pleistocene (10,000 - 2 million years old)
- Pre-caldera succession (South Volcano)
- Post-caldera lavas (South Volcano)

Source: Corwin et al. 1957; Trusdell et al. 2006
Figure 3.2-9
Pagan Pozzolan Deposits

Source: Wilson & Ding 2007
3.2.6.2.2 Geologic Hazards

Geologic hazards of concern for Pagan include the possibility of seismic activity (e.g., earthquakes), volcanic activity, landslides, and tsunamis. These concerns are addressed in the following sub-sections.

3.2.6.2.2.1 Seismic Activity

Seismic activity on Pagan can be attributed to its close proximity to the Mariana Trench subduction zone (see Section 3.2.4, Regional Geologic Setting), and the presence of two active volcanoes on the island. Seismic activity from low magnitude earthquake swarms has been documented and high magnitude earthquakes are possible. Months prior to the major explosive eruption of Mount Pagan in 1981, a number of locally felt earthquakes occurred, as described in the following section. On the day of the eruption, a swarm of small earthquakes occurred followed by a loud boom (Trusdell et al. 2006). These earthquakes are thought to have been the result of shifting underground magma (molten lava).

Other types of earthquake-generating activity in the region are the same as those described for Tinian. Pagan is not currently monitored with ground-based geophysical instrumentation to monitor seismic activity.

3.2.6.2.2.2 Volcanic Activity

Six of the northern Mariana Islands (i.e., Anatahan, Guguan, Pagan, Agrihan, Asuncion, and Uracus) have stratovolcanoes that have erupted in the past century (Trusdell et al. 2006). Lava flows erupted at stratovolcanoes are typically slow moving, thick, viscous flows (U.S. Geological Survey 2014); however, they can be fluid and fast-moving depending upon the energy of the eruption, topography, and the composition of the magma. It is possible for stratovolcanoes to have violent and prolonged eruptions. Eruptive materials associated with stratovolcanoes can include ash clouds; density currents of volcanic debris and hot gas (termed pyroclastic flows); falling rock blocks (termed volcanic bombs); and muddy debris floods (termed lahars). Other volcanic activity includes phreatic eruptions (water magma interactions) that can produce ash, steam, and gas. Agrihan, the highest of the Mariana arc volcanoes and located immediately north of Pagan, had a significant eruptive event in 1917 that sent large blocks of rock into the air and resulted in the deposition of approximately 10 feet (3 meters) of ash and lapilii (i.e., small stones ejected into the air from the volcano) on a former village on the southeast coast of Agrihan (U.S. Geological Survey 2014). Recent eruptions from Anatahan deposited in excess of 20 feet (6 meters) of volcanic ash on Anatahan, disrupted numerous flights, and closed Saipan International Airport (Quick n.d.). As previously described in Section 3.2.6.2, Geology, Pagan is home to two active stratovolcanoes with historic eruptions and continued volcanic activity through 2012.

As stated earlier, Pagan is not currently monitored with ground-based geophysical instrumentation. The only current source of information is satellite observation as noted in the Volcano Hazards Program Report (U.S. Geological Survey 2014). Land deformation may occur within the crater on Pagan such as swelling, shrinking, and topographical changes to the surface due to magma movement underneath the surface. Ground deformation may also be accompanied by temperature changes in the rock and water around it. Gases and particulates are released into the atmosphere as a result of volcanic activity of Mount Pagan. As magma moves up in the crust, pressure decreases and gases are released. Magma produces sulfur dioxide, carbon monoxide, carbon dioxide, hydrogen sulfide, hydrogen chloride, and hydrogen fluoride. These gases behave according to their properties and can accumulate, migrate, and be emitted in various areas depending on changing volcanic activity, subsurface conditions, and weather
The hazard that these gases pose is that they are acids and can also cause asphyxia (a decrease in the concentration of oxygen and an increase in the concentration of carbon dioxide in the body which can lead to loss of consciousness and death). Particulates and solids can also become projectiles in sizes ranging from ash to objects more than 20 inches (50 centimeters) in diameter and present physical hazards. Gases may also be accompanied by temperature changes in the rock and water around it (The International Volcanic Health Hazard Network n.d.). Low level hazardous conditions continue to occur and minor gas and steam plumes continue to be observed at Mount Pagan in satellite data.

Volcanic activity can also produce noise ranging from soft hissing to deafening explosions accompanied by shockwaves. While the volcano is building up pressure prior to an eruption, sounds have been captured by acoustic recording devices and can sound like a rumble, roar, or sound coming from a jet engine. During blasts and explosions, impulsive, broad frequency band acoustic signals are created which are the highest amplitude or loudest sounds created by volcanoes. Consequently, these loud booms and cracks travel the furthest and energy from these blasts can travel across ocean basins being recorded by pressure recorders thousands of kilometers away (Oregon State University n.d.; Hotovec et al. 2013).

3.2.6.2.2.3 Landslides

Rock falls, failure of slopes, and shallow debris flows (all forms of landslides) are possible due to the volcanic and seismic activity on Pagan. Evidence of collapse structures and debris flows have been reported on Pagan (Corwin et al. 1957; Trusdell et al. 2006).

3.2.6.2.2.4 Tsunamis

Tsunamis are generated when significant volumes of water are displaced by explosive eruptions or landslides of volcanic flanks. The National Oceanic and Atmospheric Administration does not have records of tsunamis occurring on Pagan. Tsunami inundation modelling has not been undertaken for Pagan (CNMI Coastal Resources Management Office, personal communication, 2013). However, the potential for tsunami generation resulting from movement of magma, submarine landslides, and seismic activity exists on Pagan and could result in significant, localized tsunamis with little warning. Modeling of 0.25 cubic mile (1.0 cubic kilometer) landslide from the south flank of Anatahan (an island in the northern Mariana Islands) volcano produces a calculated tsunami amplitude of 2 to 3 feet (0.6 to 0.9 meter) on Saipan; however, the presence of large calderas on Anatahan, Pagan, and Maug indicate that there is the potential for Mariana volcanoes to produce very large explosive eruptions, which could displace much greater volumes of water and thus generate a dangerous tsunami on Pagan (Quick n.d.).
3.2.6.3 Soils

Detailed soil survey data for Pagan is unavailable. As described earlier, surface soil and rock conditions range from alluvium (soil created from eroded rock), residuum (soil created from rock weathered in place), volcanic ash, raised coral reef deposits, volcanic cinder (Photo 3.2-4), and spatter deposits, as well as sharp (a’a) (see Photo 3.2-3) and smooth (pahoehoe) basalt, andesite, or basaltic andesite lava flows. Soils on the island are thin and largely confined to gentle slopes with a maximum depth seldom greater than 2 feet (0.6 meter). The best-developed soils are found in the inner basin, south of Lake Sanhalom, and the area north of the central plateau (Pangelinan and Kapileo 1970).

Anecdotal observations indicate that there are portions of soil (either alluvium or residuum) that are highly eroded. Surveys in 2000 and 2010 (Cruz et al. 2000; Kessler 2011) found the island’s forests and grasslands “severely overgrazed” due to the abundance of feral cattle, goats, and pigs that have done considerable damage to island vegetation. This overgrazing has resulted in large open areas susceptible to soil erosion. Erosion has not been as prominent on Pagan as it has been on some other islands in the chain, perhaps due to the many lava flows and a lower abundance of loose pyroclastic materials. However, localized erosion has been prominent in large drainages that head on the western upper flank of Mount Pagan and flow southwestward into the central plateau (Trusdell et al. 2006).

Photo 3.2-4. View of volcanic cinder sand along the west coast of Pagan (facing south) with South Pagan Volcano in the background
3.3 **WATER RESOURCES**

Section 3.3 describes the existing conditions of the water resources on Tinian and Pagan. Water resources include surface waters, groundwater, and nearshore waters. The region of influence includes the surface waters, groundwater, and nearshore waters immediately adjacent to these islands.

3.3.1 **Definition**

Surface waters, groundwater, nearshore waters and other key terms are defined below:

- **Surface waters** include lakes, streams, rivers, springs, and wetlands; some of these features may be considered “Waters of the U.S.” The discussion of surface waters also incorporates the analysis of watersheds and floodplains. A detailed discussion of stormwater runoff is provided in Sections 3.14 and 4.14, *Utilities*; however, potential impacts to water quality due to stormwater runoff are discussed under water resources.

  o **Waters of the U.S.** are defined under 40 CFR 230.3(s) and 33 CFR Part 328 as: “(1) all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; (2) all interstate waters including interstate wetlands; (3) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters: (i) which are or could be used by interstate or foreign travelers for recreational or other purposes; or (ii) from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or (iii) which are used or could be used for industrial purposes by industries in interstate commerce…”

  o **Wetlands** are defined by Section 404 of the Clean Water Act as: “areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” The CNMI Water Quality Standards define wetlands as “waters of the Commonwealth,” and state that all wetlands are subject to the provisions of the standards. Areas described and mapped as wetland communities may also contain small streams, shallow ponds, and lake edges.

  o **Watersheds** are typically defined by topographic ridges and their respective drainage areas contributing runoff to surface waters, including the sea, lakes, estuaries, or wetlands.

  o **Sub-watersheds** are smaller geographic units of a larger watershed.

  o **Floodplains** are low-lying areas subject to flooding as a result of excessive rains, stormwater runoff, or inundation from storm-induced waves.
- **Water Quality** describes the chemical and physical composition of water as affected by natural conditions and human activities.

- **Groundwater** is water beneath the ground surface in soil pore spaces and in the fractures of rock formations. An **aquifer** is an underground layer of water-bearing permeable rock or materials (gravel, sand, or silt) from which groundwater can be extracted using a well.

- **Nearshore waters** are all areas extending seaward from the coast out to a depth of 330 feet (100 meters).

### 3.3.2 Regulatory Framework

The U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and the U.S. Maritime Administration are the primary federal agencies with jurisdiction over water resources. Within the CNMI, the CNMI Bureau of Environmental and Coastal Quality is the administrative authority for the Clean Water Act and some activities under Section 10 of the Rivers and Harbors Act. Federal and local regulations that serve to protect, conserve, and manage water resources are listed below.

#### 3.3.2.1 Federal Regulation

- Clean Water Act
  - Section 401
  - Section 402
  - Section 404

- Water Pollution Control Act
- Fish and Wildlife Coordination Act
- Safe Drinking Water Act
- Coastal Zone Management Act
- Rivers and Harbor Act
  - Section 10

- Energy Independence and Security Act
- Executive Order 11990, Protection of Wetlands
- Executive Order 11988, Floodplain Management

#### 3.3.2.2 CNMI Regulation

- CNMI Earthmoving and Erosion Control Regulations
- CNMI Wastewater Treatment and Disposal Rules and Regulations
- Water Quality Standards
- Groundwater Recharge Requirements
- Drinking Water Regulations
- Well Drilling and Well Operation Regulations
- Northern Mariana Islands Administrative Code Chapter 65-120: Wastewater Treatment and Disposal
A complete listing of applicable regulations is provided in Appendix E, Applicable Federal and Local Regulations.

### 3.3.3 Methodology

Reports and studies prepared by or for the federal government, the CNMI government, and independent researchers that address natural resources (e.g., water, geology, biology) and infrastructure (e.g., utilities) on Tinian and Pagan were reviewed for information related to the existing condition of water resources. Federal and CNMI regulations were reviewed for regulations that serve to protect, conserve, and manage water resources (see Section 3.3.2). In addition, an aquifer study is underway to evaluate potential well capacity and existing water quality in notional well fields; well setbacks and potential for saltwater intrusion (the movement of saline water into freshwater aquifers); and man-made contaminant migration into notional well fields on Tinian. This study will provide information needed to design and space wells in the notional well field. Information from this study will be added to the Final Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS).

Water resources identified during the literature review which could be potentially affected by the proposed action are described below. The CNMI government performs regular water quality monitoring of Tinian’s coastal waters. The results of recent nearshore water quality monitoring are summarized in Section 3.3.4.3, Nearshore Waters. The CNMI government does not perform regular water quality monitoring of Pagan’s coastal waters and does not perform water quality monitoring of surface waters or groundwater on either island. Information on nearshore water quality was summarized from the Mariana Archipelago Reef Assessment and Monitoring Program (Brainard 2012).

### 3.3.4 Tinian

#### 3.3.4.1 Surface Water Resources

Rainfall on Tinian averages 83 inches (212 centimeters) per year (Water and Environmental Research Institute 2003), 58% of which typically occurs from July to November while only 14% typically occurs during the dry season from January to April (Department of the Navy [DoN] 2010a). Much of the precipitation on Tinian evaporates, transpires, or percolates into openings in the limestone and volcanic rock beneath the thin soil surface (Gingerich 2002).

#### 3.3.4.1.1 Surface Water Features

There are three known inland water features within the Military Lease Area (Table 3.3-1 and Figure 3.3-1): (1) Lake Hagoi; (2) Mahalang Complex; and (3) Bateha Isolated Wetlands. Because Tinian is formed almost entirely of permeable limestone karst, there are few springs and no perennial (permanently flowing) streams. Drainage throughout most of Tinian is underground where rainwater generally percolates downward into porous rock (Doan et al. 1960), with the exception of during heavy rain events that occasionally result in stormwater runoff entering the surface and nearshore waters via short-lived ephemeral streams. Surface water features occur on Tinian in areas of impermeable clay that prevent infiltration of surface water, or at perched water tables (temporary pockets of groundwater located above unsaturated soil or rock, not connected to the permanent groundwater table). These areas are entirely dependent on rainfall as a water source for sustaining productivity and habitat quality.
Because the entire shoreline is either limestone cliffs and rocky outcrops or sand beach, there are no mangroves or coastal wetlands present.

### Table 3.3-1. Tinian Surface Water Features

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Hagoi</td>
<td>Located on the northwest side of the Military Lease Area, Lake Hagoi is a</td>
<td>34 acres</td>
</tr>
<tr>
<td></td>
<td>permanent partially-open-water complex. It is situated on a limestone terrace</td>
<td>(14 hectares)</td>
</tr>
<tr>
<td></td>
<td>over either an impervious layer or a perched water table. Lake Hagoi is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dependent entirely on rainfall as a water source; in periods of drought the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>water level drops and the coverage of open water dramatically decreases</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(DoN 2010a). Since 2010, a rapid reduction of open surface water has been</td>
<td></td>
</tr>
<tr>
<td></td>
<td>observed (Wenninger 2012). Due to sediment inflow, the open water area of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lake Hagoi is slowly transforming into a marsh, completely covering emergent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vegetation (AECOS, Inc. and Wil Chee Planning, Inc. 2009).</td>
<td></td>
</tr>
<tr>
<td>Mahalang Complex</td>
<td>Located within the north central portion of the Military Lease Area,</td>
<td>Approximately</td>
</tr>
<tr>
<td></td>
<td>Mahalang comprises a cluster of craters and depressions, a subset of which</td>
<td>24 individual</td>
</tr>
<tr>
<td></td>
<td>pond water during the wet season. The complex is located on a plateau in</td>
<td>sites;</td>
</tr>
<tr>
<td></td>
<td>an area of grasslands, tangantangan, and mixed secondary forest. Some of</td>
<td>estimated</td>
</tr>
<tr>
<td></td>
<td>the features are characterized as likely bomb craters from World War II</td>
<td>the two</td>
</tr>
<tr>
<td></td>
<td>activities (DoN 2013a). Dominant vegetation within the craters consists of</td>
<td>largest</td>
</tr>
<tr>
<td></td>
<td>upland plant species, including introduced grass mixed with various</td>
<td>features as</td>
</tr>
<tr>
<td></td>
<td>weedy vines and herbaceous plants.</td>
<td>approximately</td>
</tr>
<tr>
<td>Bateha Isolated Wetlands</td>
<td>Located within the central portion of the Military Lease Area, these features</td>
<td>1.5 acres</td>
</tr>
<tr>
<td></td>
<td>consist of two shallow depressional areas that contain water during wet</td>
<td>(0.6</td>
</tr>
<tr>
<td></td>
<td>periods (U.S. Fish and Wildlife Service 1996; DoN 2013a). They are broad</td>
<td>hectare)</td>
</tr>
<tr>
<td></td>
<td>depressions or “moats” that have evolved as eroded clay and silt filled</td>
<td>each</td>
</tr>
<tr>
<td></td>
<td>depressions in limestone bedrock (DoN 1997). Vegetation within and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>surrounding these features is dominated by introduced species.</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Vegetation is described in Section 3.9, Terrestrial Biology.

### 3.3.4.1.1 Wetlands Communities

In support of the EIS/OEIS, all three surface water features were surveyed for wetland characteristics. Consistent with the definition of a wetland under the Clean Water Act, Lake Hagoi has hydric soils (soil which are permanently or seasonally saturated, resulting in anaerobic conditions), hydrophytic vegetation (plants adapted to life in water or waterlogged soils), and has surface water for most of the year (DoN 2013a). Vegetation within and surrounding the wetland is dominated by species native to Tinian. Based on the 2014 wetland surveys at the Mahalang Complex, one of the depressions (MD3) contains wetland vegetation and is a depressional isolated wetland (Figure 3.3-1). Other sites surveyed at the Mahalang Complex (MC1, M7, MC2, M10, and M11) in 2014 did not contain wetland vegetation and are ephemeral surface waters. The 2014 wetland survey documented wetland vegetation at both sites within the Bateha Isolated Wetlands. Table 3.3-2 provides a summary of the surface water areas determined to maintain wetland characteristics. The survey report is provided in Appendix L, Wetland Study Report.
Figure 3.3-1
Tinian Surface Waters and Flood Zones
### Table 3.3-2. Summary of Potential Wetlands of the Bateha and Mahalang Complexes

<table>
<thead>
<tr>
<th>Site</th>
<th>Presence of Obligate Wetland Vegetation</th>
<th>Presence of Hydrological Conditions</th>
<th>Test Pit and Presence of Hydric Soils</th>
<th>Site Connected to Stream System</th>
<th>Ponded Water Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bateha BD1</td>
<td>Yes: <em>Ipomoea aquatic</em> (minor)</td>
<td>Yes; depressional</td>
<td>No. 1 – hydric soils&lt;br&gt;No. 2 – hydric soils&lt;br&gt;No. 3 – hydric soils&lt;br&gt;No. 4 – hydric soils&lt;br&gt;No. 5 – hydric soils</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Bateha BD2</td>
<td>Yes: <em>Ipomoea aquatic</em> (minor)</td>
<td>Yes; depressional</td>
<td>No. 1 – no hydric soils&lt;br&gt;No. 2 – no hydric soils&lt;br&gt;No. 3 – no hydric soils&lt;br&gt;No. 4 – hydric soils present</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Mahalang MC1</td>
<td>No</td>
<td>Yes; crater</td>
<td>No. 1 – hydric soils&lt;br&gt;No. 2 – hydric soils</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Mahalang M7</td>
<td>No</td>
<td>Yes; crater</td>
<td>No. 1 – no hydric soils (too far upslope due to high water levels?)&lt;br&gt;No. 2 – no hydric soils (too far upslope due to high water levels?)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Mahalang MC2</td>
<td>No</td>
<td>Yes; crater</td>
<td>No. 1 – no hydric soils (too far upslope due to high water levels?)&lt;br&gt;No. 2 – hydric soils</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Mahalang M10</td>
<td>No</td>
<td>Yes; crater</td>
<td>No. 1 – no hydric soils (too far upslope due to high water levels?)&lt;br&gt;No. 2 – hydric soils</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Mahalang M11</td>
<td>No</td>
<td>Yes; depressional</td>
<td>No. 1 – no hydric soils&lt;br&gt;No. 2 – no hydric soils</td>
<td>No</td>
<td>No; No saturated grounds</td>
</tr>
<tr>
<td>Mahalang MD3</td>
<td>Yes: <em>Ipomoea aquatic</em> (dominant)</td>
<td>Yes; depressional</td>
<td>No. 1 – hydric soils&lt;br&gt;No. 2 – no hydric soils (too far upslope due to high water levels?)</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: No. = number.

### 3.3.4.1.1.2 Sub-watersheds

The U.S. Department of Agriculture identified five sub-watershed areas on Tinian: Makpo Valley, Puntan Diaplo-Lamanibot, Carolinas, Masalok, and Puntan Tahgong. The designated sub-watershed areas are based on Island Resource Steering Committee concern areas, topography, and principal land uses. The Island Resource Steering Committee originated in 1991 and included government agencies and members of the Tinian community (U.S. Department of Agriculture 1994). Sub-watersheds areas are shown in Figure 3.3-1. Contamination due to human activity has the potential to impact surface water and groundwater in these sub-watersheds. Examples of existing or past human activities/land uses which have the potential to contaminate water resources include: agriculture/crop production and harvesting; auto mechanic shops; vehicle fuel stations; fuel storage; cattle ranching; pesticide storage
and application; chemical storage; asphalt plant; landfill; grounds maintenance; and land disturbance/grading/construction. Details on historic and current sites of potential environmental concern are discussed in Section 3.16, *Hazardous Materials and Waste*.

**Puntan Tahgong Sub-watershed.** Located within the north end of the Military Lease Area, the Puntan Tahgong sub-watershed contains Lake Hagoi. It is the most disturbed of the Tinian sub-watersheds due to intensive sugar cane production prior to and during World War II; and due to nearly-complete vegetation clearing for runways and housing during World War II. The sub-watershed is underlain by porous limestone formations (primarily the Mariana Limestone) with small areas underlain by less permeable volcanic materials and more permeable beach deposits. Groundwater in Puntan Tahgong sub-watershed is vulnerable to surface contaminants due to the high permeability of the limestone substrate and the previous land use. Potential contaminants from World War II land uses and other historical land uses, as listed above, may still be present in Tinian’s sub-watersheds (U.S. Department of Agriculture 1994).

**Puntan Diaplo-Lamanibot Sub-watershed.** The Puntan Diaplo-Lamanibot sub-watershed area includes the majority of the west side of the Military Lease Area, Tinian International Airport, and land south of Tinian International Airport. It supports secondary forest and portions of it are used for farming and ranching. The sub-watershed includes the location of the unlined Tinian municipal solid waste facility, and is therefore at risk for groundwater contamination due to that activity. The sub-watershed is underlain by porous limestone formations (primarily the Mariana Limestone) with small areas underlain by less permeable volcanic materials and more permeable beach deposits.

**Masalok Sub-watershed.** The Masalok sub-watershed is located largely within the east side of the Military Lease Area and is used mainly for livestock grazing. Residual contaminants from material storage during and following World War II and overgrazing are existing concerns for the Masalok sub-watershed (DoN 2010a). The sub-watershed is underlain by porous limestone formations (primarily the Mariana Limestone).

**Makpo Valley Sub-watershed.** The Makpo Valley sub-watershed currently supplies all of the municipal potable water supply and a portion of the agricultural water supply for the island. A small portion of the sub-watershed is situated within the south-central side of the Military Lease Area and Tinian International Airport. This sub-watershed is primarily underlain by porous limestone formations (primarily the Mariana Limestone).

**Carolinas Sub-watershed.** The Carolinas sub-watershed supports limestone forest cliffs along the southeastern shoreline including a small portion of the southeastern end of the Military Lease Area. The watershed is underlain by porous limestone formations (primarily the Mariana Limestone).

### 3.3.4.1.2 Flood Zones

The Federal Emergency Management Agency classifies areas that are likely to be inundated in a 100-year flood event as Flood Zone A. Areas along coasts subject to inundation by the 100-year flood event and with storm-induced wave hazards are classified as Flood Zone V. The Federal Emergency Management Agency has identified 19 isolated areas that are designated as Flood Zone A. These zones are located in areas including Hagoi, portions of North Field, Tinian International Airport, and Makpo Sub-watershed (Commander, U.S. Naval Forces Marianas 2004). The entire Tinian coastline extending...
from approximately 400 feet (120 meters) offshore to the shoreline cliff face or to the inland limit of primary flat sand beaches along open coastlines is designated as Flood Zone V and may be subject to storm-induced wave hazards. Tinian flood zones are shown in Figure 3.3-1.

3.3.4.1.3 Surface Water Quality

The CNMI Water Quality Standards establish criteria designed to protect the designated uses for each classification of waters (i.e., coastal waters, fresh waters, and wetlands). Coastal water quality is discussed in Section 3.3.4.3, Nearshore Waters. Designated uses of fresh surface waters include: aquatic life, fish consumption, recreation, aesthetic enjoyment, and potable water supply. The CNMI Bureau of Environmental and Coastal Quality maintains a monitoring program for water quality. However, this monitoring program on Tinian is limited to coastal waters. To date, surface water quality data has not been assessed for the three known surface water features on Tinian and the CNMI Bureau of Environmental and Coastal Quality performs no regular monitoring of surface water quality (Bearden et al. 2012).

3.3.4.2 Groundwater Resources

3.3.4.2.1 Groundwater Availability

Rainfall percolates rapidly downward into porous limestone rock and is the primary recharge source of fresh groundwater on Tinian (Doan et al. 1960). The average annual groundwater recharge for Tinian is estimated to be about 30 inches (76 centimeters) per year (Gingerich 2002). Groundwater is plentiful in Tinian’s basal groundwater lens (lenses of fresh groundwater that floats on top of denser saltwater below) (Doan et al. 1960). This freshwater, Ghyben-Herzberg groundwater lens (fresh water that “floats” on top of saltwater forming a profile that has the appearance of a lens) is in both limestone and volcanic rocks, with the most important sources coming from limestone formations (Gingerich 2002). The interface between the freshwater and saltwater is a transition zone at a depth below sea level (Figure 3.3-2 and Figure 3.3-3). The portion of the lens that is used for potable water (i.e., with chloride concentrations less than 250 parts per million) is thickest in the North-Central Highland and Central Plateau and grows increasingly thinner approaching the coastline. See Appendix P, Utilities Study, for additional information about the Ghyben-Herzberg lens relationship. Tinian geologic units including Mariana and Tagpochau limestones are shown in Section 3.2, Geology and Soils, Figure 3.2-3. The freshwater lens extends from a maximum recorded 3.42 feet (1.04 meters) above MSL to about 140 feet (42 meters) below MSL at its deepest point (Gingerich 2002). Groundwater table elevation contours and the general direction of groundwater flow are shown in Figure 3.3-4.
Figure 3.3-2  Graphic Depiction of a Freshwater Lens above a Saltwater Wedge – Standard, Vertical Pumping Well

Note: This figure is intended as a simple representation of interface between the freshwater and saltwater.

Figure 3.3-3  Graphic Depiction of a Freshwater Lens above Saltwater Wedge – Horizontal, Maui-Type Pumping Well

Note: This figure is intended as a simple representation of interface between the freshwater and saltwater.
Figure 3.3-4
Tinian Groundwater Wells, Elevation, and Flow Direction
The U.S. Environmental Protection Agency has not identified a sole-source aquifer (i.e., the principal source of drinking water) underlying Tinian. Per the CNMI Wastewater Treatment and Disposal Rules and Regulations, a Class I Aquifer Recharge Area is defined as an “area contributing surface infiltration to a geologic formation, or part of a formation, that is water bearing and which currently transmits, or is believed capable of transmitting water to supply pumping wells or springs.” While not formally designated, based on this definition, the CNMI Bureau of Environmental and Coastal Quality considers all of Tinian a Class I Aquifer Recharge Area per the CNMI Rules and Regulations.

Figure 3.3-4 shows the locations of known groundwater wells. The Commonwealth Utilities Corporation public system extracts water from one horizontal Maui-type well (Maui Well #2) located in the Makpo sub-watershed (a Maui-type well has a horizontal collector trench constructed near the top of the water table). Before Maui Well #2 was put into service, the public system extracted water from Maui Well #1. Maui Well #1 is currently out of service due to old equipment and difficulty obtaining repair parts. See Appendix P, Utilities Study, for additional information on Tinian’s public water system and discussion of the sustainable yield (the rate at which groundwater can be continuously withdrawn from an aquifer without impairing the quality or quantity of the pumped water or the environment) of Tinian’s aquifers.

In addition to pumping from Maui Well #2 for the public water system, water is currently pumped from two wells (rehabilitated by a private party) to fill containers for providing water to cattle, labeled M21 and M26 in Figure 3.3-4.

Historically, the Japanese may have dug more than 100 wells during occupation of Tinian; most of which were reportedly abandoned and filled. The U.S. military constructed approximately 44 groundwater wells between 1944 and 1945 on the island for water supply for the U.S. military, including Maui Well #1. All of these wells were abandoned shortly after World War II. It is not known if (or how) these wells were properly closed when abandoned. A total of 33 wells were used for groundwater monitoring between 1993 and 1997 by the U.S. Geological Survey. Of the 33 wells, 16 were rehabilitated and 17 were newly developed for groundwater monitoring on the island. Rehabilitation involved retrieving the original pump and pipe, redrilling if necessary, cleaning out the hole to near the original depth, and installing new surface casings/well head features, if necessary.

The CNMI government owns Maui Well #1 and Maui Well #2. There are other wells located on Tinian that are used for groundwater monitoring, agricultural use, or have been abandoned.

### 3.3.4.2.2 Groundwater Quality

While it is not currently a problem, Tinian has the potential for high chloride levels in groundwater due to seawater intrusion into the freshwater lens from excessive pumping (Gingerich 2002). The secondary drinking water standard for chloride is set at concentrations less than or equal to 250 parts per million. Chloride concentrations at the municipal water well (i.e., Maui Well #2) range from 160 to 220 parts per million, with an average of 180 parts per million; notably close to the secondary drinking water standard (i.e., non-mandatory drinking water quality standards for aesthetic considerations, such as taste, color, and odor) (U.S. Army Corps of Engineers 2003). Table 3.3-3 summarizes recent data.
Table 3.3-3. Tinian – Tinian Municipal Well Water Quality

<table>
<thead>
<tr>
<th>Well #</th>
<th>Year Tested</th>
<th>Chloride Concentrations Observed (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maui Well #2</td>
<td>2011</td>
<td>Mean 203, Range 195-210</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>Mean 196, Range 175-223</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>Mean 190, Range 172-217</td>
</tr>
</tbody>
</table>

Note: ppm= parts per million.

Surface activities (e.g., sewage spills, leachate from septic systems, and polluted stormwater runoff percolation) can also contaminate groundwater aquifers. As discussed in Section 3.14, Utilities, the Tinian existing solid waste facility consists of an unlined, open disposal site located about 0.5 mile (0.8 kilometer) north of San Jose on the west side of 8th Avenue (see Figure 3.3-1). The solid waste facility is believed to have been in use since 1944 and may contain World War II-era military waste, as well as municipal solid waste generated on Tinian. No trash pickup service is available on Tinian; therefore, residents take their municipal waste to the Tinian solid waste facility for disposal. The CNMI commercial entities (administrative offices, hotels, restaurants, etc.) including the Tinian Dynasty Hotel and Casino, transport their waste to the municipal solid waste facility as well. The facility does not comply with the Resource Conservation and Recovery Act Subtitle D regulations applicable to municipal solid waste landfills (40 CFR 258) and may be a source of groundwater contamination. It is not known if groundwater in the vicinity of the solid waste facility has been contaminated, but standard contaminants for municipal waste have not been detected in groundwater extracted for municipal water supply at Maui Well #1 and #2.

3.3.4.3 Nearshore Waters

Nearshore waters around Tinian are designated Class AA by the CNMI Bureau of Environmental and Coastal Quality, except for the nearshore waters of Tinian Harbor that are designated Class A. Class AA designation means these waters should remain in their natural pristine state with an absolute minimum of pollution or alteration of water quality from human related sources or actions. Class A designation waters under the jurisdiction of the CNMI Bureau of Environmental and Coastal Quality are protected for their recreational use and aesthetic enjoyment. Other uses of Class A waters are allowed as long as they are compatible with the protection and propagation of fish, shellfish, wildlife, and limited body contact recreation. Sewage outfalls, sewer collection overflows, sedimentation from unpaved roads and development, urban runoff, reverse osmosis brine discharges, and agriculture are the most significant stressors on the CNMI’s marine water quality (Bearden et al. 2010). As discussed above, the Tinian municipal solid waste facility does not comply with the Resource Conservation and Recovery Act Subtitle D regulations and could be a source of nearshore water contamination. However, the solid waste facility was not identified as a source of contamination or a significant stressor to marine water quality (Bearden et al. 2012).

Beginning in 2004, the CNMI water quality for coastal waters has been assessed and reported once every 2 years in terms of water body segments based on established, named CNMI sub-watershed units (Bearden et al. 2012). As presented in Appendix I of the CNMI Bureau of Environmental and Coastal Quality’s 2012 Water Quality Assessment Report (Bearden et al. 2012), the coastal waters of the Masalok, Makpo Valley, Puntan Diaplo-Lamanibot, and Puntan Tahgong sub-watersheds were listed as impaired by one or more pollutants during and the 2004, 2006, 2008, 2010, and 2012 reporting cycles. Masalok sub-watershed was reported as impaired by orthophosphate for the 2004 reporting cycle (20%
of the net reporting period). Makpo Valley sub-watershed was reported as impaired by enterococci bacteria, dissolved oxygen, biocriteria, and orthophosphate for the 2004, 2006, 2010 and 2012 reporting cycles (80% of the net reporting period). Puntan Diaplo-Lamanibot sub-watershed was reported as impaired by enterococci bacteria and orthophosphate for the 2004 and 2012 reporting cycles (40% of the net reporting period). Puntan Tahgong sub-watershed was reported as impaired by biocriteria and orthophosphate for the 2004 and 2006 reporting cycles (40% of the net reporting period). Only Makpo Valley and Puntan Diaplo-Lamanibot were listed as impaired during the 2012 assessment and reporting cycle. Table 3.3-4 provides a summary of the impaired Tinian coastal waters.

**Table 3.3-4 Tinian Impaired Coastal Waters**

<table>
<thead>
<tr>
<th>Sub-watershed</th>
<th>Pollutant(s)</th>
<th>Source</th>
<th>Year Listed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masalok</td>
<td>orthophosphate</td>
<td>unknown</td>
<td>2004</td>
</tr>
<tr>
<td>Makpo</td>
<td>enterococci, dissolved oxygen, biocriteria, orthophosphate</td>
<td>unknown, on-site treatment systems, urban runoff</td>
<td>2012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2004</td>
</tr>
<tr>
<td>Puntan Diaplo-Lamanibot</td>
<td>enterococci, orthophosphate</td>
<td>unknown</td>
<td>2012</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2004</td>
</tr>
<tr>
<td>Puntan Tahgong</td>
<td>biocriteria, orthophosphate</td>
<td>unknown</td>
<td>2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2004</td>
</tr>
</tbody>
</table>

*Source: Bearden et al. 2012; APPENDIX II: Detailed 305b Listing of the CNMI Waters; Table II-5 Category 5: Coastal Waters Impaired by Pollutants (Total Maximum Daily Load Required).*

The Makpo sub-watershed includes both Tinian’s commercial harbor and its population center (San Jose). The absence of wastewater collection and treatment systems, stormwater quality treatment and erosion controls are existing concerns for the Makpo Valley sub-watershed. Makpo Valley sub-watershed coastal waters have been listed as impaired based on bacterial, nutrient, dissolved oxygen, and biological criteria. The sources of pollution include on-site treatment systems and urban runoff, as well as unidentified sources (B. Bearden, Consolidated Utilities Corporation, personal communication, December 4, 2012).

As part of the Mariana Archipelago Reef Assessment and Monitoring Program the National Oceanic and Atmospheric Administration, National Marine Fisheries Service conducted shallow-water conductivity, temperature, and depth casts in nearshore waters surrounding Tinian in August 2003, September 2005, and May 2007. Across all sample years and locations, at a depth of 33 feet (10 meters) water temperatures ranged from 82.71 to 85.86 degrees Fahrenheit (28.17 to 29.92 degrees Celsius) and salinity ranged from 34.22 to 34.60 practical salinity units. In 2003 cooler temperatures and higher salinity were recorded around the northeast end of Tinian relative to other areas of the island. In 2005 and 2007 spatial comparison suggest an east to west gradient in water properties, with warmer, more saline, and less turbid waters along the western half of the island compared to the eastern half (Brainard 2012).

In 2005 and 2007 water samples were collected to measure chlorophyll-α, total nitrogen, nitrate, nitrite, phosphate, and silicate levels. Measures of chlorophyll-α, nitrogen, nitrate, and nitrite concentration were lower in 2007 than in 2005. Phosphate and silicate concentration were higher in 2007 than in 2005. In 2005 all measured parameters showed higher concentrations in the southwest region of the island and total nitrogen was 4 times higher in the southwest as compared to other regions of the island.
Again in 2007 the highest concentration of nutrients was in the north regions of the island. However, in 2007 the highest chlorophyll-\(\alpha\) values were in the southwest region (Brainard 2012).

### 3.3.5 Pagan

#### 3.3.5.1 Surface Water Resources

##### 3.3.5.1.1 Surface Water Features

Average annual rainfall on Pagan is 70 to 80 inches (178 to 203 centimeters). Surface water features on Pagan include two lakes: Laguna Sanhiyon and Laguna Sanhalom, shown in Figure 3.3-5, and springs found across the island. There are no permanent rivers or streams on the island. Though surface water drainage has not been studied, it is thought that most of the infiltrating rainwater percolates rapidly to a large basal fresh groundwater body; however, no testing has been conducted to confirm this (CNMI Office of Transition Studies and Planning 1978).

Laguna Sanhiyon (commonly known as Lower Lake) is an approximately 40-acre (16-hectare) brackish water lake on the western shore. The lake has a maximum depth of approximately 65 feet (20 meters) (CNMI Office of Transition Studies and Planning 1978). A sand bar composed of marine tuffs and basaltic sand separates the lake from the ocean (Photo 3.3-1). During storms, waves occasionally overtop the sand bar (CNMI Office of Transition Studies and Planning 1978). A small tidally mediated freshwater wetland area is located on the north end of Laguna Sanhiyon (Polhemus 2010).

Laguna Sanhalom (commonly known as Upper Lake or Inner Lake) is a 43-acre (17-hectare) brackish lake at the foot of Mount Pagan. The lake has a maximum depth of about 75 feet (23 meters), reaching a depth of 65 to 70 feet (20 to 21 meters) below sea level (CNMI Office of Transition Studies and Planning 1978).

Watershed areas on Pagan have not been designated. Due to the generally high permeability and infiltration rates of surficial volcanic materials on Pagan, the contribution of stormwater runoff to recharge Pagan's major surface water bodies (Laguna Sanhalom and Laguna Sanhiyon) is minimal as compared to the contribution from groundwater (Doan et al. 1960). During their 3-month long field investigation of the island, Doan et al. (1960) did not observe any stream formations, even during moderately heavy rain events. However, Doan et al. 1960 did mention that some surface runoff on steep slopes and cliffs was observed during and following the rain events, which suggests that stormwater runoff does enter the surface waters in some areas and during some storm events. This runoff is expected to form channelized flow from heavy rainfall. In addition sub-surface flow from higher elevations within and around the volcano is also believed to influence these surface waters.
*Consistency in the location of groundwater well W-2 between maps presented in Corwin et al. 1957 and Athens 2009 suggest that well W-2 was sampled in the summer of 1957 by Corwin et al. and was then re-located during the 2009 archaeological survey.

Figure 3.3-5
Pagan Surface Waters and Groundwater Well Locations

Legend
- Japanese Dug Well (3 feet diameter, considered for reconditioning in 1978 by CNMI Government)
- Groundwater Well (located during 2008 Archaeological Survey)
- Permanent Dug Groundwater Well (located and sampled by Corwin et al. 1957)

Sources: Corwin et al. 1957; CNMI 1978; Athens 2009
3.3.5.1.2 Flood Zones

No flood zone data are available for Pagan.

3.3.5.1.3 Surface Water Quality

As described in Section 3.2, Geology and Soils, the island’s forests and grasslands have been “severely overgrazed” due to the abundance of feral cattle, goats, and pigs that have done considerable damage to island vegetation (Cruz et al. 2000; Kessler 2011). This overgrazing has resulted in large open areas susceptible to soil erosion.

Water quality of both lakes has never been fully assessed and is not actively monitored by the Bureau of Environmental and Coastal Quality due to the remoteness of the island (Bearden et al. 2012). However, water quality samples from the lakes were collected by the U.S. Geological Survey in 1983 and 2001 (U.S. Geological Survey 2014). The data are presented in Table 3.3-5.

Table 3.3-5. Pagan Surface Water Quality Data Summary

<table>
<thead>
<tr>
<th>Surface Water Body</th>
<th>Sample Date</th>
<th>Dissolved Solids (mg/L)</th>
<th>Nitrate (mg/L)</th>
<th>Ammonia (mg/L as NH(_4))</th>
<th>Phosphorus (mg/L as P)</th>
<th>Sodium (mg/L)</th>
<th>Chloride (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laguna Sanhiyon</td>
<td>3/12/1983</td>
<td>12400</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3500</td>
<td>7000</td>
</tr>
<tr>
<td>Laguna Sanhiyon</td>
<td>5/25/2001</td>
<td>13200</td>
<td>0.221</td>
<td>0.032</td>
<td>0.003</td>
<td>3890</td>
<td>7260</td>
</tr>
<tr>
<td>Laguna Sanhalom</td>
<td>3/12/1983</td>
<td>6380</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1800</td>
<td>3500</td>
</tr>
<tr>
<td>Laguna Sanhalom</td>
<td>5/24/2001</td>
<td>4230</td>
<td>0.221</td>
<td>0.052</td>
<td>0.004</td>
<td>1040</td>
<td>1910</td>
</tr>
</tbody>
</table>

Notes: mg/L = milligrams per liter; P = phosphorus; NH\(_4\) = Ammonia; - = not analyzed.

Laguna Sanhiyon has a salinity of about half that of the ocean. Although biological contamination (elevated fecal coliform) of surface waters caused by migration of bacteria from animal waste through the hydrologic system of the island has been documented (CNMI Office of Transition Studies and Planning 1978), surface water samples collected from the lakes and springs above the upper lake by the U.S. Geological Survey in 1983 (U.S. Geological Survey 2014) were below the U.S. Environmental Protection Agency’s recommended fecal coliform criterion (U.S. Environmental Protection Agency 1976). Surface water samples collected from Laguna Sanhalom by the U.S. Geological Survey in 1983 and 2001 (U.S. Geological Survey 2014) indicate that the water is brackish with a salinity about 4 to 6 times the potable drinking water standard (CNMI Office of Transition Studies and Planning 1978). The mixing of saltwater may occur through vents, faults, and the bedrock substrate. Nitrogen-based compounds in samples from the U.S. Geological Survey data were below detectable levels, as were phosphates. Sulfate and silica concentrations were elevated in the 2001 samples for the lakes. Elevated concentrations of rare dissolved metals and metalloids in the 2001 sample from the lower lake are likely the result of the weathering young volcanic deposits on the island (U.S. Geological Survey 2014). Water from both lakes is not considered a viable potable source. Table 3.3-6 summarizes the 1983 and 2001 surface water data.
<table>
<thead>
<tr>
<th>Site Name</th>
<th>Laguna Sanhiyon</th>
<th>Laguna Sanhalom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample Date</strong></td>
<td>3/12/1983</td>
<td>5/25/2001</td>
</tr>
<tr>
<td><strong>Sample Time</strong></td>
<td>4:10 PM</td>
<td>11:30 AM</td>
</tr>
<tr>
<td><strong>Total nitrogen, water, filtered, mg/L</strong></td>
<td>-</td>
<td>&lt; 0.21</td>
</tr>
<tr>
<td><strong>Organic nitrogen, water, filtered, mg/L</strong></td>
<td>-</td>
<td>E 0.13</td>
</tr>
<tr>
<td><strong>Ammonia, water, filtered, mg/L as nitrogen</strong></td>
<td>-</td>
<td>E 0.03</td>
</tr>
<tr>
<td><strong>Nitrite, water, filtered, mg/L as nitrogen</strong></td>
<td>-</td>
<td>&lt; 0.006</td>
</tr>
<tr>
<td><strong>Nitrate, water, filtered, mg/L as nitrogen</strong></td>
<td>-</td>
<td>&lt; 0.050</td>
</tr>
<tr>
<td><strong>Ammonia plus organic nitrogen, water, filtered, mg/L as nitrogen</strong></td>
<td>-</td>
<td>0.16</td>
</tr>
<tr>
<td><strong>Nitrate plus nitrite, water, filtered, mg/L as nitrogen</strong></td>
<td>&lt; 0.100</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td><strong>Orthophosphate, water, filtered, mg/L</strong></td>
<td>&lt; 0.061</td>
<td>-</td>
</tr>
<tr>
<td><strong>Phosphorus, water, filtered, mg/L as phosphorus</strong></td>
<td>-</td>
<td>E 0.003</td>
</tr>
<tr>
<td><strong>Orthophosphate, water, filtered, mg/L as phosphorus</strong></td>
<td>-</td>
<td>&lt; 0.02</td>
</tr>
<tr>
<td><strong>Chloride, water, filtered, mg/L</strong></td>
<td>4.1</td>
<td>7000</td>
</tr>
<tr>
<td><strong>Sulfate, water, filtered, mg/L</strong></td>
<td>390</td>
<td>3500</td>
</tr>
<tr>
<td><strong>Silica, water, filtered, mg/L as silicon dioxide</strong></td>
<td>8</td>
<td>1910</td>
</tr>
<tr>
<td><strong>Barium, water, filtered, ug/L</strong></td>
<td>20.2</td>
<td>7260</td>
</tr>
<tr>
<td><strong>Barium, water, unfiltered, recoverable, ug/L</strong></td>
<td>100</td>
<td>&lt; 100</td>
</tr>
<tr>
<td><strong>Boron, water, filtered, ug/L</strong></td>
<td>2290</td>
<td>-</td>
</tr>
<tr>
<td><strong>Chromium, water, unfiltered, recoverable, ug/L</strong></td>
<td>20</td>
<td>1540</td>
</tr>
<tr>
<td><strong>Iron, suspended sediment, recoverable, ug/L</strong></td>
<td>90</td>
<td>-</td>
</tr>
<tr>
<td><strong>Iron, water, unfiltered, recoverable, ug/L</strong></td>
<td>130</td>
<td>40</td>
</tr>
<tr>
<td><strong>Manganese, water, filtered, ug/L</strong></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td><strong>Strontium, water, filtered, ug/L</strong></td>
<td>2600</td>
<td>19.2</td>
</tr>
<tr>
<td><strong>Vanadium, water, filtered, ug/L</strong></td>
<td>-</td>
<td>5.5</td>
</tr>
<tr>
<td><strong>Zinc, water, filtered, ug/L</strong></td>
<td>9.6</td>
<td>-</td>
</tr>
<tr>
<td><strong>Zinc, water, unfiltered, recoverable, ug/L</strong></td>
<td>20</td>
<td>5.4</td>
</tr>
<tr>
<td><strong>Antimony, water, filtered, ug/L</strong></td>
<td>0.53</td>
<td>-</td>
</tr>
<tr>
<td><strong>Aluminum, water, unfiltered, recoverable, ug/L</strong></td>
<td>200</td>
<td>-</td>
</tr>
<tr>
<td><strong>Aluminum, water, filtered, ug/L</strong></td>
<td>-</td>
<td>M</td>
</tr>
<tr>
<td><strong>Lithium, water, filtered, ug/L</strong></td>
<td>31.5</td>
<td>-</td>
</tr>
<tr>
<td><strong>Lithium, water, unfiltered, recoverable, ug/L</strong></td>
<td>50</td>
<td>31.1</td>
</tr>
<tr>
<td><strong>Selenium, water, filtered, ug/L</strong></td>
<td>-</td>
<td>110</td>
</tr>
<tr>
<td><strong>Selenium, water, unfiltered, ug/L</strong></td>
<td>13.8</td>
<td>-</td>
</tr>
<tr>
<td><strong>Uranium (natural), water, filtered, ug/L</strong></td>
<td>2</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Total coliform, water, colonies per 100 milliliters</strong></td>
<td>0.35</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes:** M = presence verified but not quantified; E = estimated; - = not analyzed; mg/L = milligrams per liter; ug/L = micrograms per liter.
3.3.5.2 Groundwater Resources

Knowledge of the groundwater resources of Pagan is limited to a 1957 study of the geology and hydrogeology of the island (Corwin et al. 1957), a 1978 planning study by the CNMI Office of Transition Studies and Planning; and limited water sampling conducted by the U.S. Geological Survey in 1983 and 2001 (U.S. Geological Survey 2014). The hydrogeology (i.e., groundwater geology) of Pagan likely does not include any large bodies of fresh groundwater near sea level (i.e., basal groundwater lenses). This is evidenced by the very limited amount of groundwater seeping from soil or rock (i.e., perennial seeps, springs). One minor seep was located on a cliff face along the west coast approximately 0.5 mile (0.8 kilometer) south of Bandeera Peninsula (Corwin et al. 1957). A limited basal confined aquifer may exist beneath Mount Pagan caldera because of the density difference between freshwater (from rainfall) and saltwater (from the adjacent ocean). This lens is likely to have developed in the Mount Pagan caldera, because the less-dense freshwater, if undisturbed by other forces, will “float” on top of the more-dense saltwater. However, the 1981 eruption and subsequent temperature convection currents have likely mixed saltwater with portions of the freshwater lens to an extent that development of this lens as a freshwater resource is questionable.

No large high-level groundwater bodies have been identified although small bodies of perched water (isolated small bodies of water found above the regional water table) may occur at depth on the South Volcano, Mount Pagan, and within the several calderas associated with the ancestral volcanoes that form the island (Corwin et al. 1957; CNMI Office of Transition Studies and Planning 1978).

Other potential sources of potable water are within the volcanic rock of the plains surrounding Mount Pagan, because of the high rates of infiltration and rapid circulation through the rocks. Figure 3.3-5 shows the location of the known groundwater wells on Pagan: a former Japanese well located north of the Japanese runway, four wells identified during a 2008 archaeological survey (CNMI Office of Transition Studies and Planning 1978; Athens 2009), and two additional wells located and sampled by Corwin et al. (1957). The wells are subject to saltwater intrusion and their current status is unknown (DoN 2013b).

Six relatively broadly-distributed groundwater samples were collected from accessible wells on Pagan by the U.S. Geological Survey in 1983 and two were collected in 2001 (U.S. Geological Survey 2014). These data suggest groundwater for the Shomushon area (area just east of Green and Red Beach, north of the Pagan airfield) to be below the U.S. Environmental Protection Agency’s regional screening levels for potable water for nutrients and dissolved metals (U.S. Environmental Protection Agency 2014). Three of the wells Corwin et al. (1957) tested (Wells 1, 2, and 3) had total dissolved solids below the secondary drinking water maximum contaminant level. Two of these wells (Wells 2 and 3) had nitrate concentrations below the primary drinking water (i.e., mandatory drinking water quality standards under the Safe Drinking Water Act) maximum contaminant level. Therefore these two wells might be considered potable; however both of these have water high in silica.

3.3.5.3 Nearshore Waters

Pagan has approximately 39 miles (63 kilometers) of undeveloped coastline that features diverse intertidal systems, with tide pools formed in basalt and limestone headlands exposed along the coast (Polhemus 2010). During coral surveys, visibility and apparent water quality was degraded in water
along Green Beach (see Figure 3.3-5) relative to the other leeward beaches. Kitchen scraps found in shallow sediments of the bay at Green Beach during coral surveys suggests that use of the area by visitors to Pagan could also potentially influence nearshore water quality (DoN 2014).

Two sea water samples collected by the U.S. Geological Survey in 1983 and 2001 at the shoreline near the center of Red Beach were analyzed for standard water quality parameters (pH, conductance, temperature, turbidity) as well as nutrients and dissolved metals. Sodium and chloride levels were standard for the sea water samples, pH was basic (7.5-8.2) as would be expected for nearshore sea water, and was typical for bicarbonate concentrations. Dissolved nitrogen as nitrate and phosphorous concentrations were also standard for nearshore seawater (U.S. Geological Survey 2014).

As part of the Mariana Archipelago Reef Assessment and Monitoring Program the National Oceanic and Atmospheric Administration, National Marine Fisheries Service conducted shallow-water conductivity, temperature, and depth casts in nearshore waters surrounding Pagan in August and September 2003, September 2005, and June 2007. Across all sample years and locations, at a depth of 33 feet (10 meters) water temperatures ranged from 83.79 to 86.18 degrees Fahrenheit (28.77 to 30.10 degrees Celsius) and salinity ranged from 34.29 to 34.61 practical salinity units. Comparisons between surveys suggest a dynamic physical environment with few spatial similarities in water properties across sample years. In 2005 and 2007, temperature and salinity values were generally lower along the east side of the island as compared to the west (Brainard 2012).

In 2005 and 2007 water samples were collected to measure chlorophyll-a, total nitrogen, nitrate, nitrite, phosphate, and silicate levels. Water quality data suggests spatial and temporal variability in nutrient concentrations. Spatial pattern of measures nutrients varied between survey years, with the exception of phosphate, which was relatively consistent between survey years. Measured silicate values were higher in 2007 than in 2005. These differences may result from seasonal effects, with the 2005 survey occurring during a period of high precipitation and 2007 survey occurring in a period of low precipitation, or may be due to other processes unknown at this time (Brainard 2012).
3.4 **AIR QUALITY**

Section 3.4 describes the existing air quality in the region of influence for the proposed action. Air quality refers to pollutants in the air, and the health and safety aspect of those pollutants to humans and the environment, including plants and animals. Air pollution refers to chemical substances, particulates, biological materials, or other harmful materials that degrade the quality of the atmosphere. Air quality is affected by air pollutants from mobile sources such as vehicles, aircraft, ships, and construction equipment, as well as by stationary sources such as emergency generators, industrial stacks, exhaust vents, prescribed fires, and natural processes (e.g., wildfires and volcanic activity). The region of influence for air quality is Tinian’s and Pagan’s airsheds, which include the land areas and coastal waters within 3 nautical miles (5.5 kilometers) of the respective islands. Tinian’s and Pagan’s airsheds are under the same air quality jurisdiction.

### 3.4.1 Definition

Air quality is defined as a measurement of pollutants in the air. Regulatory definitions are based on the 1970 Clean Air Act (amended in 1977 and 1990), and are described in detail in Appendix G, *Air Quality Technical Memo*.

### 3.4.2 Regulatory Framework

The regulatory framework governing air quality is briefly summarized below and described in greater detail in Appendix G, *Air Quality Technical Memo*. A complete listing of applicable regulations is provided in Appendix E, *Applicable Federal and Local Regulations*.

- Clean Air Act 42 U.S. Code § 7401 et seq.
- CNMI Air Pollution Control Regulations
- Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management
- Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance

The U.S. Environmental Protection Agency, under the requirements of the Clean Air Act, established National Ambient Air Quality Standards for six contaminants. These contaminants, referred to as criteria pollutants, are:

- Carbon monoxide
- Nitrogen dioxide
- Ozone
- Particulate matter
- Lead
- Sulfur dioxide

The National Ambient Air Quality Standards include primary and secondary standards. The primary standards were established to protect human health, particularly the health of sensitive populations such as asthmatics, children, and the elderly. Sensitive land uses protected by the primary air quality
standards are publicly accessible areas used by these sensitive populations; including residences, hospitals, libraries, churches, parks, playgrounds, and schools. The secondary air quality standards set limits to protect the environment, including plants and animals, from adverse effects associated with pollutants in the air. In addition to the criteria pollutants that have been established by the National Ambient Air Quality Standards, greenhouse gas emissions that trap heat in the atmosphere also occur from both natural processes and human activities. Human activities are responsible for almost all of the increase in greenhouse gases in the atmosphere over the last 150 years (U.S. Environmental Protection Agency 2013). The primary long-lived greenhouse gases directly emitted by human activities are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

3.4.3 Methodology

Areas where concentration levels of a criteria pollutant are below standards are designated as being “in attainment,” per the Clean Air Act. Areas where a criteria pollutant level equals or exceeds standards are designated as being in “nonattainment.” A “maintenance area” is one that has been redesignated from nonattainment status to attainment status, and has an approved maintenance plan under § 175 of the Clean Air Act. Where insufficient data exist to determine an area’s attainment status, it is designated as unclassifiable.

The CNMI local government has not collected ambient air quality data. Therefore, no existing ambient air quality data are available to represent current air quality conditions with respect to criteria pollutants. Because of the lack of ambient air quality monitoring data, the existing air quality conditions on Tinian and Pagan cannot be evaluated against National Ambient Air Quality Standards. Therefore, both islands are considered unclassifiable. However, given limited emission sources on these islands, it is anticipated that they would presumably be in an attainment area if the ambient data were monitored as other states. The discussion of existing air quality conditions on, and surrounding, the islands of Tinian and Pagan is based on a brief discussion of major emission sources and where they exist on the two islands. The localized air quality condition can be correlated with the close proximity of major emission sources. In general, the sensitive receptors (e.g., individuals with respiratory conditions) that are close to major emission sources tend to have more air quality concerns than those located far from these sources.

Stationary source permits regulate emissions from a facility but cannot be utilized to calculate ambient air quality conditions in terms of the National Ambient Air Quality Standards.

3.4.4 Tinian

Tinian has a tropical climate. Over the course of the year, the temperature varies from 76 to 88 degrees Fahrenheit (24 to 31 degrees Celsius) and is rarely below 73 degrees Fahrenheit (22 degrees Celsius) or above 90 degrees Fahrenheit (32 degrees Celsius). The probability of precipitation varies throughout the year but occurs most often around October. Wind speeds typically vary from 2 to 22 miles per hour with dominant winds originating from the east. It is anticipated that air pollutants from the island would be quickly dispersed under normal weather conditions.

The major stationary sources on Tinian include power generation units and distribution facilities that comprise the existing island-wide power system owned by the Commonwealth Utilities Corporation. The
A power generation facility consists of four 2.5-megawatt diesel generators and two 5-megawatt diesel generators. These generators are the largest stationary sources of air emissions on Tinian. Given the limited human activities on the island, Tinian is considered an unclassified area and presumed to be in attainment for all criteria pollutants. In addition to the major stationary sources, facilities may have back-up generators in case of grid power failure; however, these sources are intermittent and considered minor stationary sources.

Traffic along major travel routes, such as Broadway and 8th Avenue within the San Jose area, are the dominant source of mobile source emissions. Operation of aircraft and vessels also generate emissions. The airport and seaport are located relatively far from sensitive neighborhoods, approximately 1 mile and 0.2 mile, respectively. Effects from these emission sources are negligible when compared to those from immediately adjacent roadway traffic.

### 3.4.5 Pagan

Because only sparsely distributed intermittent encampments currently occur on Pagan, and no electrical utility facilities exist, air pollution as a result of human activities is essentially nonexistent. Pagan is considered an unclassified area and presumed to be in attainment for all criteria pollutants. Active volcanoes on Pagan are the main sources of air emissions. Pagan contains two active volcanoes (Mount Pagan and South Pagan volcanoes). Almost all of the historical eruptions have originated from the Mount Pagan volcano (or North Pagan volcano). The largest recorded eruption took place in 1981.

According to satellite images received by the U.S. Geological Survey (2013), the Pagan volcanoes generate persistent gas and steam plumes with occasional robust plumes. Ambient sulfur dioxide conditions are not monitored on Pagan. The only sources of air quality information are satellite observations and occasional reports from observers who pass by or visit the island. However, volcanic emissions released from active volcanoes, such as sulfur dioxide (a criteria pollutant), are of concern with respect to human health.

Sulfur dioxide, a colorless gas with a characteristic and irritating smell, is one of the most common gases released in volcanic eruptions. On the local scale, sulfur dioxide is a hazard to humans in its gaseous form. This odorous pollutant is perceptible at different levels, depending on the individual's sensitivity, but is generally perceived between 0.3 to 1.4 parts per million and is easily noticeable at 3.0 parts per million. Gas concentrations would reduce in half over a period of 6 to 24 hours. Therefore, only about 5% (i.e., 0.5 parts per million approximately) of the emitted gas is present in the lower atmosphere after 1 to 4 days, which is close to the odor level that is barely perceivable.
3.5 Noise

Section 3.5 describes noise as perceived from a human perspective. The region of influence for noise is the islands of Tinian, Pagan, and surrounding areas including the southern portion of Saipan that could potentially be affected by the proposed action. Noise can also affect other resources such as biological (e.g., wildlife response), cultural (e.g., historic structures), recreational (e.g., noise intrusion on experience), and land use (e.g., incompatibility with existing land uses). This section presents baseline noise levels within the study area and focuses on the human response to those levels. Other sections in this EIS/OEIS use this information but in the context of their respective resource baseline and potential impact analyses. For example, the noise environment as it relates to terrestrial biological resources is presented in Sections 3.9 and 4.9, Terrestrial Biology of this EIS/OEIS.

3.5.1 Definition

Noise is generally described as unwanted sound. Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Unwanted sound can be based on objective effects (such as hearing loss and speech interruptions) or subjective judgments (such as noise complaints and annoyance).

There are two main concepts to understand how noise is generated—sound level and frequency.

- **Sound Level.** Sound level or intensity is a measure of the loudness of a sound expressed in decibels. A human ear can only detect sounds that are above a certain decibel level. The other end of the spectrum is sound so loud (high decibel level) that it can cause pain, discomfort, and hearing loss.

- **Frequency.** Frequency is a measure of sound-wave cycles per unit of time, with higher frequency sounds dispersing more quickly than those at lower frequencies. The standard unit of measurement for sound wave frequency is cycles per second, expressed as hertz.

Sound waves move outward in all directions from the source and weaken as the distance from the source increases. Sound waves (i.e., noise) can also be diminished or enhanced by wind movement, terrain, ground cover, and temperature. Human hearing can generally perceive frequencies between 20 and 20,000 hertz. The human ear cannot hear sounds above and below these frequencies.

Detailed definitions and explanations of noise modeling and methodology are provided in Appendix H, Noise Study.

3.5.1.1 Sound Level

Sound level is a measurement for the loudness of a sound, and loudness is a function of the amount of energy (or pressure) in a sound wave. A sound wave consists of a moving front of pressure that exceeds surrounding atmospheric pressure, followed by a trough that is below surrounding atmospheric pressure. The more this pressure front varies from the surrounding pressure, the louder, or more intense, the sound. Sound intensity is measured in units called decibels. The decibel system of measuring sound provides us with a simplified relationship between the physical intensity of sound and
its perceived loudness to the human ear. The decibel scale is logarithmic, therefore, sound intensity increases or decreases exponentially with each decibel of change.

Not all people are affected the same way by the same sounds. In varying situations, common sounds can interfere with our speech, disturb our sleep, or interrupt a routine task. When this occurs, these sounds become noise (Army Center for Health Promotion and Preventative Medicine 2006). Just as some people find hard rock music annoying, others find it soothing and relaxing.

The decibel levels of multiple sources of sound are not additive. In fact, doubling a noise source would only generate a 3-decibel increase. For example, a receptor under a flight path of one jet airliner 500 feet (152 meters) overhead would experience 115 decibels; if two jetliners passed side-by-side, the receptor would experience 118 decibels not 230 decibels. In addition, the decibel level of a sound decreases (or attenuates) exponentially as the distance from the source increases. For a single point source, like a construction bulldozer, the sound level decreases by approximately 6 decibels for each doubling of distance from the source. Common sound levels include a garbage disposal, which measures at about 77 decibels, and a car at 100 feet (314 meters), which measures at about 60 decibels.

**3.5.1.2 Frequency Weighting (A and C Weighting)**

The human ear cannot perceive all pitches or frequencies of sound equally. Therefore, sound measurement can be adjusted or weighted to compensate for the human lack of sensitivity to low-pitched and high-pitched sounds. The weighted scales used in this analysis are defined below. Please note that noise levels from one scale cannot be added or converted mathematically to levels in another weighting scale.

- **A-weighted Scale.** This scale accounts for higher-pitched sounds and used for evaluating noise sources such as aircraft, vehicles, and small arms firing (up to .50-caliber).

- **C-weighted Scale.** This scale accounts for the lower-pitched sounds and used for evaluating explosions and large-caliber weapons such as artillery and mortars (20 millimeter and greater).

**3.5.1.3 Noise Metrics**

Noise is measured using several metrics that reflect different noise characteristics. There are differences in continuous (e.g., aircraft flying) versus impulsive (e.g., weapons firing) types of noise, variations in frequency, duration of noise exposure. Duration of noise exposure also dictates how a person perceives noise; a relatively long steady noise, like a train, aircraft passing or traffic, “feels” different than a rapid loud gunshot type noise. Noise metrics used for the affected environment are as follows:

- **Day-Night Average Sound Level** is used to measure average annual noise levels around airfields and ranges. Day-night average sound levels can be either A-weighted or C-weighted depending upon the activity measured. Because noise is considered more intrusive at night, a 10-decibel penalty is applied for operations occurring during nighttime hours, between 10:00 p.m. and 7:00 a.m.

- **Peak 15 Sound Level** (hereafter referred to as Peak) is the instantaneous, unweighted maximum value reached by the sound pressure produced by small- and large caliber weapons. Peak measures the impulsive sounds generated by small and large munitions, explosions, and sonic
booms. It represents a single event where the maximum noise level is likely to be exceeded 15% of the time.

### 3.5.1.4 Noise Modeling

To derive the noise contour bands, the following software models were used for evaluating existing noise conditions. Refer to Appendix H, *Noise Study* for more detailed information.

- The Small Arms Range Noise Assessment Model calculates and displays noise contour bands for firing operations at small arms ranges (Army 2003). It considers the type of weapon and ammunition, number of rounds fired, range attributes such as size and barriers, time of day fired, and direction of both muzzle and projectile.

- The model NOISEMAP is used to generate noise contour bands around airfields and landing zones (Czech and Plotkin 1998). The model incorporates the aircraft type and number; takeoffs, landings, touch and goes (i.e., aircraft simulates landing on the runway and then taking off), as well as closed patterns (e.g., going around the airfield to land or take off because of noise abatement procedures), and time of operation to depict noise levels.

- The BNOISE2 model calculates and portrays noise contour bands for large caliber weapons (Army 2009). It considers the weapon, ammunition, rounds fired, time of day fired, range size, and direction of both the muzzle and projectile.

### 3.5.1.5 Noise Zones

Typically, noise contour bands are depicted on maps in 5-decibel bands, from 65 decibels to 85 decibels from the noise source. These bands are then grouped into noise zones that are used to identify whether land uses exposed to these noise zones are compatible or incompatible with the level of noise exposure. Some land uses such as residential areas, schools and hospitals are considered more sensitive than others, such as commercial endeavors. People living in residential areas, students in schools, and patients in hospitals are considered sensitive receptors. *Figure 3.5-1* shows potential sensitive noise receptors on Tinian and Saipan.

### 3.5.2 Regulatory Framework

The Noise Control Act of 1972 and U.S. Environmental Protection Agency Guidance provide the regulatory framework used for this noise evaluation. Two programs are used by the U.S. military to address this guidance: (1) the Range Air Installation Compatible Use Zone (Office of the Chief of Naval Operations Instructions 3550.1A) for ground-based and air-to-ground operations within ranges and training areas, and (2) the Air Installation Compatible Use Zone (Office of the Chief of Naval Operations Instructions 11010.36C) for airfield operations (DoN 2008a, 2008b).

These compatible use zone programs help military installations determine noise generated by military training and operations; evaluate how the noise from these operations may impact adjacent communities, sensitive noise receptors, and activities; and assist military planners with assessing existing and proposed land uses on an installation. The U.S. military also provides this information to adjacent communities so if they wish to, they can use it in their planning and zoning decisions.
Figure 3.5-1

Sensitive Noise Receptor Locations – Tinian and Saipan
The results of the two programs are that noise contour bands based on the military activities can be modeled. These bands are then overlaid on land use planning maps to determine land use compatibility within the noise contour bands. Land use compatibility is then determined regarding the noise zone in which the land use is found.

Noise zones are defined as follows:

- **Zone I** (<65 A-weighted/62 C-weighted/87 decibels Peak). This noise zone includes all areas in which day-night average sound levels are less than 65 decibels A-weighted, or 62 decibels C-weighted, or the Peak sound level is below 87 decibels. This noise zone is usually compatible with all types of land use activities (e.g., residential, schools, hospitals, places of worship, commercial). A subset of Zone I is the Land Use Planning Zone contours with noise levels between 57 and 62 decibels C-weighted. These noise levels are compatible with any land use, but land use planners often use this area as a buffer around military ranges. For example, although residential areas would be compatible in these areas, permitting or zoning a high-density apartment complex could invite noise complaints on days of higher than normal range activities.

- **Zone II** (65 to 75 A-weighted / 62 to 70 C-weighted / 87 to 104 Peak). Exposure to noise within this zone is normally considered incompatible with noise-sensitive land uses such as residences, hospitals, schools, and places of worship. Activities such as industrial, transportation, and resource production (e.g., farming, ranching, and mining) are considered compatible within this zone.

- **Zone III** (>75 A-weighted / >70 C-weighted / >104 Peak). Exposure to noise within this zone is considered incompatible with noise-sensitive land uses such as residences, schools, hospitals, places of worship, parks, and playgrounds but compatible with industrial, transportation, and resource production.

Table 3.5-1 lists the noise zones in tabular format, presents the noise levels encompassed within the particular noise zone, and identifies whether sensitive land uses such as homes, schools, hospitals, places of worship are compatible with that zone (Army 2007). Table 3.5-2 provides general land uses and identifies which are typically compatible with particular noise zones.

### Table 3.5-1. Noise Zones and Sensitive Land Use Compatibility

<table>
<thead>
<tr>
<th>Zone</th>
<th>Decibel A-weighted / C-weighted / Peak</th>
<th>Land Use Compatibility Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>&lt;65 / &lt;62 / &lt;87</td>
<td>Compatible</td>
</tr>
<tr>
<td>II</td>
<td>65 to 75 / 62 to 70 / 87 to 104</td>
<td>Normally Incompatible</td>
</tr>
<tr>
<td>III</td>
<td>&gt;75 / &gt;70 / &gt;104</td>
<td>Incompatible</td>
</tr>
</tbody>
</table>

*Note:* Compatibility refers to sensitive land uses such as homes, schools, hospitals, and places of worship.

*Sources:* Army 2007; Army Center for Health Promotion and Preventative Medicine 2009.
Table 3.5-2. General Land Use Compatibility by Noise Zone

<table>
<thead>
<tr>
<th>Noise Zones</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft/Small Caliber (A-weighted)</td>
<td>&lt;65</td>
<td>65-70</td>
<td>70-75</td>
</tr>
<tr>
<td>Large Caliber/Explosives (C-weighted)</td>
<td>&lt;62</td>
<td>62-70</td>
<td>&gt;70</td>
</tr>
<tr>
<td>Percussive Munitions (Peak)</td>
<td>&lt;87</td>
<td>87-104</td>
<td>&gt;104</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Land Use</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes'</td>
</tr>
<tr>
<td>Industrial</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Open/Agricultural</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Recreational</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Residential</td>
<td>Yes</td>
<td>Yes'</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes: ¹Open land acceptable.
²With noise attenuation features.

Sources: Army 2007; Army Center for Health Promotion and Preventative Medicine 2009.

Another guideline used by the military for assessing noise generated by large-caliber and explosive munitions is risk of complaints. This approach uses Peak sound levels within low, moderate, and high ranges for risk of complaints. Table 3.5-3 provides the decibel levels associated with each level for risk of complaint.

Table 3.5-3. Large-caliber Weapons and Explosives

<table>
<thead>
<tr>
<th>Risk of Complaints</th>
<th>Peak Decibel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>&lt; 115</td>
</tr>
<tr>
<td>Moderate</td>
<td>115 – 130</td>
</tr>
<tr>
<td>High</td>
<td>&gt; 130</td>
</tr>
</tbody>
</table>

3.5.3 Methodology

Reports, studies, data sets, and regulations of the federal government and the CNMI government were reviewed and NEPA documents evaluated to define the existing noise environment for Tinian and Pagan. Site visits to Tinian and review of aerial photography of Saipan and Pagan were used to identify points of interest, such as residential areas, schools, and places of natural and cultural importance, for specific noise evaluation. Personal interviews with air traffic control and airspace managers, as well as review of regional flight records yielded information about current operations at Tinian and Saipan International Airports and within the regional CNMI airspace.

3.5.4 Tinian

The current noise environment on Tinian is typical of a rural town or small suburban area. Over half of Tinian’s population resides in San Jose. Other residential areas include Marpo Heights, Marpo Valley, Carolinas Heights, and Carolinas village. All of Tinian’s population resides outside of the Military Lease Area. As of the 2010 U.S. Census, total population was 3,136 people. Schools on Tinian include Tinian Elementary School, Tinian High School, and Northern Marianas College.

Although infrequent, most noise-generating activities stem from existing military aviation, marine, and ground-based training activities primarily occurring in the Military Lease Area once or twice per year. Other noise contributors include civil and commercial aircraft operations at Tinian International Airport, cargo vessel operations at the Port of Tinian, and aircraft activities in regional airspace.
3.5.4.1 Ground-based Military Training Activities

Existing military training consists mostly of infrequent ground-based non-live-fire training and occurs primarily in the Military Lease Area. A limited amount of small arms are employed during training using either simulated munitions or firing live ammunition into steel bullet traps. The small arms firing produces Peak sound levels of 90 to 100 decibels at 500 feet (152 meters) and 80 to 90 decibels at 1,000 feet (305 meters) for the most common types of small arms (5.56 and 7.62 millimeter, and .50 caliber). These activities occur well within the Military Lease Area and noise is imperceptible (undetectable) to populations outside Military Lease Area boundaries. Sound dissipates at the rate of 6 decibels per doubling of the distance from the source. The distance from where the small arms are employed, to the closest population in the village of Marpo Heights, is approximately 4 miles (6 kilometers). At this distance, the noise level reduces to a Peak sound level of 65 decibels (or Noise Zone I), well within the compatibility limits presented in Table 3.5-1.

Small unit field exercises and expeditionary warfare training occurs primarily on the northern portion of the Military Lease Area, including within an expeditionary airfield at North Field. On the southern portion of the Military Lease Area, limited military training primarily consists of reconnaissance exercises. With the maximum noise levels at about 65 decibels, none of these activities generate noise levels exceeding Noise Zone I outside of military boundaries, therefore adjacent land uses are considered compatible. Under current conditions, all of Tinian is considered to be in Noise Zone I, except in the immediate vicinity of the airport.

3.5.4.2 Aircraft and Airspace Activities

3.5.4.2.1 Military Lease Area

North Field (Photo 3.5-1) is an unimproved World War II-era airfield currently used for military vertical and short-field landings as part of existing military training. North Field is occasionally used for other military operations, such as helicopter insertion and extraction of personnel. Pyrotechnics (e.g., flares) are also used during existing training operations occurring throughout the main North Field area. These activities all create noise, as do the small arms and the limited amount of aircraft operations. These activities are infrequent and do not generate perceptible noise levels for populated areas to the south in San Jose or to the north in Saipan. Operations at North Field were evaluated but there are so few operations that the noise contour plotting software (which cannot plot noise levels below 55 decibels) could not be applied. Using the NOISEMAP software model, noise levels fall well below 65 decibels day-night average sound level (or Noise Zone I) and, therefore are considered compatible with all land uses.
3.5.4.2.2 Tinian International Airport

Tinian International Airport, located just south of the Military Lease Area boundary, is a commercial airport that had 49,116 annual flight operations during 2012 (Federal Aviation Administration 2013). Based on the 2014 to 2040 year-over-year growth rate estimated by the Federal Aviation Administration Terminal Area Forecast (Federal Aviation Administration 2013), air traffic operations for Tinian International Airport would not be expected to change (see also Appendix O, Transportation Study). At that time there were four single-engine aircraft and two multi-engine aircraft based at the airport and it has limited airfield services. Single engine air taxi operations by Star Marianas Airlines make up the majority of the operations at Tinian International Airport. Although rare, chartered jets such as Boeing 747 or 767 occasionally fly into and out of the airport.

Although military operations comprise a small proportion of the total annual operations, military jets, such as the FA-18 are about 30 decibels louder than the civilian aircraft operating at Tinian. As such, the noise environment at Tinian International Airport is dominated by the occasional military aircraft when they are operating at the airfield. Figure 3.5-2 shows the baseline noise contours for Tinian International Airport.

Points of interest were identified for a variety of reasons; some are sensitive land uses such as residential areas or schools, others were chosen to portray the general noise environment at that location and represent areas that have a combination of biological, cultural, recreational, or other resource implications. Section 4(f) discussions are presented in Section 4.19, Section 4(f) Evaluation. All sensitive receptors (i.e., homes and schools) are located well away from areas affected by 65 decibel levels or louder. Table 3.5-4 shows the noise levels at representative points of interest under current noise conditions generated by typical civilian aircraft and occasional military operations at Tinian International Airport.

3.5.4.2.3 Saipan International Airport

Saipan International Airport, due to its close proximity to Tinian International Airport is included in the following discussion as it could potentially be impacted by the proposed action. In addition, during scoping the public expressed concern if noise generated in the Military Lease Area would affect southern Saipan. There are 22 aircraft based at Saipan International Airport. Daily aircraft operations average 175, consisting of air taxi/inter-island commercial flights to and from Tinian, Rota, and Guam as well as international commercial airline flights to and from countries such as Japan and China (Air Force 2012). Although there are aircraft operating over the Military Lease Area, these operations are infrequent and are done at approximately 2,100 feet (640 meters) in altitude where noise levels would not exceed 65 decibels day-night average sound level (or Noise Zone I) and are considered compatible with all land uses. Saipan International Airport is unlikely to contribute to the noise environment in residential areas of Tinian, south of the Military Lease Area.

3.5.4.2.4 Airspace

Under baseline conditions, one Special Use Airspace unit (Air Traffic Controlled Assigned Airspace 6) and several airport departure and arrival routes produce aircraft-generated noise around Tinian and Saipan. These levels are negligible and do not perceptibly contribute to the baseline noise environment. These activities do not generate noise levels exceeding 65 decibels day-night average sound level.
Figure 3.5-2
Baseline Noise Contours at Tinian International Airport

Legend
- International Broadcasting Bureau
- Military Lease Area

Tinian Representative Points of Interest:
- T1 Tinian High School
- T2 Lake Hagol
- T3 Mahalang Ephemeral Ponds
- T4 Marpo Heights
- T5 Mount Lasso / Overlook Area
- T6 Bateha 1 - Isolated Wetlands
- T7 Northeast of Marpo Heights
- T8 Bateha 2 - Isolated Wetlands
- T9 San Jose
- T10 San Jose Catholic Church
- T11 Tinian Elementary School
- T12 Unai Chiget
- T13 Unai Chulu
- T14 Unai Dankulo
- T15 Unai Masalok
- T16 North Field National Historic Landmark
- T17 International Broadcasting Bureau
- T18 Old West Field
- T19 Northern Marianas College - Tinian
- T20 Ushi Point
- T21 Native Limestone Forest
- T22 Unai Lam Lam

Tinian International airport

San Jose

NORTH
Table 3.5-4. Baseline Noise Levels at Representative Points of Interest

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Description</th>
<th>Type</th>
<th>Noise Level – A-weighted Day-Night Average Sound Level (decibels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Tinian High School</td>
<td>School</td>
<td>36.7</td>
</tr>
<tr>
<td>T2</td>
<td>Lake Hagoi</td>
<td>Other</td>
<td>44.1</td>
</tr>
<tr>
<td>T3</td>
<td>Mahalang Ephemeral Ponds</td>
<td>Other</td>
<td>39.5</td>
</tr>
<tr>
<td>T4</td>
<td>Marpo Heights</td>
<td>Residential</td>
<td>45.4</td>
</tr>
<tr>
<td>T5</td>
<td>Mount Lasso Overlook Area</td>
<td>Other</td>
<td>40.7</td>
</tr>
<tr>
<td>T6</td>
<td>Bateha 1 - Isolated Wetlands</td>
<td>Other</td>
<td>38.8</td>
</tr>
<tr>
<td>T7</td>
<td>Northeast of Marpo Heights</td>
<td>Residential</td>
<td>48.5</td>
</tr>
<tr>
<td>T8</td>
<td>Bateha 2 - Isolated Wetlands</td>
<td>Other</td>
<td>45.6</td>
</tr>
<tr>
<td>T9</td>
<td>San Jose</td>
<td>Residential</td>
<td>37.3</td>
</tr>
<tr>
<td>T10</td>
<td>San Jose Catholic Church</td>
<td>Church</td>
<td>37.1</td>
</tr>
<tr>
<td>T11</td>
<td>Tinian Elementary School</td>
<td>School</td>
<td>36.9</td>
</tr>
<tr>
<td>T12</td>
<td>Unai Chiget</td>
<td>Other</td>
<td>35.4</td>
</tr>
<tr>
<td>T13</td>
<td>Unai Chulu</td>
<td>Other</td>
<td>44.0</td>
</tr>
<tr>
<td>T14</td>
<td>Unai Dankulo/Long Beach</td>
<td>Other</td>
<td>47.0</td>
</tr>
<tr>
<td>T15</td>
<td>Unai Masalok</td>
<td>Other</td>
<td>48.8</td>
</tr>
<tr>
<td>T16</td>
<td>North Field National Historic Landmark</td>
<td>Other</td>
<td>41.2</td>
</tr>
<tr>
<td>T17</td>
<td>International Broadcasting Bureau</td>
<td>Administrative</td>
<td>41.8</td>
</tr>
<tr>
<td>T18</td>
<td>Old West Field</td>
<td>Other</td>
<td>54.6</td>
</tr>
<tr>
<td>T19</td>
<td>Northern Marianas College - Tinian</td>
<td>School</td>
<td>37.2</td>
</tr>
<tr>
<td>T20</td>
<td>Ushi Point</td>
<td>Other</td>
<td>36.3</td>
</tr>
<tr>
<td>T21</td>
<td>Native Limestone Forest</td>
<td>Other</td>
<td>50.0</td>
</tr>
<tr>
<td>T22</td>
<td>Unai Lam Lam</td>
<td>Other</td>
<td>39.0</td>
</tr>
</tbody>
</table>

Note: Shading indicates that points of interest are within the Military Lease Area.

### 3.5.4.3 Waterborne Activities

Currently, there are occasional Amphibious Assault Vehicle landings at the Port of Tinian. While these operations are rare, their noise levels are temporarily noise levels of 88 A-weighted decibels at 100 feet (30 meters). These noise levels are single events and not an average noise level used for compatibility. While average noise levels exceeding 65 decibels are considered incompatible with sensitive land uses, these areas are at least 1,000 feet (305 meters) from the port. To put it into perspective, at this distance noise levels from an Amphibious Assault Vehicle would be about as loud as two dump trucks operating in the harbor area. Therefore, sensitive land uses are not exposed to incompatible noise levels under baseline conditions. In the waters around Tinian, small fishing and dive boats operate and a cargo vessel makes regular trips between the Saipan and Tinian ports (in 2010, ferryboat operations between Tinian and Saipan ceased operations). Fishing and dive boats, as well as the cargo vessel operations generate noise levels that are low enough to be considered compatible with adjacent land uses.

### 3.5.4.4 Traffic

Roads on Tinian currently experience very light traffic volumes. According to the 2008 CNMI Comprehensive Highway Master Plan, the largest traffic volumes were on Broadway, Canal, and Grand Streets in San Jose with annual daily trips of 1,470, 1,520, and 2,240, respectively (Commonwealth
Department of Public Works 2008). Traffic volume on all other roads, including those in the Military Lease Area and Port of Tinian, is well below 500 daily trips. Traffic volumes this low contribute very little to the noise environment and do not exceed 65 decibels day-night average sound level. Again, all land uses within Noise Zone I are considered compatible.

### 3.5.4.5 Pagan

Currently the noise environment on Pagan is limited to visitors on the northern portion of the island. Man-made noise-generating activities (all-terrain vehicles, generators, and occasional aircraft) are rare and temporary. The only constant noise sources are naturally occurring and include wind, surf, and wildlife. Acoustically, this area would be typical of a rural or wilderness setting with ambient noise levels between 35 and 45 decibels A-weighted (U.S. Environmental Protection Agency 1978). Noise levels of this level cannot be modeled; therefore, no noise contour bands are presented.
3.6 AIRSPACE

Section 3.6 describes the current condition of the airspace surrounding the islands of Tinian and Pagan as well as the airspace approaches to Saipan International Airport on the island of Saipan. This information is derived from Appendix I, *Airspace Technical Memo*, which can be referred to for more details on this resource. In the U.S. and its territories, domestic airspace includes airspace overland to 12 nautical miles (22 kilometers) miles from the shoreline. The proposed Special Use Airspace associated with this action would lie entirely within the Oakland Flight Information Region. International airspace begins 12 nautical miles (22 kilometers) from the shoreline and is controlled based on International Civil Aviation Organization regulations. The International Civil Aviation Organization codifies the principles and techniques of international air navigation and fosters the planning and development of international air transportation to ensure safe and orderly growth. The U.S. is one of 191 member states belonging to the International Civil Aviation Organization. They have been delegated as the Air Navigation Service Provider for the airspace associated with the CNMI (Federal Aviation Administration 2014a, *Oakland Oceanic Controlled Airspace/Flight Information Region*). The Range and Training Areas under the proposed action includes both domestic and international airspace. Therefore, the Federal Aviation Administration has both special expertise and jurisdiction by law for both the domestic and international airspace associated with this proposed action.

In accordance with the *Memorandum of Understanding between the Federal Aviation Administration and the Department of Defense Concerning Environmental Review of Special Use Airspace Actions* (Federal Aviation Administration and the Department of Defense 2005), the Federal Aviation Administration is a cooperating agency for this EIS/OEIS to ensure that planning and decision making are conducted efficiently and effectively and without duplication of effort. The Federal Aviation Administration is responsible for evaluating, processing and charting airspace changes. They are represented by the Federal Aviation Administration Western Service Area (Renton, Washington) which provides guidance and control of U.S. territory airspace in the Pacific that includes the CNMI.

The region of influence for the proposed action is the airspace where the U.S. military proposes to operate aircraft and conduct live-fire training, and the airspace associated with the airports in the vicinity of the proposed airspace, to include Saipan. The region of influence includes the airspace associated with the proposed flight and live-fire training, including air-to-ground, sea-to-surface, and ground-based weapons training. The region of influence encompasses:

- The airspace supporting flights to and from Tinian International Airport, Saipan International Airport, and the Pagan airfield.
- Airspace within a 12-nautical mile (22-kilometer) boundary of Tinian’s shore (see Chapter 2, *Proposed Action and Alternatives*).
- Airspace (domestic and international) within a 60-nautical mile (111-kilometer) by 80-nautical mile (148-kilometer) area surrounding Pagan (see Chapter 2, *Proposed Action and Alternatives*).
- The portions of the airspace associated with published aviation routes and other organized track system routes.
Other Special Use Airspace in the region would not be expected to have cumulative impacts with the proposed action. Therefore, the analysis does not include the following:

- **Air Traffic Control Assigned Airspaces 1, 2 and 5 and Warning Area 517** would not be expected to have a cumulative effect with the proposed action as civilian aircraft needing access to this airspace are en route to and from Guam International Airport from locations south and east of the island. Therefore, Air Traffic Control Assigned Airspaces 1, 2 and 5 and Warning Area 517 are not included in the region of influence.

- **Military Training Route Instrument Route 983** is aligned west of Tinian. It begins at a point northwest of Saipan and extends to an end point southwest of Guam. With two exceptions, the route is 8-nautical miles (15-kilometers) wide and extends from the surface to below 10,000 feet (3,048 meters) MSL. A portion of Instrument Route 983 is located approximately 8 nautical miles (15 kilometers) from Tinian. Instrument Route 983 is seldom used and was only scheduled for use four to six times in the past 3 to 4 years (Lt. Burkland W., Navy, June 2014). Due to the low usage, cumulative impacts resulting from use of Instrument Route 983 are dismissed from detailed analysis.

### 3.6.1 Definition

Airspace is a three-dimensional (i.e., latitude, longitude, and altitude) resource that is managed and controlled in the U.S. and its territories by the Federal Aviation Administration. The management of airspace and air traffic control consists of the direction, control, and coordination of flight operations in the “navigable airspace.” Navigable airspace consists of airspace above the minimum altitudes of flight prescribed by regulations under U.S. Code Title 49, Subtitle VII, Part A. It includes the airspace needed to ensure safety of flight, including airspace needed for aircraft departures and arrivals (49 U.S. Code § 40102), the airspace needed for military training, and other special uses. The Federal Aviation Administration considers how navigable airspace is designated, used, and administered to best accommodate the individual and common needs of military, commercial, and general aviation. The management and use of airspace is important for many reasons including economic, transportation, recreation, and national defense.

The terminology and classification system used to characterize airspace is complex, but the following are key concepts required to understand the resource because they contain the basic set of rules used by aircraft operators flying in the region of influence (Federal Aviation Administration 2014b).

- **Above Ground Level:** Altitude expressed in feet measured above the ground surface.
- **Mean Sea Level:** Altitude expressed in feet measured above average (mean) sea level.
- **Visual Flight Rules:** A standard set of rules that all pilots, both civilian and military, must follow when not operating under instrument flight rules and in visual meteorological (weather) conditions. These rules require that pilots remain clear of clouds and avoid other aircraft.
- **Instrument Flight Rules:** A standard set of rules that all pilots, civilian and military, must follow when operating under flight conditions that are more stringent than visual flight rules. These conditions include operating an aircraft in clouds, operating above certain altitudes prescribed by Federal Aviation Administration regulations, and operating in some locations such as major civilian airports. Air traffic control agencies ensure separation of all aircraft operating under instrument flight rules.
There are two categories of airspace: regulatory (rulemaking) and other than regulatory (non-rulemaking). Regulatory airspace includes six airspace classifications, namely A, B, C, D, E, [no F], and G, and two types of Special Use Airspace: prohibited areas and restricted areas. Instances where the Federal Aviation Administration would establish new restricted areas are rulemaking actions because they require change to an existing Federal Aviation Administration regulation. Title 14 of the Code of Federal Regulations (14 CFR), Aeronautics and Space, contains rules issued by the FAA governing all civil aviation in the United States.

Classes A, B, C, D and E are controlled airspace, within which all aircraft operators are subject to certain pilot qualifications, operating rules and equipment requirements identified in 14 CFR Part 91, General Operating and Flight Rules. Figure 3.6-1 is a conceptual representation of the controlled classes relative to each other. It shows the maximum altitude of the various classes. Each class has specific navigational requirements that must be met for a pilot to enter safely. See Appendix I, Airspace Technical Memo, for a summary of these requirements by class. Class G is airspace that is not A, B, C, D, or E and is described as uncontrolled airspace.

Non-regulatory airspace includes five types of Special Use Airspace: (1) military operations areas, (2) warning areas, (3) alert areas, (4) controlled firing areas, and (5) national security areas. Military operations areas and warning areas are established through the Federal Aviation Administration as non-rule making actions.

Special use airspace is airspace with defined dimensions where activities must be confined because of their nature, or where limitations may be imposed on aircraft operations that are not a part of those activities (Figure 3.6-2).

Types of Special Use Airspace needed for military training activities and relevant to this EIS/OEIS are described below. (See Appendix I, Airspace Technical Memo, for the legal definition for each airspace type as contained in Federal Aviation Order 7400.2J).

- **Restricted areas** are airspace established under 14 CFR part 73 provisions, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Airspace designated as a restricted area denotes the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Entering a restricted area without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. Restricted areas are published in the Federal Register and constitute 14 CFR Part 73.

- **Military operations area** is airspace below 18,000 feet (5,486 meters) MSL that separates military activities from instrument flight rule traffic. It also informs pilots flying under visual flight rules of where these activities are conducted.

- **Warning areas** are areas of defined dimensions extending from 3 nautical miles (6 kilometers) outward from the coast of the U.S. and extend outward over international waters. Warning areas are designated to contain activity that may be hazardous to nonparticipating aircraft. These areas may be considered for joint use with commercial aircraft if: (1) control can be shifted to the Federal Aviation Administration during times when it is not required for military use, and (2) they are located in airspace under civilian air traffic control authority.
Figure 3.6-1  
Cross Section of Airspace Classes and Relationships

Notes:  
MSL - Mean Sea Level  
AGL - Above Ground Level  
ft - feet

- Saipan International Airport is located within Class D airspace and extended by Class E airspace.
- Tinian International Airport is located within Class G airspace with a restricted area floor that extends into their Class E airspace.
- Pagan Airfield is located within Class G airspace.
Air Traffic Control Assigned Airspace is assigned by Air Traffic Control when requested, to segregate military air traffic and activities from other aircraft using Instrument Flight Rules.

A Restricted Area denotes the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Entering these areas without authorization from the using or controlling agency is prohibited.

A Military Training Route is a flight corridor used by the U.S. military to practice high-speed, low altitude flight, generally below 10,000 feet (3,048 meters) MSL.

A Military Operations Area is airspace below 18,000 feet (5,486 meters) MSL that separates military activities from Instrument Flight Rule traffic. It also informs pilots flying Visual Flight Rule traffic of where these activities are conducted.

A Warning Area is airspace of defined dimensions that begins 3 nautical miles (11 kilometers) from the shoreline and extends outward into international waters. This type of airspace contains activity that may be hazardous to non-participating aircraft and used to warn non-participating pilots of potential danger.

For illustrative purposes only; airspace may not exist in the CNMI
Air Traffic Control Assigned Airspace is not considered Special Use Airspace but is used to extend the vertical limits of Special Use Airspace. Air Traffic Control Assigned Airspace has defined vertical and lateral limits, and is assigned by the Air Traffic Control facility responsible for the airspace to provide air traffic separation between the specified activities being conducted within the assigned airspace and other air traffic flying under instrument flight rules. Air Traffic Control Assigned Airspace is established through Letters of Agreement between the Department of Defense and Federal Aviation Administration.

Other airspace such as Classes A, B, C, D, E and Air Traffic Control Assigned Airspace are also needed to support Department of Defense military operations. Definitions for each of these classes of airspace can be found in Appendix I, *Airspace Technical Memo*.

Aeronautical charts also show aviation routes used by aircraft transiting between destinations. Airways are scheduled for use during flight planning and managed by an Air Route Traffic Control Center to ensure aircraft are safely separated from each other while en route to and from their destinations. The federal airway system allows the Federal Aviation Administration to effectively manage the airspace and ensure the safety of all users of the airspace. Additionally, aeronautical charts show airspace obstructions (e.g., communication towers and antennae). The obstructions often require lighting to ensure flight safety of aircraft operating at lower altitudes. In addition to aeronautical charts, there are published standardized procedures used to control aircraft arrivals and departures for many public airports. Air traffic controllers use the standardized procedures to ensure the flight safety of arrivals and departures to the runways. For example, during inclement weather conditions, pilots rely on instruments within their aircraft and navigational aids to land their aircraft safely based on instructions provided by the local air traffic control facility. These approach and departure procedures prescribe the correct altitudes and headings to be flown and procedures for missed approach, as well as obstacles, terrain, and potentially conflicting airspace. Appendix I, *Airspace Technical Memo*, contains detailed information regarding the published approaches for Tinian and Saipan International Airports.

### 3.6.2 Regulatory Framework

The International Civil Aviation Organization is responsible for codifying the principles and techniques of international air navigation and fostering the planning and development of international air transportation to ensure safe and orderly growth. In accordance with Executive Order 10854, *Extension of the Application of the Federal Aviation Act of 1958*, both rulemaking and non-rulemaking actions that encompass airspace outside of the U.S. sovereign airspace (e.g., beyond 12 nautical miles [22 kilometers] from the U.S. coast line) require coordination with the Department of Defense and Department of State. All Executive Order 10854 coordination must be conducted at the Federal Aviation Administration headquarters level by the Airspace Regulations and Air Traffic Control Procedures Group (Federal Aviation Administration 2014c, Section 2). The Federal Aviation Administration’s Western Service Area has jurisdiction for international airspace associated with this proposed action and is responsible for obtaining airspace coordination with the International Civil Aviation Organization for this proposed action.

The Federal Aviation Administration has the overall responsibility for matters involving the use of navigable airspace and handles airspace matters in accordance with Federal Aviation Administration Order JO 7400.2K, *Procedures for Handling Airspace Matters* (Federal Aviation Administration 2014c). The Federal Aviation Administration has the same requirements under NEPA as the U.S. military (Federal
Aviation Administration Order 1050.1E, *Environmental Impacts: Policies and Procedures* (Federal Aviation Administration 2006a) and Federal Aviation Administration Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* (Federal Aviation Administration 2006b). To meet their NEPA requirements, the Federal Aviation Administration may adopt the EIS/OEIS prepared by the Department of Defense provided they independently evaluate the information in the document and take full responsibility for the scope and content that addresses Federal Aviation Administration actions. Federal Aviation Administration headquarters has the final approval authority for all permanent and temporary Special Use Airspace except controlled firing areas and must issue its own Record of Decision (Federal Aviation Administration Order 1050.1E, paragraphs 404d and 518h).

The Federal Aviation Administration controls airspace through policies and procedures designed to ensure safe and efficient use of the airspace by all users. Like the highway system and traffic laws, Federal Aviation Administration and International Civil Aviation Organization rules govern the Airspace System and regulations to establish how and where aircraft may fly. Collectively, the Federal Aviation Administration uses these rules and regulations to make airspace use as safe, effective, and compatible as possible for all types of aircraft, from private propeller-driven planes to large, high-speed commercial and military jets.

The U.S. military requests airspace from the Federal Aviation Administration and schedules and uses airspace in accordance with the processes and procedures detailed in Department of Defense Directive 5030.19, *DoD Responsibilities on Federal Aviation*, and Federal Aviation Administration regulations (DoN 2013a). When new airspace is needed to support military training, the U.S. military works closely with the Federal Aviation Administration to ensure the needs of all users of the airspace are met.

### 3.6.3 Methodology

Information used to characterize the existing environment was obtained from current and in-progress environmental analyses, data from the Federal Aviation Administration, commercial and other civilian aircraft traffic data, local airport reported data, existing military usage, and responsibilities and procedures for utilization of existing Special Use Airspace and Air Traffic Control Assigned Airspace. Additional detailed information is included in Appendix I, *Airspace Technical Memo*. Information regarding obstructions with the potential of interfering with flight safety during military training activity was also identified.

### 3.6.4 Tinian

The airspace surrounding Tinian is within the Federal Aviation Administration’s Guam Combined Center/Radar Approach Control Flight Information Region. Radar services are provided to high altitude aircraft operating on instrument flight rule plans en route to, transiting through, and arriving at or departing from the airports within its service area. For Tinian, air traffic control services are provided at altitudes above 3,500 feet (1,100 meters) MSL by Guam Combined Radar/Approach Control. Air traffic services for aircraft en route to and from Saipan International Airport and below 3,500 feet (1,100 meters) are provided by Saipan Air Traffic Control. Air traffic control services are not available below 2,000 feet MSL (610 meters) for aircraft arriving and departing Tinian International Airport. All three airfields (Tinian International Airport, North Field, and Saipan International Airport) require access to the
airspace within 12 nautical miles (22 kilometers) of Tinian for approaches and departures. Tinian International Airport and Saipan International Airport are used by commercial, private and military aircraft. North Field is used exclusively by the military (see Figure 3.6-2). There are no published approaches to North Field.

### 3.6.4.1 Tinian International Airport

Tinian International Airport has one runway that supports departures and arrivals in two directions; east (Runway 08) and west (Runway 26). Approximately 85% of arrivals and departures to Tinian International Airport come from the west and head to the east while only 15% comes from the east and heads to the west (Natasha Morgan, Tinian International Airport, personal communication, January 2014).

Tinian International Airport is equipped with a navigational light system that includes runway edge lights and runway end identifier lights. Additionally the airport has a Precision Approach Path Indicator with lights visible from about 5 nautical miles (9.26 kilometers) during the day and up to 20 nautical miles (37.04 kilometers) at night. There are no additional navigational aids, air traffic control towers, or air traffic control services. Aircraft arrivals and departures use visual flight rules and occur on a first come, first serve basis with pilots notifying each other of their intentions via the common traffic advisory frequency. The Guam Combined Center/Radar Approach Control provides air traffic control services for military flights en route to and from the Tinian International Airport beginning and ending at 3,500 feet (1,066 meters) MSL above Tinian. There are three published approaches to Tinian International Airport (Skyvector 2013): Tinian Area Navigation Global Position System, Tinian Area Navigation, and Tinian Non-Directional Beacon. For a detailed description of these approaches refer to Appendix I, Airspace Technical Memo.

Flights between Saipan and Tinian take place within the Saipan/Tinian Class E airspace and generally remain under 3,000 feet (914 meters) MSL. Charter flights which comprise 99% of Tinian International Airport operations fly using visual flight rules on a route similar to the commuter route depicted in Figure 3.6-3. It is the primary flight path for aircraft transiting between Saipan and Tinian (also see Section 3.6.4.5, Commercial Aviation Routes).

There are currently no scheduled flights into or out of the Tinian International Airport, and no commercial airlines offer international flights directly to Tinian. Flight operations generally consist of private aircraft, unscheduled charter flights available through Star Marianas, and military aircraft. The use of the Tinian International Airport by military aircraft requires prior coordination and approval with the CNMI Commonwealth Ports Authority and the Federal Aviation Administration (DoN 2013b).

As shown in Figure 3.6-4, there were 49,116 operations reported by Tinian International Airport in 2013. An operation is counted each time an aircraft lands or departs a runway. Operations are reported based on 365 flying days each year. This results in an approximately 134 operations on an average annual day (67 departures and 67 arrivals).
Figure 3.6-3
Commuter Flight Routes

Legend

- Current Flight Route - Runway 07/08 In Use
- Current Flight Route - Runway 25/26 In Use
- Notional Depiction (routes may vary)

Tinian International Airport
North Field
Tinian International Airport
Saipan International Airport

Philippine Sea
Pacific Ocean

0 2 4 1 Nautical Miles
0 2 4 1 Kilometers

NORTH

3-65
3.6.4.2 Tinian North Field

Tinian North Field lies within the northern portion of the Military Lease Area and beneath Saipan International Airport’s Class E airspace and approach corridors to Runway 07.

Approaches, departures, and training operations at North Field are within Saipan International Airport’s Class E airspace and managed by Saipan Air Traffic Control. Military aircraft operating at North Field are required to maintain radio communication with Saipan Air Traffic Control.

Military fixed wing and helicopter training activities include airlift of personnel and cargo drops into the Military Lease Area and North Field approximately 100 times per year (DoN 2013c). Helicopters operating over Lake Hagoi typically are required to maintain a minimum altitude of 1,000 feet (305 meters) above ground level during training exercises. Helicopter overflights are also restricted over the Mahalang ephemeral ponds and the Bateha sites (DoN 2013b).

3.6.4.3 Saipan International Airport

The Saipan International Airport has one runway that supports departures and arrivals in two directions, northeast (Runway 07) and southwest (Runway 25). A departure on Runway 07 would be heading northeast with a compass heading of 070 and a departure on Runway 25 would be heading southwest with a compass heading of 250. Arrivals to Runway 07 would be approaching from the southwest and arrivals to Runway 25 would be approaching from the northeast. Approximately 85% of arrivals and departures to Saipan International Airport come from the west and head east while only 15% comes from the east and heads to the west (Air Force 2012).
Saipan International Airport lies within the Guam Combined Center/Radar Approach Control. The Combined Center/Radar Approach Control is responsible for air traffic control of aircraft operations outside of the airport’s Class D and E airspace. Saipan Air Traffic Control is responsible for the separation and movement of aircraft within their Class D and E airspace (Figure 3.6-5). The Class D airspace encompasses a 4.3-mile (6.9-kilometer) radius and stretches from the surface to 2,700 feet (823 meters) above ground level. Class E airspace extends the Class D to 7.4 miles (11.9 kilometers) west of Saipan and 6.5 miles (10.5 kilometers) east of Saipan. Prior to entering this Class D and E airspace, all pilots are required to establish and maintain radio communications with Saipan Air Traffic Control.

Saipan International Airport has two navigational aids, a non-directional beacon, and an instrument landing system. There are no obstructions identified for air traffic using Saipan International Airport. However, as a noise abatement procedure pilots are required to climb straight out until they reach an altitude of 1,600 feet (488 meters) before they are permitted to turn. Refer to Appendix I, Airspace Technical Memo, for a detailed description of the following procedures for Saipan International Airport:

- Saipan Instrument Landing System or Localizer /Distance Measuring Equipment Runway 07
- Saipan Non-directional Beacon /Distance Measuring Equipment Runway 07
- Saipan Non-directional Beacon/Distance Measuring Equipment Runway 25

![Figure 3.6-5 Tinian and Saipan Regional Airspace](image-url)
Saipan International Airport provides services for seven major airlines (Asiana, China Eastern, Delta, Fly Guam, Shanghai, Sichuan, KLM, and United/Cape Air) and the Star Marianas charter/air taxi service. Major airlines have scheduled direct flights to Saipan from Guam, Korea, Japan, China, and Hong Kong. Star Marianas offers on-demand chartered air taxi service from Saipan to Tinian and Rota using single- and twin-engine aircraft. Between March 31, 2012 and March 31, 2013, there were 64,028 operations reported for Saipan International Airport (Figure 3.6-6). The airport is open 365 days per year generating approximately 176 operations (88 arrivals and 88 departures) on an average annual day. There are approximately nine scheduled daily international flights. Major airlines scheduled arrivals occur between the hours of 1:00 a.m. and 9:00 a.m. local time with the majority arriving before 5:00 a.m. Departures occur between the hours of 2:00 a.m. and 6:00 p.m. with approximately half occurring before 6:00 a.m. (FlightStats 2014). Saipan International Airport is designated as the commercial aviation divert airfield location for eastbound flights originating in western Asia and for all flights in-bound to Guam in the event that they cannot land at their original scheduled destination.

![Annual Operations at Saipan International Airport](image)

Source: Federal Aviation Administration 2013.

**Figure 3.6-6** Annual Operations at Saipan International Airport

### 3.6.4.4 Airspace Designated for Military Use

*Figure 3.6-7* illustrates the regional airspace currently available for military training.
Figure 3.6-7
Existing Mariana Islands Airspace
Designated for Military Use

Source: DoN 2013b
Joint Region Marianas is designated as the scheduling and using agency for Restricted Area 7201 (Farallon de Medinilla). They are also responsible for coordinating use of Air Traffic Control Assigned Airspaces 3A, 3B, 3C, and 6 with the Federal Aviation Administration. The Guam Combined Center/Radar Approach Control is designated the controlling agency (DoN 2013b).

Air Traffic Control Assigned Airspace 6 lies directly over Tinian and Saipan and has a floor of 39,000 feet (11,877 meters) MSL and a ceiling of 41,000 feet (12,497 meters) MSL. Air Traffic Control Assigned Airspace 3A/B/C lies within 30 nautical miles (56 kilometers) of Tinian with a floor at the surface and a ceiling of 30,000 feet (9,144 meters) MSL. Use of Air Traffic Control Assigned Airspace requires at least one aircraft to continuously monitor the appropriate Guam Combined Center/Radar Approach Control frequency for immediate recall of the altitude/airspace as needed (DoN 2013c). Joint Region Marianas is the DoN-led command that provides scheduling and control of activities within the Air Traffic Control Assigned Airspace. The Federal Aviation Administration issues a Notice to Airmen at least 72 hours prior to military activity in the Air Traffic Control Assigned Airspace 3 A/B/C. Table 3.6-1 presents current use of Air Traffic Control Assigned Airspace in the region of influence.

<table>
<thead>
<tr>
<th>Airspace</th>
<th>Annual # of Days</th>
<th>Annual Hours Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATCAA 3A</td>
<td>160</td>
<td>1,440</td>
</tr>
<tr>
<td>ATCAA 3B</td>
<td>157</td>
<td>1,417</td>
</tr>
<tr>
<td>ATCAA 3C</td>
<td>111</td>
<td>1,109</td>
</tr>
<tr>
<td>ATCAA 6</td>
<td>61</td>
<td>381</td>
</tr>
</tbody>
</table>

Source: DoN 2011, Table 3-2. ATCAA = Air Traffic Control Assigned Airspace.

Restricted Area 7201 is located within 50 nautical miles (93 kilometers) of Tinian and is activated by a Notice to Airmen. Altitude limits span from the surface to infinity. This restricted area (7201) is located within Air Traffic Control Assigned Airspace 3A and would not directly interact with the proposed airspace. Additionally, the Federal Aviation Administration completed a feasibility assessment in 2011 and found that activation of Restricted Area 7201 would not conflict with any air traffic service routes (DoN 2013c). Therefore, Restricted Area 7201 is dismissed from further analysis in Chapter 4. Detailed information on Restricted Area 7201 is located in the Mariana Islands Range Complex Airspace EA/OEA (DoN 2013c), which is hereby incorporated by reference.

### 3.6.4.5 Commercial Aviation Routes

There is no published commercial route for aircraft transitioning between Tinian and Saipan International Airports. As shown in Figure 3.6-3, commuter and private flights to and from Saipan and Tinian International Airports fly the shortest route possible and limit time over water to the extent practicable. The current route takes those flights directly over the Military Lease Area. Although not published, it is the primary flight route for aircraft transiting between Saipan and Tinian. Figure 3.6-4 presents the annual air taxi and general aviation operations that would be expected to use this flight route.
As shown in Figure 3.6-8 several commercial routes lie within close proximity of Tinian. Additional routes that traverse the Pacific are not charted but are based on the Federal Aviation Administration’s Pacific Organized Track System to provide fuel-efficient routes for long-distance, transpacific flights. These routes are currently adjusted every 12 hours in response to upper-level wind conditions and adjustments necessary to route around active airspace would not be expected to impact these commercial routes.

The Federal Aviation Administration completed an air traffic analysis over a 7-day period from September 16 to 22, 2012, for instrument flight rules traffic within the Guam Combined Center/Radar Approach Control airspace that included operations within the vicinity of Air Traffic Control Assigned Airspace 3A, 3B, and 3C. The study identified a total of 62 commercial tracks that occurred on or parallel to aviation route G205 along the far western edge or northwest corner of Air Traffic Control Assigned Airspace 3A, and a total of 28 tracks that occurred within Air Traffic Control Assigned Areas 3B and 3C, eight of which occurred between 10:00 p.m. and 2:00 a.m. local time (DoN 2013c).

### 3.6.4.6 Airspace Obstructions

The International Broadcasting Bureau facility (Photo 3.6-1) is located on Tinian, on the western side of the Military Lease Area. The facility has an antenna array that includes five high/low band pairs of antennas, one mid band antenna, and two low band antennas for a total of 13 curtain antennae. Each antenna comprises two vertical steel towers between 150 and 400 feet (46 to 122 meters) tall with a curtain of horizontal and vertical cables hung between the towers of the same height (DoN 2010). All aircraft need to avoid these obstacles to prevent collision. Additionally, aircraft equipped with flight control or mission-critical electronic systems are vulnerable to the electromagnetic emissions from the relay station and are advised to avoid potential interference with aircraft control.
Regional Airports and Commercial Aviation Routes

Source: DoN 2013b

Legend

- Guam
- CNMI
- Aviation Route

Figure 3.6-8

Andersen Airforce Base
Guam Won Pat International Airport

0 10 20 40 Nautical Miles
0 10 20 40 Kilometers

3-72
3.6.5 Pagan

Several elements within the Pagan region of influence are discussed to describe the current use of the airspace being proposed for military use.

The Pagan airfield is a 1,500 foot (300 meter) grass runway (Runway 11/29) considered closed indefinitely by Federal Aviation Administration as a result of volcanic activity in 1981. See Section 3.13.5.1, Air Transportation, for additional discussion of the Pagan airfield. The Pagan airfield is located within Class G airspace with no air traffic control services available for aircraft using the Pagan airfield. All aircraft must fly using visual flight rules. The closest airport with instrument approaches is the Saipan International Airport, about 180 nautical miles (333 kilometers) to the south. Pagan airfield is considered the lifeline for homesteaders on other northern islands of the CNMI and limited charter and general aviation operations occur for visitors to the island. Recently, passengers traveling to Pagan have been primarily federal and local government officials, including personnel from the U.S. Fish and Wildlife Service, the U.S. Geological Survey, the U.S. military, the Northern Islands Mayor’s Office, and other local government agencies. The most current record of operations was found in the 2008 Pagan Airstrip Master Plan (Commonwealth Ports Authority 2008). It reported 10 to 24 annual operations from 2004 to 2007 by chartered helicopter (Bell 206) and fixed-wing aircraft (Cessna) (see also Appendix O, Transportation Study). Most of the flights, whether by helicopter or fixed-wing aircraft, have carried the maximum load of four passengers and the pilot (Commonwealth Ports Authority 2008).

The airspace surrounding Pagan is within the Federal Aviation Administration’s Seattle Flight Information Region. The Oakland Air Route Traffic Control Center provides radar services to high-altitude aircraft operating on instrument flight rules flight plans and is responsible for controlling aircraft en route to, transiting within, and arriving at or departing from the airports within its service area.

3.6.5.1 Airspace Designated for Military Use

The closest military use airspace to Pagan is Air Traffic Control Assigned Airspace 3A. Its northern border lies approximately 60 nautical miles (111 kilometers) south of Pagan (see Appendix I, Airspace Technical Memo).

3.6.5.2 Aviation Routes

There are two published transpacific aviation routes located within 60 nautical miles (111 kilometers) of Pagan (see Figure 3.6-8) that are scheduled for use during flight planning. Their use is controlled by the Federal Aviation Administration to ensure aircraft are safely separated from each other while en route to and from their destinations. Aircraft typically fly at altitudes at or above 30,000 feet (9,144 meters). A337 lies about 23 nautical miles (43 kilometers) to the east and G205 is located approximately 40 nautical miles (74 kilometers) to the west. Operations on these aviation routes and in the vicinity of Pagan are within the Federal Aviation Administration’s Western Service Area’s Oakland Flight Information Region and controlled by the Seattle Air Route Traffic Control Center. Aircraft originating from the south and using these routes would transition from the Guam Combined Center/Radar Approach Control area to the Oakland Oceanic Control Area and then to the Fukuoka Oceanic Control area at a point north of the proposed Warning Area 14. Aircraft originating from the north transition in the opposite direction. The Federal Aviation Administration-completed air traffic analysis included
operations along aviation routes G205 and A337 for a 7-day period in September 2012. The analysis found a total of 62 commercial tracks occurred on or parallel to aviation route G205 and 10 civilian/commercial tracks on or parallel to route A337 (DoN 2013c).

3.6.5.3 Airspace Obstructions

There are no published obstructions to airspace on Pagan; however, the Federal Aviation Administration could publish temporary flight restrictions as a result of volcanic activity on the island. Temporary flight restrictions are published through the Notices to Airmen process.
3.7 **LAND AND SUBMERGED LAND USE**

Section 3.7 provides a summary of existing and planned land use, including submerged lands, on and adjacent to Tinian and Pagan. The region of influence includes the land of Tinian and Pagan, and their associated submerged lands, which are defined as areas within 3 nautical miles (5 kilometers) of the mean high tide line. The southern portion of Saipan is also included because of its proximity to Tinian, and potential for impacts (i.e., noise) from the proposed action. The region of influence is shown on Figure 3.7-1. The following discussion includes civilian and military land uses, as well as planning guidance that directs future development.

### 3.7.1 Definition

Land use includes natural and man-made activities occurring or planned on land and submerged land (within 3 nautical miles [5 kilometers] from shore). There are four key components to this land use discussion:

1. **Jurisdictional Control of Land.** There are a broad variety of contract types for control of land ownership. Real estate contracts include unencumbered deeds, long-term lease agreements, temporary easements, rights-of-way, assignments of custody and control, and a host of other types of contracts. In an effort to simplify the nomenclature for this section, all the various types of land controls are referred to as ownership and/or management, and include “jurisdictional control.” For example, the Military Lease Area is owned by the CNMI government, but leased to the Department of Defense, giving them jurisdictional control over the Military Lease Area (within the confines and stipulations of the lease agreement).

2. **Jurisdictional Control of Submerged Land.** Submerged land(s) refers to a special condition of jurisdictional control that is related to the “land beneath navigable waters.” Generally, this is considered those lands between the low and high-tide line and out to 3 nautical miles (5 kilometers) from the jurisdictional (mean high tide) line of the state, as outlined in the Conveyance of Submerged Lands to Territories (48 U.S. Code Chapter 15). This Act establishes the federal law that recognizes the rights of coastal states to jurisdictional authority over their coastlines and territorial waters. This authority is often referred to as the “jurisdictional waters.” While this Act provides jurisdictional authority for submerged lands to the states, the U.S. Federal Branch (i.e. Department of Defense) still reserves executive privilege to supersede the state’s authority, particularly when it concerns issues of national security or public safety. Jurisdictional authority of submerged lands for CNMI falls under the purview of the CNMI Bureau of Environmental and Coastal Quality. However, this is not applicable to those submerged lands adjacent to the Military Lease Area on Tinian as they are under the jurisdictional control of the U.S. government. The submerged lands around Pagan are within the jurisdictional control of the CNMI government (i.e., the CNMI Bureau of Environmental and Coastal Quality).
Figure 3.7-1
Region of Influence for Land and Submerged Land Use

Legend
- Submerged Lands (CNMI)
- Submerged Lands (US Leased)
- Military Lease Area

Data Sources: DoN 2010, U.S. 2014
3. **Current and Planned Uses of Land.** Existing and planned land uses are typically documented in community or government land use plans, which are intended to represent the community’s vision for land use development. The plans acknowledge that there are competing land uses and that these land uses are not necessarily compatible. Areas or zones are designated for a specific land use to provide adequate physical distance between incompatible land uses. There are also lands that are regulated or reserved for a specific use, such as cultural resource preservation or natural resource protection. These land use areas are often identified on government land use plans and maps. The CNMI Department of Public Lands is the primary land use planning agency for Tinian and Pagan as there are no local government island-specific zoning boards. Saipan has a Zoning Board at the local government level.

4. **Current and Planned Uses of Submerged Land.** Submerged lands in the CNMI are regulated by the CNMI Bureau of Environmental and Coastal Quality. This agency is responsible for meeting the requirements of the Coastal Zone Management Act. The coastal zone includes all non-federal lands and submerged lands out to a distance of 3 nautical miles (5 kilometers) of the mean high tide line. The CNMI Coastal Resources Management Program defines the area subject to its provisions as the entire land area comprising the 14-island archipelago and the adjoining waters contiguous to each island seaward the extent of 3 geographic miles (5 kilometers), with the exception of the island of Farallon de Medinilla, which is used by the U.S. Department of Defense as a target area (National Oceanic and Atmospheric Administration 1980). For the purposes of the Coastal Zone Management Act, long-term leases are considered to be federal lands. The U.S. has jurisdiction of the submerged lands off of U.S.-leased land areas, including Tinian Military Lease Area. The Coastal Resources Management Program also identifies Areas of Particular Concern, which require that any work done within these areas would require a valid coastal permit (CNMI Coastal Resources Management Office 2014).

### 3.7.2 Regulatory Framework

The regulations governing land use and submerged land use are briefly summarized below. A complete listing of applicable regulations is provided in Appendix E, *Applicable Federal and Local Regulations*.

#### 3.7.2.1 Federal Regulations
- Coastal Zone Management Act
- Territorial Submerged Lands Act as amended (Senate Bill 256 and Presidential Proclamation)

#### 3.7.2.2 CNMI Regulations
- **CNMI Constitution — Article XI: Public Lands.** Article XI of the CNMI Constitution states that public lands collectively belong to the people of the CNMI who are of Northern Marianas decent. A person of Northern Marianas descent is someone who is a citizen or national of the U.S. and who is at least one-quarter Northern Marianas Chamorro or Northern Marianas Carolinian, or a combination thereof. The CNMI Department of Public Lands is the official government agency responsible for the administration and disposition of public lands. These public lands are available for commercial lease.
- **Public Law 16-50 Homestead Law.** See Section 3.7.3.3, *The CNMI Homestead Program.*
3.7.2.3 U.S.-CNMI Covenant and Lease Agreements

As summarized in Section 1.4, The Mariana Islands, the CNMI was integrated into the U.S. as a result of The Covenant to Establish a Commonwealth of the Northern Mariana Islands in Political Union with the United States of America, (The 1976 Covenant) which was signed by U.S. and CNMI representatives on February 15, 1975. Certain land areas on Tinian were “made available to the U.S. by lease to enable it to carry out its defense responsibilities” (Northern Mariana Islands 1975a; see Section 1.4.2, Commonwealth of the Northern Mariana Islands Military Lease Area).

The 1976 Covenant directed that a separate Technical Agreement Regarding Use of Land to Be Leased by the United States in the Northern Mariana Islands (Technical Agreement) (Northern Mariana Islands 1975b; see Section 1.4.2, Commonwealth of the Northern Mariana Islands Military Lease Area) be drafted to describe terms of lease back property and joint use of certain areas. The Technical Agreement was simultaneously executed with the 1976 Covenant. The Technical Agreement provided for the lease back of U.S. Military leased property to the CNMI government to provide agricultural permits to residents of Tinian and other joint use arrangements, between the U.S. Military and the CNMI government which are summarized in Appendix K, Summary of Historical Land Use Agreements between the U.S. and the CNMI. The original 17,799 acres (7,203 hectares) leased by the U.S. to the current lease area of approximately 15,148 acres (6,130 hectares).

Below are selected provisions within the Technical Agreement as they pertain to leases on Tinian:

- The lease back, though expired, is being administered on a month-to-month tenancy and is subject to cancellation with 1 year’s notice or sooner in the event of urgent military requirement or national emergency.
- All uses of land in the Military Lease Area must be compatible with planned military activities.
- No construction of permanent facilities on lease back areas.
- Federal Aviation Administration airfield requirements and related safety zones apply to any facilities or activities in the Military Lease Area.
- All shoreline areas in and around the northern two-thirds of Tinian will remain open to fishermen at all possible times, except for those areas that must be closed to comply with safety, security, or hazardous risk requirements under the proposed action.
- Marianas citizens will have the same access to beach and recreation areas in the Military Lease Area of Tinian as military personnel (and their dependents) have for recreation.
- Closure for military maneuvers will be kept to a minimum, consistent with military requirements for safety and security.

Since the establishment of the Technical Agreement, numerous lease agreements have been executed that have reduced the acreage of the original agreement. Some of the amendments are described below as they pertain to Tinian (see Appendix K, Summary of Historical Land Use Agreements between the U.S. and the CNMI).

- **1983 Lease Agreement made pursuant to the Covenant to Establish a CNMI in Political Union with the U.S.** The lease for the lands specified in the 1976 Covenant and Technical Agreement was issued on January 6, 1983 for an initial term of 50 years with an option for the U.S. to renew
for a succeeding additional 50-year term. Terms of the lease mandated that any non-military uses within the leased areas must be approved by the DoN (DoN 2008).

- **1988 Leaseback Agreement between the CNMI and U.S.** The U.S. leases back to the CNMI 709 acres (287 hectares) on Tinian, including West Field.

- **1994 Leaseback and Disposal Agreement between the CNMI and U.S.** In 1994, the U.S. inventoried lands leased from the CNMI to determine land no longer needed for defense purposes and thus deemed surplus. The U.S. leased land deemed surplus included 1,245 acres (504 acres) on Tinian, south of West Field, and also designated the “Exclusive Military Use Area.”

- **1996 Partial Termination Agreement between the CNMI and U.S.** The U.S. released claims to 39 acres (16 hectares) at Tanapag Harbor on Saipan.

- **1999 Partial Release of Leasehold Interest between the CNMI and U.S.** The U.S. released leasehold interest in areas in the southern portions of Tinian and West Field. The U.S. identified West Field as a civilian aviation airfield and authorized the use of the 996 acres (403 hectares) of the Military Lease Area as the Tinian Military Retention Land for Wildlife Conservation for the Tinian Monarch (*Monarcha takatsukasae*). This area was designated per mitigation agreement number 1-2-98-F-07 between the Federal Aviation Administration and the U.S. Fish and Wildlife Service, dated January 4, 1999. The U.S. released leasehold interests of 10 acres (4 hectares) at Masalok Beach for CNMI to establish as a “Youth Site.” The U.S. also released interest in public rights of way within the Lease Back Area.

### 3.7.3 Methodology

A site visit to Tinian, document searches and reviews of publicly available information, and interviews at various agencies were conducted to obtain current and accurate land and submerged land use information. Meetings with CNMI agencies included the Department of Public Lands, Bureau of Environmental and Coastal Quality, Division of Fish and Wildlife (within the Department of Lands and Natural Resources), Mariana Visitors Authority, among others. The land use plans discussed in this section are those that are officially adopted by the CNMI government and those that are in-progress. The planned or proposed projects that have permits or are funded and moving towards being developed are discussed in this section. For a discussion of reasonably foreseeable land uses and projects, see Chapter 5, *Cumulative Impacts*.

#### 3.7.3.1 The CNMI Coastal Resources Management Plan

The Bureau of Environmental and Coastal Quality is responsible for the implementation of the Coastal Resources Management permit process. While the permit process is not applicable to federally leased or owned submerged lands, the Coastal Zone Management Act consistency determination is, and must address potential impacts to these CNMI Areas of Particular Concern. The Bureau of Environmental and Coastal Quality has identified geographic areas with special management requirements: CNMI Areas of Particular Concern. There are five CNMI Areas of Particular Concern delineated:

1. **Shoreline:** The area between the mean high water mark and 150 feet (46 meters) inland.

2. **Lagoon and Reef:** The area extending seaward from the mean high water mark to the outer slope of the reef.
3. **Wetlands and Mangrove**: Areas that are covered either permanently or periodically with water and where species of wetland or mangrove vegetation can be found.

4. **Port and Industrial**: Includes land and water areas surrounding the ports of Saipan and Tinian.

5. **Coastal Hazards**: Those areas identified as coastal flood hazard zones (V and VE) on the Federal Emergency Management Agency Flood Insurance Rate Maps.

Any project wholly or partially within a CNMI Area of Particular Concern requires a Coastal Resources Management permit.

### 3.7.3.2 The CNMI Land Use Plans

The most recent official land use plan for all of the CNMI is the CNMI Public Land Use Plan (Marianas Public Land Corporation 1989). This plan superseded the Physical Development Master Plan for the Commonwealth of the Northern Mariana Islands (CNMI Office of Transition Studies and Planning 1978), hereafter referred to as the CNMI Physical Development Master Plan. The CNMI Public Land Use Plan outlines goals, objectives, and policies for the CNMI through a planning period of 1989 to 2015. The plan encompasses public land of the CNMI, with the focus on Saipan’s projected growth.

More recent planning efforts for Tinian and Pagan are in progress (CNMI Department of Public Lands 2013a). The preliminary land use plans are included because they provide the best available current information on land use planning objectives.

The Commonwealth Zoning Board is charged with zoning for Saipan. Zoning and land use information for Saipan is provided in the 2013 Saipan Zoning Law and associated 2013 Saipan Zoning Map (Commonwealth Zoning Board 2013). There are no zoning laws or maps for Tinian and Pagan.

### 3.7.3.3 The CNMI Homestead Program

The CNMI Department of Public Lands is mandated to designate public land, including land on Tinian and Pagan, for potential homesteads. In an effort to fulfill this mandate, the CNMI Department of Public Lands designates available and suitable land on their land use planning maps for potential village and agricultural homesteading. A person is not eligible for more than one agricultural and one village homestead. A freehold interest in the homestead is granted once the person meets specified criteria and cannot be transferred for 10 years after receipt (Fifteenth (15th) Northern Marianas Commonwealth Legislature 2007).

In 2010, the CNMI enacted Public Law 16-50, a homesteading law to establish the Northern Islands Village and Agricultural Homesteading program for current or former residents of the Northern Islands or any qualified person interested in residing on the Northern Islands. The law, however, requires extensive municipal planning and infrastructure development prior to homesteading deeds being issued and, to date; the CNMI has not deeded any land on Pagan (DoN 2014a). Additional discussion on CNMI homesteading programs are discussed in Section 3.15, *Socioeconomics and Environmental Justice*, and Appendix Q, *Socioeconomic Impact Assessment Study*. 
3.7.4 Tinian

3.7.4.1 Jurisdictional Control and Management

3.7.4.1.1 Land Area and CNMI Real Estate Designations

Tinian land area is approximately 25,148 acres (10,177 hectares) in size with approximately 68 miles (109 kilometers) of roads administered by the CNMI’s Department of Public Works. A total of 10% (approximately 2,422 acres [980 hectares]) of Tinian’s land is privately owned, and the remaining 90% (or 22,726 acres [9,197 hectares]) are public lands (DoN 2010). Figure 3.7-2 illustrates the percentages of both private and public Tinian land ownership, including the five public land sub-classifications, which are shown on Figure 3.7-3.

Public land is further classified as one of five sub-classifications described below:

1. **Grant of Public Domain**: Public lands given in fee simple (i.e., absolute title to land), with no use specified.
2. **Designated Public Lands**: Public lands actively managed for a particular use, such as a forest or park.
3. **Leased**: Public lands that require government approval (i.e., permits). If the proposed lease encompasses greater than 12.4 acres (5 hectares) it must be approved by the CNMI legislature. Areas less than 12.4 acres (5 hectares) require the CNMI Department of Public Lands approval. Permits tend to be for commercial operations, such as hotels, golf courses, and cattle grazing.
4. **Technical Agreement Leased**: Public lands that are leased to the military and collectively referred to as the Military Lease Area (15,148 acres [6,130 hectares]). This area encompasses the northern portion of Tinian. International Broadcasting Bureau occupies 840 acres (340 hectares) of land in the Military Lease Area (Figure 3.7-3). The Military Lease Area is largely undeveloped.
5. **Undesignated**: Undeveloped Tinian public lands without a specified use are classified as undesignated public lands.

The U.S. presently leases 15,148 acres (6,130 hectares) on Tinian (approximately the northern two-thirds of Tinian) from the CNMI. The U.S. Leaseback Agreement with the CNMI for the 7,779 acres (3,148 hectares) located in the middle third of Tinian is referred to as the Lease Back Area. The U.S. Leaseback Agreement expired in 2014, and ranchers have maintained cattle grazing in the Lease Back Area on a month-to-month basis. However, the CNMI and the Department of Defense are executing a renewal of the lease until the summer of 2016 (Zotomayor 2015).

The majority of these leased lands are used for training purposes. While training may occur all year long, it typically occurs only a few times per year for limited durations. When areas are not closed for training, the land is accessible to the public. Tinian jurisdictional control of land is shown in Figure 3.7-2 and Figure 3.7-3. As shown, all private land and non-Technical Agreement leased lands are located south of the Military Lease Area. Fee interest ownership is the primary means of private land ownership (DoN 2010). Leases or easements are used for land transfer and/or management purposes.
3.7.4.1.2 Homestead Developments on Tinian

There are at least two areas with fully implemented homestead programs on Tinian, Marpo Heights and the Carolinas Plateau. In 2014, the CNMI governor announced that a contract was awarded to a construction company to start site development work for the West San Jose Homestead. The West San Jose Homestead does not currently contain any homes but will be subdivided into 189 residential lots. Basic infrastructure such as roads and utility rights-of-way, have been developed. Other homestead village areas have been noted on the Department of Public Lands’ Tinian land classification map (CNMI Department of Public Lands 2013b), some funding has been provided and the design and clearing of roads and rights-of-way has begun. For further discussion on these and other homestead village sites please see Chapter 5, Cumulative Impacts. For information and discussion on the CNMI homestead program and current status, please see Appendix Q, Socioeconomic Impact Assessment Study.
Figure 3.7-3
Tinian Land Jurisdictional Control and Management

Sources: DoN 2010; CNMI Department of Public Lands 2013a

Legend
- International Broadcasting Bureau
- Designated Public Land
- Undesignated Public Land
- Grant of Public Domain
- Leased Public Land
- Privately Owned Land
- Technical Agreement Leased (U.S. Military Lease Area)
- Exclusive Military Use Area
- Lease Back Area

Sources: DoN 2010; CNMI Department of Public Lands 2013a
3.7.4.1.3 CNMI Areas of Particular Concern Designations on and around Tinian

As shown on Figure 3.7-4, all five CNMI Areas of Particular Concern are found on Tinian: Shoreline, Lagoon and Reef, Wetlands and Mangroves, Port and Industrial, and Coastal Hazards (National Oceanic and Atmospheric Administration 1980; CNMI Coastal Resources Management Office 2014). Designated “Shoreline”, “Lagoon and Reef” and “Coastal Hazard” CNMI Areas of Particular Concern surround the entire island. For more discussion on “Lagoon and Reef” areas see Section 3.10, Marine Biology. There are four “Wetland and Mangrove” CNMI Areas of Particular Concern on Tinian: Lake Hagoi, Bateha, Mahalang, and Makpo. For more discussion on “Wetland and Mangrove” areas see Section 3.3, Water Resources and Section 3.9, Terrestrial Biology. Tinian’s port and harbor is designated as a “Port and Industrial” CNMI Area of Particular Concern.

3.7.4.1.4 Submerged Land Control around Tinian

The Territorial Submerged Lands Act (Public Law 113-34, 27 Stat. 518) was amended to provide for the transfer of certain submerged lands around the CNMI to the CNMI government to assure parity with other insular areas. Prior to the transfer, the U.S. government had control (fee simple ownership) over submerged lands on the CNMI. The U.S. retained control over submerged lands extending to 3 nautical miles (5 kilometers) from the coast of Tinian where the U.S. government has land leases. The U.S. government has rights in, and powers over, the waters and submerged lands extending seaward of the mean high tide line (see Figure 3.7-1). Per the 1980 CNMI Coastal Management EIS, “The commonwealth has excluded from its coastal management area all lands which are under the sole jurisdiction of or are held in trust by the federal government, its officers, or agents;” however, these submerged lands must comply with the federal Coastal Zone Management Act (National Oceanic and Atmospheric Administration 1980). To ensure the protection of military training in the area, a January 2014 Presidential Proclamation did not include the transfer of submerged lands adjacent to the leased lands of Tinian to the government of the CNMI (Obama 2014). Therefore, the U.S. retains control over submerged lands extending to 3 nautical miles (5 kilometers) from the coast of Tinian where the U.S. government has land leases.

Figure 3.7-5 shows the CNMI Department of Public Lands classifications of land use. This section covers the specific land uses, including lands outside of the Military Lease Area in the region of influence. Historical developments and land use are described in Section 4.11, Cultural Resources.

3.7.4.1.5 Exclusive Military Use Area

The Exclusive Military Use Area is used for military training. The area covers approximately the northern third of Tinian and comprises 7,574 acres (3,065 hectares) of land (DoN 2008). It is mostly forested, providing a realistic combat environment for maneuvers and amphibious training (DoN 2010). In the Exclusive Military Use Area some simulated munitions and live-fire small arms are employed.
Figure 3.7-4
Tinian CNMI Areas of Particular Concern

Legend
Areas of Particular Concern
- Port and Industrial APC
- Shoreline APC
- Coastal Hazards APC
- Lagoon and Reef APC
- Wetlands and Mangrove APC

Existing Boundaries
- Military Lease Area
- International Broadcasting Bureau

Figure 3.7-5
Tinian and Saipan
Existing Land Use

Sources: CNMI Department of Public Lands 2013a; CNMI CZB 2013
3.7.4.2 Existing Land Use

Figure 3.7-6 depicts the military uses on Tinian. The U.S. military uses the Exclusive Military Use Area for military training events that include Military Operations in Urban Terrain training, command and control, logistics, bivouac, vehicle land navigation, convoy training, and other ground element field activities. A key feature of the Exclusive Military Use Area is North Field, an unimproved expeditionary World War II-era airfield. North Field supports vertical and short-field landings, force-on-force airfield defense and offensive training, expeditionary airfield command and control, air traffic control, logistics, armament, fuels, rapid runway repair, and other airfield-related requirements.

Pyrotechnics and fires are allowed during training exercises on North Field (Commander, U.S. Naval Forces Marianas 2004). There have also been clandestine reconnaissance and hostage rescue exercises at the former Japanese Air Command Post at North Field where controlled live-fire was used.

Non-combatant evacuation operations occur at Unai Dankulo, Unai Chulu, Tinian Harbor, and North Field (DoN 2010). Hydrographic surveys are conducted from small boats around Tinian.

The Tinian Mortar Range (also called Chiget Mortar Range) on the east side of the island, between North Field and the eastern coast contains unexploded ordnance (60 millimeter and 40 millimeter) and is restricted to all but trained unexploded ordnance personnel. The area is fenced and warning signs prohibiting entrance are posted. See Section 3.16, Hazardous Materials and Waste, for more discussion on unexploded ordnance.

At Lake Hagoi, Unai Lam Lam, Unai Chulu, and Unai Dankulo (Long Beach), current training is restricted to designated areas because of cultural or natural resources.

No parks or recreation areas are designated in the Exclusive Military Use Area. However, there is public access to beaches, and there are 13 points of interest that are on the self-guided Tinian Historic Interpretive Trail (see Section 3.8, Recreational Resources). No agricultural uses are allowed within the Exclusive Military Use Area; however, historically there have been reports of animals grazing (Commander, U.S. Naval Forces Marianas 2004).

3.7.4.2.1 International Broadcasting Bureau

The International Broadcasting Bureau facility is located within the Exclusive Military Use Area on the northwestern side of Tinian (see Figure 3.7-2). It is distinct and fenced off from the remainder of the Exclusive Military Use Area and no training takes place within its boundaries. The International Broadcasting Bureau facility, which occupies approximately 800 acres (324 hectares), was developed in 1998 and includes access roads, an antenna field, and an operations facility. It is considered semi-improved, as it requires minimal landscaping and maintenance. About 25 employees work there, none of whom reside onsite (DoN 2013). Perimeter fencing and a security gate restrict public access to the International Broadcasting Bureau property, but the public has access to the coastal areas for recreation.
3.7.4.2.2 Lease Back Area

The Lease Back Area is composed of approximately 7,779 acres (3,148 hectares) and is located on the middle third of the island. As discussed in Section 3.7.2.3, U.S.-CNMI Covenant and Lease Agreements, the Tinian Leaseback Agreement has expired; however, the land is still used for cattle grazing. The Lease Back Area contains the following land uses:

- **Agricultural/Grazing in the Military Lease Area.** The total agriculture/grazing area is estimated at 2,552 acres (1,032 hectares) (see Figure 3.7-5). Most grazing and agricultural permits issued by the Department of Public Lands have expired.

- **Tinian Military Retention Land for Wildlife Conservation.** A 936-acre (379-hectare) conservation area is located within the Lease Back Area and is commonly referred to as the Tinian Military Retention Land for Wildlife Conservation and was designated for the Tinian monarch when it was on the federal endangered species list. See Section 3.9, Terrestrial Biology, for further discussion on this conservation area. The terms of the mitigation agreement allow the U.S. military to use the area for low-impact, non-habitat destructive training.

- **Points of Interest.** There are seven points of interest within the Lease Back Area that are on the Tinian self-guided tour; however, public access may be restricted during training. Refer to Section 3.8, Recreation, for other land and submerged land uses in the Lease Back Area.

3.7.4.2.3 Land Use Outside of the Military Lease Area

As shown on Figure 3.7-5, land use to the south of the Military Lease Area includes transportation (Tinian International Airport), agricultural, residential, resort, public services (e.g., power plant), open space, and conservation land. Most of Tinian’s population and commercial activity are in San Jose near the Port of Tinian.

The Technical Agreement (Northern Mariana Islands 1975b) between the U.S. and the CNMI governments provided for the lease back of property and joint use arrangements for the harbor and port area on Tinian; however the lease on the harbor was terminated in the 1994 amendment. Though the harbor lease was terminated in 1994, the U.S. retains the following rights:

- Handle cargo, stage equipment, and other port related activities.
- Use the harbor as ports of entry for troops, vehicles, and equipment. There is a staging area near San Jose used for logistical support associated with major training events.
- Install, operate and maintain fuel and utility lines to support above activities.

Military land uses on Tinian are shown on Figure 3.7-6. The Tinian government previously allowed (in the 1990s) special operations teams using combat rubber craft at Unai Leprosarium and Unai Kammer to conduct nighttime training landings (U.S. Commander Pacific Fleet 1999). This type of training could occur again with permission of the local government and the National Marine Fisheries Service. Unai Kammer is near the Tinian Dynasty Hotel and residential areas. Only the beach and nearby abandoned structures at Unai Kammer were used (DoN 2013). Unai Leprosarium is near the point south of Turtle Cove, near the airport.
3.7.4.3 Existing Submerged Land Use

3.7.4.3.1 Submerged Land Use Outside of the Military Lease Area

As discussed in Section 3.7.4.2, Existing Land Use, the Technical Agreement (Northern Mariana Islands 1975b) between the U.S. and the CNMI governments provided for the lease back of property and joint use arrangements for Tinian Harbor and port area, including submerged land associated with the harbor and port. Though the harbor lease was terminated in 1994, the U.S. retains the following rights, within submerged land:

- Moor vessels, handle cargo, stage equipment, and other port related activities
- Use the harbor as ports of entry for troops, vehicles, and equipment

Under the current military training program for Tinian, Amphibious Assault Vehicles have used an unutilized (by the public) boat ramp at the Tinian Marina, to land and launch Amphibious Assault Vehicles.

3.7.4.3.2 Public Use of Submerged Lands around Tinian

The public use of submerged lands and the waters above include recreation, fishing, and marine transportation. See Section 3.8, Recreation, Section 3.13, Transportation, and Section 3.15, Socioeconomics and Environmental Justice, for more discussion of use of the waters around Tinian.

3.7.4.4 Tinian Land Use Plans

Per the CNMI Public Land Use Plan (Marianas Public Land Corporation 1989), planned land use on Tinian involves accommodating growth in the available land outside of the Military Lease Area, with the majority of development expected to be concentrated in the San Jose area. This may include new urban land uses and hotel-style development (i.e., a compact footprint for transient accommodations, such as guest rooms with a bed and a bath) instead of a resort-style (i.e., a sprawling land-intensive complex that often includes a hotel plus outdoor amenities, such as gardens, golf courses, etc.) to accommodate the expected increase in visitors as a result of tourism.

Figure 3.7-5 shows the current land use information from the Department of Public Lands Land Classification Map for fiscal year 2013 (CNMI Department of Public Lands 2013b).

3.7.4.5 Saipan Existing Land and Submerged Land Use

Land use along the southern coast of Saipan may be affected by the proposed large-caliber weapons training noise that would occur on Tinian as part of the proposed action. As such, it is discussed briefly in the land use section, but is primarily addressed in Section 3.5, Noise. For a description of the affected environment for Saipan in regards to noise, see Section 3.5, Noise, and the Commonwealth of the Northern Mariana Islands Joint Military Training Noise Study in Appendix H, Noise Study (DoN 2014b).

The land use on the southern coastal area of Saipan includes a resort, golf course, beaches, residential neighborhoods, schools, commercial, and agriculture. The Commonwealth Zoning Board’s zoning for the southern portion of Saipan is shown on Figure 3.7-5. The beaches and marine waters are used by tourists and residents for recreation.
3.7.5  Pagan

3.7.5.1  Land Jurisdictional Control and Management

3.7.5.1.1  Land Area

Although some families claim ancestral rights to the lands on Pagan, the CNMI government has title to all the land on Pagan. The establishment of homesteads in accordance with the CNMI Constitution and implementing statutes has been approved, but due to lack of funding, no deeds have been conveyed for the property. No land on Pagan is controlled by the U.S. government. The CNMI Department of Public Lands is mandated to manage the land for economic development and the benefit of the indigenous population (Coastal Resources Management Office 2008). In 1981, the residents of Pagan were evacuated due to volcanic eruptions and were relocated to Saipan; therefore, Pagan is considered uninhabited per the U.S. Census. There are people who visit Pagan and some may stay in temporary encampments. Access to Pagan is controlled by the CNMI government and permits are needed in order to visit. Resettlement of Pagan has not been approved by the CNMI government since the 1981 evacuation.

3.7.5.1.2  CNMI Areas of Particular Concern Designations on and around Pagan

Pagan includes two of CNMI’s five Areas of Particular Concern (Figure 3.7-7): (1) Shoreline and (2) Lagoon and Reef. The “Shoreline” and “Lagoon and Reef” CNMI Areas of Particular Concern surround Pagan and are discussed in Section 3.10, Marine Biology.

3.7.5.1.3  Submerged Land Control around Pagan

The U.S. Senate Bill 256 amends the Territorial Submerged Lands Act to provide for the transfer of submerged lands around the CNMI to the CNMI government to assure parity with other insular areas. Prior to this, the U.S. government had control (fee simple ownership) over submerged lands in all of the CNMI. Submerged lands extend 3 nautical miles (5 kilometers) from the coast of Pagan. Under Public Law 113-34, 27 Stat. 518, the CNMI now has rights in, and powers over, Pagan’s submerged lands extending seaward of the mean high tide line.

3.7.5.2  Existing Land Use

Pagan is a remote, difficult-to-reach island. There is no infrastructure or usable docking facilities. Helicopters or small planes can land on a World War II-era remnant airfield built by the Japanese; however, lava flows have damaged and shortened the airfield. Historical developments and use are described in Section 3.11, Cultural Resources. Pagan is mostly unmanaged, and feral ungulates (i.e., cattle, goats, and pigs) roam the island. There is no CNMI land use designation for Pagan, so it is therefore assumed to be conservation (see Section 3.7.5.4, Pagan Land Use Plans). However, Pagan visitors also conduct subsistence activities such as hunting, fishing, gathering of fruits, and such while staying on the island.

In recent years, limited military training has occurred as part of the Forager Fury and Forager Fury II exercises. The training consisted of a 1-day, non-live-fire combat search and rescue training mission. A rotary-wing aircraft (MV-22 Osprey) was utilized to extract personnel from a simulated downed aircraft on Pagan.
Figure 3.7-7
Pagan CNMI Areas of Particular Concern
3.7.5.3 Existing Submerged Land Use

Uses of Pagan submerged land and associated waters are primarily recreational, fishing, and marine transportation. See Section 3.8, Recreation, Section 3.13, Transportation, and Section 3.15, Socioeconomics and Environmental Justice, for a discussion of uses of the waters around Pagan.

3.7.5.4 Pagan Land Use Plans

3.7.5.4.1 CNMI Physical Development Master Plan

The CNMI Physical Development Master Plan (CNMI Office of Transition Studies and Planning 1978) included a plan for Pagan as the island had a small permanent population at that time. Pagan was inhabited by about 40 residents in 1978. The CNMI Physical Development Master Plan expected that Pagan’s population would not exceed 200 during the plan period (1978-1985). The CNMI Physical Development Master Plan projected that development would remain in the Bandera-Shomushon area (near the airfield and former dock). Some proposed infrastructure improvements to support homestead developments were included in the 1978 Physical Development Master Plan.

3.7.5.4.2 CNMI Public Land Use Plan

The CNMI Public Land Use Plan (Marianas Public Land Corporation 1989) was prepared after the evacuation of Pagan when there was no permanent population present. The 1989 plan did not mention Pagan specifically and referred to all islands north of Saipan collectively as the “Northern Islands.” The 1989 plan stated that “public lands in the Northern Islands will remain in their current designation as conservation areas.”

3.7.5.4.3 Five-year Land Use Plan Update for Pagan

Pagan is still considered as conservation land per the 1989 CNMI Public Land Use Plan. There is no land use plan specifically for Pagan. The 2013 CNMI Department of Public Lands’ Five-year Land Use Plan for Pagan, CNMI is a land use planning effort that generated three potential land use plan options for consideration. The CNMI Department of Public Lands has not selected any of these options or officially adopted any land use plans for Pagan (CNMI Department of Public Lands 2013a). The developable use options all utilize roughly the same footprint and designate areas for community development, community farming, and general use. Only one of the options includes military land use. In 2010, the CNMI enacted Public Law 16-50, a homesteading law to establish the Northern Islands Village and Agricultural Homesteading program for current or former residents of the Northern Islands or any qualified person interested in residing on the Northern Islands. The law, however, requires extensive municipal planning and infrastructure development prior to homesteading deeds being issued and, to date; the CNMI has not deeded any land on Pagan (DoN 2014a). For a discussion on the CNMI homesteading programs and status, please see Section 3.15, Socioeconomics and Environmental Justice.
3.8 RECREATION

3.8.1 Definition

Section 3.8 describes the existing recreational resources on Tinian and Pagan. Recreation is defined as any type of activity in which area residents or visitors, including military personnel on liberty, may participate in for enjoyment during leisure time. Recreational resources are primarily assets of the physical geography of each island; from the mountains to the ocean, and the terrain in between. There are also man-made recreational resources, including parks, monuments, points of interest, National Historic Landmarks, sports fields, and events (e.g., competitions, cultural festivals, food fairs). National Historic Landmarks are places that possess exceptional value or quality in illustrating and interpreting the heritage of the U.S.

The region of influence for recreation includes the islands of Tinian and Pagan, and their surrounding waters. Recreational resources for this EIS/OEIS are organized into the following five categories: (1) historic and cultural sites, (2) beaches and parks, (3) ocean-based resources, (4) scenic points, and (5) annual events. The description of resources in this chapter follows these categories. Although each resource is organized under one category, there may be multiple recreational opportunities from a single resource. For example, a resource described under historic sites may offer scenic views. Therefore, a description of each resource is provided to supplement its categorization.

3.8.2 Regulatory Framework

The following entities are responsible for the management and maintenance of tourist sites and recreational areas on Tinian and Pagan:

- **National Park Service** – The National Park Service is a federal agency that has one office on Guam, one office on Saipan, but does not currently have an office presence on Tinian. Although managed by the National Park Service, the North Field National Historic Landmark on Tinian (National Historic Preservation Act Site #85003268 designated on December 30, 1985, discussed in Section 3.11, Cultural Resources) is not maintained by the National Park Service. The Superintendent for the National Historic Landmark is based out of Saipan.

- **Tinian and the CNMI Mayor’s Offices** – The Tinian Mayor’s Office maintains visitor areas on Tinian, including the historic and cultural sites in and outside of the National Historic Landmark. The CNMI Mayor’s office is responsible for maintaining areas on Pagan for permitted ecotours.

- **CNMI Department of Land and Natural Resources – Division of Parks and Recreation** – This agency has a small presence on Tinian. The Division of Parks and Recreation is responsible for the administration of parks and recreational sports facilities in populated areas. However, this agency has no specific park management plans for Tinian or Pagan.

- **CNMI Bureau of Environmental and Coastal Quality – Division of Coastal Resources Management** – This agency ensures consistency with the Coastal Zone Management Program, and manages Areas of Particular Concern (see Section 3.7, Land and Submerged Land Use), which include areas extending 150 feet (45 meters) inland from shorelines, and extending
seaward to the outslope of lagoons and reefs. The Division of Coastal Resources Management requires commercial recreation and tourism operators to secure a permit to operate in the shoreline jurisdiction.

- **CNMI Department of Land and Natural Resources – Division of Fish and Wildlife** – This agency is responsible for the protection and enhancement of natural resources, both terrestrial and ocean-based. This agency issues fishing, harvesting, and hunting permits. In addition, this agency has law enforcement responsibilities and can issue citations for violations.

- **CNMI Department of Community and Cultural Affairs – Division of Sports and Recreation** – This agency oversees two facilities on Tinian, both located in the village of San Jose - the gymnasium and pool/ball field complex. The division is responsible for administration of the sports complexes and associated recreation programs.

### 3.8.3 Methodology

Information regarding the use of recreational resources was obtained through a series of agency interviews, phone calls, site visits, and focused internet searches.

### 3.8.4 Tinian

As discussed in Section 3.15, *Socioeconomics and Environmental Justice*, the tourism industry is the largest industry on Tinian, with over 54,000 visitors in 2013. According to the Tinian Dynasty, the average length of stay on Tinian is 2.5 nights, and the majority of the visitors to Tinian are there for the historic and cultural sites and to enjoy the warmth and the beaches (DoN 2014). Recreational resources enhance the visitor experience and help drive the local economy (DoN 2010). Most recreational facilities on Tinian are geared to visitors, and most commercial establishments catering to recreation activities are located in the village of San Jose. The most popular activities for visitors include historical island tours, snorkeling, and water sports at the beaches outside the Military Lease Area, as described below (Mariana Visitors Authority 2012). Figure 3.8-1 shows locations of various recreational resources on Tinian.

#### 3.8.4.1 Historic and Cultural Sites

Tour agencies provide packaged tours of historic and cultural sites on and around Tinian. These tours are generally windshield tours with brief stops at the sites for the tourists to take photographs (DoN 2014). There are two tours sponsored by the Tinian Dynasty: South Side and North Side. The South Side tour makes stops at the following historic and cultural sites: Suicide Cliff and the House of Taga. The North Side tour stops at the North Field National Historic Landmark (DoN 2014). When the Tinian Dynasty is full, the bus tours will run all day with each tour accommodating up to 80 people and lasting 2 to 3 hours (DoN 2014).
Historic and Cultural Sites within the Military Lease Area

North Field National Historic Landmark

The North Field National Historic Landmark is located on the north end of the Military Lease Area (see Section 3.11, Cultural Resources, Figure 3.11-2) and is managed by the National Park Service. It includes World War II landing beaches at Unai Babui and Unai Chulu; World War II buildings, structures, and structural remains; and North Field runways (see below Photos 3.8-1 to 3.8-6). According to the Tinian Mayor’s Office, the atomic bomb pits at North Field have approximately 100 visitors per day (DoN 2014).

The DoN retains control of lands encompassing the North Field National Historic Landmark based on a 50-year lease agreement with the CNMI (the landowner) that has been in place since 1983 (National Park Service 2001). The sites are accessible to the public, except during certain periods of military training. The DoN provides a 45-day advance notice to the CNMI agencies when military training is scheduled on Tinian (National Park Service 2001). The North Field National Historic Landmark is also the site of anniversary tours sponsored by private tour operators, such as Stephen Ambrose Historical Tours. The North Field National Historic Landmark is also a destination of the Tinian Dynasty North Side tour.

Ushi Field-North Field Trail

The Ushi Field-North Field Trail is an interpretive trail developed by the Department of Defense in 1999 that identifies 14 points of World War II historic interest. Ushi Field-North Field Trail is part of the National Historic Landmark and is managed by the National Park Service. During World War II, the Seabees (members of the U.S. Naval Mobile Construction Battalion) and Marine Corps constructed six large airstrips on Tinian. Four of the six airstrips (Runways Able, Baker, Charlie, and Dog) were located at North Field and constructed over the former Japanese Ushi Point airfield, formerly the Japanese Imperial Naval Air Forces headquarters. On August 6, 1945, the Enola Gay (B-29 bomber) took off from the northernmost runway (Runway Able) to drop an atomic bomb on Hiroshima, Japan. Three days later another B-29, Bock’s Car, took off from the same runway to drop an atomic bomb on Nagasaki, Japan, on August 9, 1945. Also located along the trail are World War II Japanese fortification features (e.g., bunkers, naval batteries, a command post), a Radio Communications Center, and the Bomb Assembly Building.

To enhance the trail experience for visitors, the DoN, through funding from the Department of Defense Legacy Resource Management Program, cleared roads and trails, and installed interpretive signs. In 2001, a brochure was printed for a Self-Guided Tour of Historic North Tinian, including the North Field National Historic Landmark, which describes its historic resources. This brochure may be obtained through the National Park Service.
Photo 3.8-1. Historic Runway Able from which Numerous Aircraft Left for Bombing Raids over Japan

Photo 3.8-2. One of Two Loading Bays from which Atomic Bombs were Loaded into Aircraft for Bombing of Japan

Photo 3.8-3. Japanese Air Operations Building

Photo 3.8-4. Japanese Air Administration Building

Photo 3.8-5. Japanese Air Raid Shelter

Photo 3.8-6. Remains of Japanese Bomb Storage and Fuel Drum Storage
3.8.4.1.1.3  Ushi “Cross” Point

Ushi “Cross” Point is the northern-most point of the island. In addition to the various memorials at the point, the site and surrounding area are used by local fishermen. See Section 3.12, Visual Resources for photos of Ushi “Cross” Point.

3.8.4.1.1.4  Mount Lasso Scenic Lookout

Mount Lasso, located in the central portion of the Military Lease Area, is accessed from an unimproved road extending up the west side of the mountain off of 8th Avenue. The approach to the lookout involves passing the foundation of a former World War II Army Air Corps hospital and the remnants of a 1920s/1930s-era Japanese Shinto shrine near the lookout area.

3.8.4.1.1.5  Japanese Radio Communications Building

Located within the southern portion of the Military Lease Area along Broadway Avenue, the Japanese Radio Communications Building (Photo 3.8-7) is a World War II-era reinforced concrete shell of a two-story building. It is surrounded by smaller accessory facilities. The Tinian Mayor’s Office is responsible for maintaining vegetation at the Japanese Radio Communications Building. Just north of the Radio Communications Building is a staging area used for off-road vehicle tours.

3.8.4.1.1.6  Nan’yo Kohatsu Kaisha Shinto Shrine

The Nan’yo Kohatsu Kaisha Shinto Shrine is in the North Field area off Broadway Avenue (Photo 3.8-8). It was constructed after World War II by Nan’yo Kohatsu Kaisha, a Japanese firm that harvested sugar cane on Tinian prior to World War II. The remains of a railroad track once used for hauling sugar cane are located between Broadway Avenue and the shrine. The Tinian Mayor’s Office is responsible for maintaining vegetation at the Nan’yo Kohatsu Kaisha Shinto Shrine.
3.8.4.1.1.7 Hinode American Memorial

North of the Shinto Shrine is a large traffic circle on Broadway Avenue. Traveling north, the road turns sharply to the east and begins its descent down to North Field plateau. The grass-covered center median of the traffic circle contains the American Memorial consisting of various Japanese-style small concrete monuments (Photo 3.8-9) that were built by Americans after World War II to honor those who were killed in the battle for Tinian. The Tinian Mayor’s Office is responsible for maintaining vegetation at the Hinode American Memorial.

Photo 3.8-9. Hinode American Memorial

3.8.4.1.1.8 Japanese Village Internment Camp

This historic site, located just east of 8th Avenue, is reached via a forested narrow trail. It was formerly the site of the Japanese civilian internment camp after the capture of Tinian by American troops during World War II. The site is overgrown with a thick forested canopy. The most prominent feature is an entrance archway and concrete foundation structures (Photo 3.8-10). The Tinian Mayor’s Office is responsible for maintaining vegetation at the Japanese Radio Communications Building.

Photo 3.8-10. Remains of the Japanese Village – Last Used as an Internment Camp for Japanese during World War II

3.8.4.1.1.9 Seabees Monument

Not far from the Japanese internment camp on the west side of the intersection of 86th Street and 8th Avenue is a small concrete and bronze monument to the Navy Seabees who constructed the facilities on island following the Battle of Tinian (Photo 3.8-11). The Tinian Mayor’s Office is responsible for maintaining vegetation at the Seabees Monument.

Photo 3.8-11. Seabees Monument along 8th Avenue
3.8.4.1.10 509th Composite Group Camp Area

The 509th Composite Group was the U.S. Army Air Corps unit responsible for the delivery of the atomic bombs that were dropped on the Japanese cities of Hiroshima and Nagasaki at the end of World War II. The group’s camp area was southeast of the 8th Avenue traffic circle, just south of the North Field National Historic Landmark. The camp location is marked by a sign, and the ruins of building foundations can be found along trails that have been cleared in the thick jungle vegetation (Photo 3.8-12). The Tinian Mayor’s Office is responsible for maintaining vegetation at the 509th Composite Group Camp Area.

3.8.4.1.2 Historic and Cultural Sites Outside of the Military Lease Area

3.8.4.1.2.1 Ruins of House of Taga

The remnants of a house belonging to the ancient Chamorro chief, Taga, are in the village of San Jose. This site contains the tallest set of latte stones used by the ancient Chamorros throughout the CNMI. Latte stones are pillars capped by a hemispherical stone capital with the flat side facing up that were used as building supports by the ancient Chamorro people. The stones are quarried limestone, each approximately 19 feet (6 meters) in length. Of the 12 large latte structures, only one remains standing (Photo 3.8-13). The Ruins of the House of Taga are listed on the National Register of Historic Places and is a stop on the Tinian Dynasty’s South Side tour. The Tinian Mayor’s Office is responsible for maintaining vegetation at the Ruins of the House of Taga.

3.8.4.1.2.2 Suicide Cliff

Suicide Cliff gets its name from the many Japanese civilians and military personnel that took their lives during the Battle of Tinian (DoN 2014). The cliff area contains a large paved parking area for cars and tour buses, as well as a comfort station. The center of the area contains bleachers facing a ceremonial area. Suicide Cliff is a stop on the Tinian Dynasty’s South Side tour. The Tinian Mayor’s Office manages the Suicide Cliff area.
3.8.4.2 Beaches and Parks

Although beaches and parks are frequented by both visitors and Tinian residents, social activities of Tinian residents center on the beaches outside the Military Lease Area. On the weekends, residents go to the beach to barbeque and spend time with friends and family (DoN 2014). Tourists also visit the beaches, but their visits are often short as they are part of a tour group. The following sections describe the use of the beaches located within and outside of the Military Lease Area.

3.8.4.2.1 Beaches and Parks within the Military Lease Area

Beaches and parks accessible to the public within the Military Lease Area include (from northwest to southeast) Unai Lam Lam, Unai Babui, Unai Chulu, Unai Chiget, Unai Dankulo, and Unai Masalok, as described below. The remote locations of these beaches, lack of facilities (e.g., restrooms, showers, picnic tables), and difficult access to some of these beaches, as discussed in the description for each beach, make these beaches less frequented than the beaches located outside of the Military Lease Area. All beaches within the Military Lease Area are on public lands that are leased to the military. Beaches within the Military Lease Area are not managed or maintained.

3.8.4.2.1.1 Unai Lam Lam

Unai Lam Lam is located on the northwest coast, a short distance from the atomic bomb pits. This small beach is accessed by a thickly vegetated foot trail off a narrow dirt road. The beach is approximately 52 feet (16 meters) wide and is protected by a coral reef. This location is remote and access is difficult, as the only access is a steeply graded, rocky trail.

3.8.4.2.1.2 Unai Babui

Unai Babui is located on the northwest coast between Unai Lam Lam and Unai Chulu. Unai Babui was designated “White Beach One” by the Allies during the World War II amphibious assault landings and is part of the North Field National Historic Landmark. The beach is approximately 177 feet (54 meters) in length. Unai Babui is accessible via a single-lane unimproved road.

3.8.4.2.1.3 Unai Chulu

Unai Chulu is located south of Unai Babui. Unai Chulu was designated “White Beach Two” by the Allies during the World War II invasion and is also part of the North Field National Historic Landmark. Unai Chulu is the most accessible beach in the Military Lease Area. Access to the beach is well marked along an improved road. This beach is approximately 479 feet (146 meters) long, with a World War II Japanese bunker located at the north end adjacent to the parking area (Photo 3.8-14).

Like Unai Lam Lam and Unai Babui, Unai Chulu is on the leeward (western) side of the island and is less windswept with thicker and taller vegetation than east coast beaches. The beach consists of white sand and a rocky shoreline that offer an overlook of the...
Philippine Sea. Because of the size and accessibility of the beach, it attracts visitor groups for entertainment and picnics. Additionally, Unai Chulu is the only beach within the Military Lease Area that is recommended by the Tinian Dynasty to visitors (DoN 2014).

3.8.4.2.1.4 Unai Chiget

Unai Chiget is remotely located on the east windward coast of Tinian. The beach is comprised of coarse grand sand and is accessible via a small turnout just north of the former Japanese Radio Communications Building.

3.8.4.2.1.5 Unai Dankulo

Situated on the east windward coast, Unai Dankulo, or Long Beach, is the largest beach on Tinian and has a continuous sandy crest across the entire run of the beach. Unai Dankulo comprises at least 10 beaches over a distance of 4,900 feet (1,494 meters), and is frequented by shore-based spear fishermen (Mariana Visitors Authority 2014). Access to Unai Dankulo is via a single-lane, unimproved road that runs from Broadway to the beach (Photo 3.8-15) and is accessed by local tour companies (Mariana Visitors Authority 2014). Additionally, all-terrain vehicle rides start at Unai Dankulo (DoN 2014).

3.8.4.2.1.6 Unai Masalok

Unai Masalok, located on Tinian’s east (windward) coast, is protected by an offshore reef and is approximately 154 feet (47 meters) in length. The 1999 Partial Release of Leasehold Interest between the CNMI and the U.S., as discussed in Section 3.7, Land and Submerged Land Use, established a 10-acre (4-hectare) area for a CNMI youth site at Unai Masalok. To date, this agreement has not resulted in any development in the beach area.

3.8.4.2.2 Beaches and Parks Outside the Military Lease Area

Beaches and parks located outside the Military Lease Area include (from north to south) Unai Kammer, Unai Taga, and Unai Tachogna, as described below. These beaches are the most frequented by tourists since they are located near the Tinian Dynasty. Additionally, the local population frequents these beaches because they are closer to the populated areas and have support facilities (e.g., areas for picnics, parking). Beaches outside the Military Lease Area are managed by the Bureau of Environmental and Coastal Quality. The Division of Parks and Recreation is responsible for the administration and maintenance of these beach parks.
3.8.4.2.2.1 Unai Kammer

Unai Kammer is located on the southwestern side of Tinian facing the Philippine Sea near the village of San Jose. This white sand beach is surrounded by mature vegetation. Unai Kammer contains approximately six well-maintained covered picnic pavilions and a large paved parking lot (Photo 3.8-16). Unai Kammer is utilized by residents as well as tourists, and is one of four beaches recommended by the Tinian Dynasty to visitors (DoN 2014).

3.8.4.2.2 Unai Taga

Unai Taga is located directly across from the Tinian Dynasty Hotel and Casino front entrance. The Unai Taga area is small and is accessed by a stairway system that extends to the beach and a concrete lookout area extending over the ocean where many local children enjoy diving and swimming (Photo 3.8-17). While the beach itself is quite small and generally frequented by residents, the site offers outstanding views to Aguijan Island and turquoise blue waters. It is a sightseeing stop for tourists. Unai Taga is one of four beaches recommended by the Tinian Dynasty to visitors (DoN 2014).

3.8.4.2.3 Unai Tachogna

Unai Tachogna is another one of four beaches recommended by the Tinian Dynasty to visitors. Unai Tachogna is located just south of Unai Taga and connected to it by a shoreline pathway (Photo 3.8-18). On weekends, local families and groups gather here to barbecue and picnic. It is also a popular place for snorkeling, personal watercraft, and banana boats, most of which can be rented from the beach operators (Photo 3.8-19) (Tinian Dynasty 2013). Like Unai Kammer, there are numerous covered pavilions for picnicking and socializing. The rental kiosk and covered pavilions make Unai Tachogna a popular destination for tourists.
Chapter 3, Affected Environment

3.8.4.3 Ocean-based Resources

Coastal recreational activities on Tinian take place in the coastal zone and surf zone waters. Ocean-based recreational activities on Tinian include snorkeling, diving, recreational fishing, and boating.

3.8.4.3.1 Snorkeling and Driving

Tinian waters contain many World War II wrecks, coral structures, and abundant sea life. Below are descriptions of the most popular snorkel and dive spots around Tinian (from north to south). All are located on the western (leeward) side of the island and require boats to get to them. There are approximately six charter boats on Tinian (National Oceanic and Atmospheric Administration 2012), as well as boats on Saipan, that offer charters to Tinian dive spots (DoN 2014).

- **Dump Coke (Cove) North/South** – Often mislabeled as Dump Cove, Dump Coke is located in Lamanibot Bay and gets its name from the many Coca-Cola bottles thrown from the cliffs during World War II. Dump Coke contains many World War II artifacts, such as airplanes, tanks, ammunition, and jeeps.

- **Tinian Grotto** – Tinian Grotto is a popular cavern dive in Tinian and is only reachable by boat. There are three main entry points. Most divers enter from the top to descend into the chamber below. Lionfish (*Pterois* sp.) can be observed in the cavern.

- **Fleming Point** – Fleming Point contains coral formations, small marine animals and fishes. The wall drops off to depths of more than 2,000 feet (609 meters) and has some of the best visibility of the waters surrounding Tinian.

- **Two Corals** – Two Corals consists of two adjacent coral formations. The fish life here includes varieties of parrot fish, grouper, damsel fish, and more. Two Corals is a short boat ride from Tinian Harbor.
3.8.4.3.2 Recreational Fishing

Most fishing activities on Tinian are of a subsistence or artisan (i.e., sell fish to cover cost of fishing excursion) variety (DoN 2014). However, recreational fishing is popular with the tourists. There are approximately six charter boats on Tinian available for recreational fishing charters. Subsistence, artisan, and recreational fishing activities include bottom fishing and trolling for barracuda, mahi-mahi, marlin, skipjack, red sea bass, and tuna. There are also shoreline fishing areas used for recreational fishing, which are primarily located south of Dump Coke South and north of the Two Coral (Turtle Cove) diving sites on the west side of Tinian (see Figure 3.8-1).

There are several fishing events held throughout the year within the CNMI. The most recent fishing events on Tinian include the Tinian Cliff Fishing Derby and the Tinian Bottom Fishing Derby. The Tinian Cliff Fishing Derby was held in April 2012. A total of 14 Tinian residents and five tourists participated in the competition sponsored by the Tinian Municipal Council and the Tinian Mayor’s Office. In December 2013, the Tinian Mayor’s Office hosted a bottom fishing derby. Anglers competed for prizes in seven categories: overall biggest, biggest deep water, biggest shallow water, most variety deep bottom, most variety shallow bottom, total weight deep bottom, and total weight shallow bottom (Saipan Tribune 2013).

3.8.4.3.3 Boating

Tinian Harbor’s small boat dock is north of the main wharf and finger piers (Photo 3.8-20). The marina contains approximately 18 small craft mooring slips. The dock and finger piers support a variety of small craft used for fishing, diving, sight-seeing, and pleasure boating. The Tinian small boat dock is operated and maintained by the Boating Access program of the CNMI Division of Fisheries and Wildlife, which is 100% federally funded by the U.S. Fish and Wildlife Service. Vehicle access to the dock is via a paved road that services the port piers. North of the boat dock is a concrete boat ramp for launching and recovering small craft (Photo 3.8-21).
As mentioned above, there are approximately six charter boats that serve tourist clientele. These charter boats are reportedly owned by non-local residents for tourists from their country of origin: Japan, China, and Korea. There is also one boat that is owned by the Tinian Dynasty’s investors (DoN 2014). Although booked as charter fishing trips, these trips serve primarily as photographic opportunities for clients (National Oceanic and Atmospheric Administration 2012). Additionally, there is at least one charter boat from Saipan that conducts a Tinian boat tour (DoN 2014).

3.8.4.4 Scenic Points

As discussed in Section 3.12, Visual Resources, there are several scenic points on Tinian. Many of the scenic points also include a historic or cultural component and have been discussed in Section 3.8.4.1, Historic and Cultural Sites. However, the Blow Hole is a scenic point on Tinian, frequented by tourists, that was not discussed in Section 3.8.4.1.

The Blow Hole is located on the rocky coast of northeast Tinian within the Military Lease Area and is a stop on the Tinian Dynasty’s North Side tour. Access to the site is off a gravel road, with the remaining 100 yards (91 meters) approachable by foot.

3.8.4.5 Annual Events

3.8.4.5.1 Tinian Hot Pepper Festival

In February, the Tinian Mayor’s Office sponsors its annual 2-day Pika, or Hot Pepper, Festival to honor the Tinian hot pepper (Donni Sali), a small but hot native pepper. The festival is an island-style show that features different kinds of locally prepared dishes, as well as arts and crafts. One of the highlights is the hot pepper eating contest. The festival location on Tinian varies from year to year, but the festival is always held in February over President’s Day weekend. The 2014 festival was held at Unai Kammer, with ferry service from Saipan offered by the Mariana Visitors Authority (Saipan Tribune 2014a).

3.8.4.5.2 San Jose Fiesta

The San Jose Fiesta is an annual celebration of Tinian’s patron saint, hosted in May by the Mayor’s office at the Fiesta Grounds at Unai Kammer. The fiesta includes all night live entertainment, food and game concessions, carnival rides, cockfighting, big fish trolling competition, and a canoe race. The highlight of the fiesta is a free-for-all dinner banquet on Saturday following the Queen’s coronation. Sunday starts with the San Jose Mass followed by a continuation of the games at the fiesta grounds. Camp grounds are also provided for those that wish to tent camp (Saipan Tribune 2014b).

3.8.4.5.3 Tinian Turquoise Blue Triathlon and Reef Swim

The Tinian Turquoise Blue Triathlon and Reef Swim is co-sponsored by the Mariana Visitors Authority, KFC Triathlon Club of Japan, Tinian Mayor’s Office, and the Tinian Dynasty Hotel & Casino. The 2014 triathlon hosted 34 competitors from the CNMI and Japan (Mariana Visitors Authority 2014). The triathlon course starts at Unai Taga with a 1.5 kilometer swim, transitions to a 40 kilometer bike ride in southern Tinian between the airport and Suicide Cliff, and finishes with a 10 kilometer run from Unai Taga to Suicide Cliff and back. There is also a 1.5, 3.0, and 4.5 kilometer reef swim at Unai Taga. In 2014, the triathlon was held the same weekend as the Tinian Hot Pepper Festival. The 15th Annual Tinian Turquoise Blue Triathlon and Reef Swim is scheduled for February 14, 2015.
3.8.4.5.4 Tour de Tinian

The annual Tour de Tinian is a 100 kilometer mountain bike through the jungles of Tinian race hosted by the Bikers Association of Tinian. The race starts and ends in San Jose Village, and the race route includes interior and coastal areas in both north and south Tinian (i.e., within and outside of the Military Lease Area). In 2014, the Tour de Tinian was held May 3, 2014 in conjunction with the San Jose Fiesta and had more than 50 participants (DoN 2014). The 2015 Tour de Tinian will be held Memorial Day weekend (Mariana Visitors Authority, personal communication, September 4, 2014).

3.8.4.5.5 World War II Anniversaries

There are three tour seasons that correspond to specific World War II anniversaries: (1) March for the Iwo Jima anniversary, (2) June for the anniversary of the Battles of Saipan and Tinian, and (3) August for the anniversary of the Atomic Bomb. Star Marianas, the Tinian Dynasty, and private tour operators provide tours of the World War II historic sites, including the North Field National Historic Landmark, for these anniversaries. These tours are generally frequented by war veterans and their families and last a few days (DoN 2014). On every fifth anniversary of the End of the War in the Pacific, there is a larger event held at the North Field National Historic Landmark with guest speakers. There are also annual Memorial Day and Veteran’s Day ceremonies (DoN 2014).

3.8.5 Pagan

Pagan is officially uninhabited because after the last major volcanic eruption in 1981, residents were evacuated from the island. There are currently no formally identified recreational facilities or activities on Pagan. Although there have been discussions about developing Pagan as an ecotourism destination and a staging area for visitors to the Marianas Trench Marine National Monument, these discussions have not resulted in establishment of Pagan as an official tourism destination. Nevertheless, Pagan offers a unique destination for backpackers, nature lovers, and hunters. Those who wish to visit Pagan must obtain a permit from the CNMI Homeland Security and Emergency Management Office. There are no scheduled flights or cruises to the island. Therefore, visitors generally come by private or chartered boats or aircraft (i.e., helicopters). Once on Pagan, visitors may visit the following historic resources (see Section 3.12, Visual Resources, Figure 3.12-2):

- Japanese-era concrete monument, which is a memorial to those that died in the Marianas during World War II
- World War II bomb shelter
- World War II Japanese Zero

Additionally, the black sand beaches on Pagan are undeveloped and generally untouched due to the lack of regular visitors, although there is feral livestock including goats, cows, pigs, and chickens (Photo 3.8-22). Since the beaches are not maintained, there is ocean-borne debris in the form of trash, fishing floats, and an occasional glass
ball (a type of fishing float). Banadeera Bay is known as a good snorkel spot (Ogumoro and Torres 2014).

There are currently two tour options being offered for Pagan: Pagan ecotour adventure and the Silver Explorer cruise ship. There is a 10-person minimum for the Pagan ecotour adventure via boat with a maximum person count of 18, which includes the tour guide and boat operator. The maximum person count for the Pagan ecotour adventure via plane is eight to ten (Goodridge, W.F.J., personal communication, August 28, 2014). The first Pagan ecotour adventure encompassed 5 days with 3 full days on Pagan in April 2014 (DoN 2014). The ecotour included camping, visiting historic sites, hiking, and enjoying the black sand beaches. The next tour is a plane charter scheduled in January 2015 (Goodridge, W.F.J., personal communication, August 28, 2014).

According to the Mariana Visitors Authority (DoN 2014), Pagan will be a regular cruise ship stop. The first cruise ship visit occurred in September 2014. The Silver Explorer cruise ship anchored and shuttled people between the ship and Pagan for a day trip nature excursion before sailing on to Saipan and Tinian. The day trip included observation of one of the most recent lava flows by trekking down the old Japanese runway, a walk to several bunkers and planes, and a hike to a scenic overlook of the two lakes. The Silver Explorer cruise ship accommodates 132 guests and 117 crew (Silversea Expeditions 2012).
3.9 **TERRESTRIAL BIOLOGY**

This section describes the existing conditions of the terrestrial biological resources on Tinian and Pagan. The analysis of terrestrial biological resources focuses on species and vegetation communities crucial to the functions of biological systems, of special public importance, or that are protected under federal or local law or statute. When species are mentioned for the first time in this section they are listed using the common name followed by the scientific name in parentheses; thereafter, only the common name is used. If there is no accepted English common name, then only the scientific name is used. Appendix L, *Biological Resources Supporting Documentation* identifies the Chamorro and Carolinian names where applicable and provides more detailed information on selected species of interest found on Tinian and Pagan.

The region of influence for terrestrial biology includes the northern portion of the Tinian International Airport, the Military Lease Area on Tinian, and the entirety of Pagan.

### 3.9.1 Definition

For the purposes of this document, terrestrial biology is divided into three categories: vegetation communities, wildlife, and special-status species.

#### 3.9.1.1 Vegetation Communities

Vegetation communities include dominant plant species that occur within the project areas. Unvegetated, disturbed, and/or developed habitats are also discussed in this section. Vegetation communities were mapped and described in vegetation assessments or survey reports and delineated by either analysis of imagery, field observations, or a combination of these two methods. For Tinian, the vegetation community categories generally follow those defined by the U.S. Forest Service in their CNMI vegetation mapping project using high resolution aerial imagery (U.S. Forest Service 2006). For Pagan, the vegetation community categories generally follow those defined by Rogers (2010) during island-wide landcover mapping using aerial imagery, followed by ground-truthing at points within some of the delineated vegetation communities. Some category names were modified to make vegetation community names consistent for both Tinian and Pagan.

#### 3.9.1.2 Wildlife

The wildlife section includes all common animal species: birds, mammals, reptiles, amphibians, and invertebrates. The discussion is subdivided into native and non-native species. Brief descriptions and life history information for wildlife species of special interest are detailed in Appendix L, *Biological Resources Supporting Documentation*.

#### 3.9.1.3 Special-status Species

Special-status species include: (1) those listed as threatened or endangered under the federal Endangered Species Act that currently occur in the wild on Tinian or Pagan, (2) species proposed for listing under the federal Endangered Species Act, (3) species protected under the Migratory Bird Treaty Act, (4) those designated by legislative authority in the CNMI as threatened and endangered, and (5)
Species of Special Conservation Need as identified in the CNMI’s Comprehensive Wildlife Conservation Strategy. Brief descriptions and life history information for Endangered Species Act-listed and proposed species and CNMI-listed species are detailed in Appendix L, Biological Resources Supporting Documentation.

3.9.2 Regulatory Framework

A variety of laws, regulations, executive orders, plans, and policies, such as the Endangered Species Act and the Migratory Bird Treaty Act, are applicable to the proposed action and alternatives for terrestrial biology.

- Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds
- Executive Order 13112, Invasive Species

These are described in detail in Appendix E, Applicable Federal and Local Regulations.

3.9.3 Methodology

3.9.3.1 Study Areas

Project-specific biological surveys for the following species or groups were conducted within study areas on Tinian that lacked sufficient or current data to evaluate potential impacts from proposed activities described in this EIS/OEIS: federally endangered Mariana common moorhen (Gallinula chloropus guami) and Micronesian megapode (Megapodius laperouse laperouse); native birds, including those protected under the Migratory Bird Treaty Act; and species proposed for listing under the Endangered Species Act (e.g., tree snails) (DoN 2014a). Surveys were conducted at representative locations (i.e., study areas) within the region of influence, and findings from these locations are assumed to be representative of other areas not surveyed that possess similar habitat attributes. The survey report is presented in Appendix L, Biological Resources Supporting Documentation, and provides figures depicting the individual study areas for each species surveyed. Previous survey reports by the DoN and U.S. Fish and Wildlife Service were also used to assess the status and presence of additional biological resources on Tinian and Pagan (e.g., Mariana fruit bat [Pteropus mariannus mariannus] and nesting sea turtles; see Table 3.9-1 and Section 3.9.3.2, Data Sources and Surveys).

3.9.3.2 Data Sources and Surveys

Various biological surveys, which have been conducted in the study areas within the region of influence, were used as key sources of information for this section. These sources include the Terrestrial Resource Surveys of Tinian and Aguiguan, Mariana Islands, 2008 (U.S. Fish and Wildlife Service 2009); Marianas Expedition Wildlife Surveys 2010 (U.S. Fish and Wildlife Service 2010); Update of Integrated Natural Resources Management Plan for Navy Leased Lands on Tinian and Farallon de Medinilla (DoN 2010a); Final Joint Region Marianas Integrated Natural Resources Management Plan (DoN 2013a); Survey Report: Terrestrial Biological Surveys on Tinian in Support of the Commonwealth of the Northern Mariana Islands Joint Military Training Environmental Impact Statement/Overseas Environmental Impact Statement (DoN 2014a); EISs, Environmental Assessments, Biological Assessments, and resulting U.S.
Fish and Wildlife Service Biological Opinions for previous actions on military lands on Tinian; and internal DoN field survey reports. In addition to the numerous DoN surveys, site-specific natural resources Geographic Information System data for the region of influence were obtained from the U.S. Fish and Wildlife Service as of August 2013. A summary of terrestrial biological field studies conducted on Tinian and Pagan is provided in Table 3.9-1.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tinian</td>
</tr>
<tr>
<td>Vegetation</td>
<td>✓</td>
</tr>
<tr>
<td>Wetlands</td>
<td>#</td>
</tr>
<tr>
<td>Birds</td>
<td>✓, #</td>
</tr>
<tr>
<td>Land mammals</td>
<td>✓</td>
</tr>
<tr>
<td>Reptiles and amphibians</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Federal Endangered Species Act-Listed Species</strong></td>
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<tr>
<td>Mariana common moorhen</td>
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<tr>
<td>Micronesian megapode</td>
<td>✓, #</td>
</tr>
<tr>
<td>Mariana fruit bat</td>
<td>✓</td>
</tr>
<tr>
<td>Sea turtles (nesting beaches)</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Species Proposed for listing under the Federal Endangered Species Act</strong></td>
<td></td>
</tr>
<tr>
<td>Tree snails</td>
<td>✓, #</td>
</tr>
<tr>
<td>Butterflies</td>
<td>✓</td>
</tr>
</tbody>
</table>

Legend: ✓ = previous surveys and other data sources. # = surveys conducted for this EIS/OEIS (DoN 2014a); see Appendix L, Biological Resources Supporting Documentation.

3.9.4 Tinian

3.9.4.1 Vegetation Communities

Early reports of Tinian dating from the 1700s describe the island as having predominately limestone forest supporting trees such as *Pisonia grandis*, *Cerbera dilatata*, and *Guamia mariannae*. Tinian’s native vegetation composition was largely impacted by agricultural and military use of the island, which began in the early 1800s and continued through World War II. In the 1920s, large sections of land were cleared by the Japanese to support sugarcane (*Saccharum* spp.) production. These fields were abandoned in the 1940s during World War II (Mueller-Dombois and Fosberg 1998). Aerial photographs reveal that World War II bombing, fires, and military reconstruction during and after the war significantly reduced the amount of native limestone forest on Tinian, and once-forested areas not under cultivation were susceptible to encroachment of the introduced non-native tangantangan (*Leucaena leucocephala*). Native limestone forests that once dominated the island were reduced to approximately 5% of the total vegetation cover (Camp et al. 2012; DoN 2013b).

Island-wide vegetation mapping was conducted in 2006 by the U.S. Forest Service (2006), and was updated in 2009 by the U.S. Fish and Wildlife Service (Amidon 2009) (Table 3.9-2 and Figure 3.9-1). The 2009 vegetation assessment of Tinian noted that since the 1980s, the coverage of open fields decreased 11.6% while secondary forest coverage increased 10.3%, likely a result of succession as open areas became reforested over the previous two decades. Smaller changes included a decrease in tangantangan and an increase in urban land cover (Amidon 2009).
Table 3.9-2. Tinian Vegetation Communities (acres)

<table>
<thead>
<tr>
<th>Vegetation Community</th>
<th>Military Lease Area</th>
<th>Non-Military Lease Area</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Limestone Forest</td>
<td>391.3</td>
<td>964.4</td>
<td>1,355.7</td>
</tr>
<tr>
<td>Mixed Introduced Forest</td>
<td>4,647.5</td>
<td>2,176.4</td>
<td>6,823.9</td>
</tr>
<tr>
<td>Tangantangan</td>
<td>5,988.1</td>
<td>2,446.1</td>
<td>8,434.2</td>
</tr>
<tr>
<td>Herbaceous-Scrub</td>
<td>2,921.8</td>
<td>1,885.1</td>
<td>4,806.9</td>
</tr>
<tr>
<td>Casuarina Forest</td>
<td>296.4</td>
<td>54.7</td>
<td>351.1</td>
</tr>
<tr>
<td>Coconut Forest</td>
<td>32.1</td>
<td>65.8</td>
<td>97.9</td>
</tr>
<tr>
<td>Beach Strand</td>
<td>394.7</td>
<td>156.3</td>
<td>551.0</td>
</tr>
<tr>
<td>Wetlands*</td>
<td>33.7</td>
<td>31.2</td>
<td>64.9</td>
</tr>
<tr>
<td>Agriculture</td>
<td>2.5</td>
<td>329.2</td>
<td>331.7</td>
</tr>
<tr>
<td>Barren (soil, sand, or rock)</td>
<td>65.1</td>
<td>134.8</td>
<td>199.9</td>
</tr>
<tr>
<td>Developed Land</td>
<td>536.1</td>
<td>1,433.1</td>
<td>1,969.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15,309.3</strong></td>
<td><strong>9,677.1</strong></td>
<td><strong>24,986.4</strong></td>
</tr>
</tbody>
</table>

**Note:** *The term wetlands refers to the habitat type and is not meant to infer a jurisdictional determination of wetlands as defined under the Clean Water Act.

**Source:** Amidon 2009.

The following vegetation community descriptions are summarized from Falanruw et al. (1989) to provide a systematic and consistent vegetation classification for discussing vegetation communities on Tinian.

### 3.9.4.1.1 Native Limestone Forest

Native limestone forest has been significantly reduced on Tinian due to past activities, including widespread cultivation of non-native species (e.g., sugar cane), activities during World War II, intentional and accidental introduction of non-native plants and animals, and grazing by non-native ungulates. Limestone forests on Tinian are important because they retain the functional ecological components of native forest that provide habitat for the majority of Tinian’s native species, including Endangered Species Act-listed and proposed species, and CNMI-listed species, as well as bird species protected under the Migratory Bird Treaty Act. These forests also help maintain water quality and reduce fire risk. Non-native plant species (e.g., tangantangan) significantly alter the native forest structure, composition, and resilience of the forest to other disturbances and also provide less suitable conditions for native flora and fauna species than a native forest (Morton et al. 2000; Tang et al. 2011; DoN 2013b).

The few areas of native limestone forest remaining on Tinian within the Military Lease Area occur along cliff lines near Mount Lasso, around the northern escarpment of Maga, above and to the south-southeast of Unai Masalok, and in the southwestern section of the International Broadcasting Bureau site (Figure 3.9-1). This vegetation community harbors native trees such as *Cynometra ramiflora*, *Neisosperma oppositifolia*, *Cerbera dilatata*, *Psychotria* spp., *Eugenia* spp., *Guamia mariannae*, *Pandanus* (*Pandanus* spp.), coral tree (*Erythrina variegata* var. *orientalis*), banyan tree (*Ficus prolixa*), *Pisonia grandis*, and tropical almond (*Terminalia catappa*).
3.9.4.1.2 Mixed Introduced Forest

Mixed introduced forest, also referred to as secondary forest, contains a mixture of introduced trees, shrubs, and dense herbaceous plants. Dominant trees common in this vegetation community include tangantangan, ironwood (*Casuarina equisetifolia*), siris tree (*Albizia lebbeck*), Formosan koa (*Acacia confusa*), flame tree (*Delonix regia*), and Madras thorn (*Pithecellobium dulce*). While not considered a native vegetation community on Tinian, the mixed introduced forest community provides habitat for the federal Endangered Species Act-listed and proposed species and CNMI-listed species as well as for other native bird species, including those protected under the Migratory Bird Treaty Act.

3.9.4.1.3 Tangantangan

This vegetation community typically occurs on limestone and is dominated by the non-native tangantangan tree. Tangantangan forests dominate much of the level and moderately sloping lowland habitat areas on Tinian, especially in the northern portions of the island. While not considered a native vegetation community on Tinian, tangantangan forest provides habitat for native bird species, including those protected under the Migratory Bird Treaty Act.

3.9.4.1.4 Herbaceous-Scrub

This vegetation community occurs on both limestone and volcanic soils, primarily within open fields, and is dominated by grassy and low herbaceous vegetation with small thickets of native and introduced shrubs. Introduced species such as lantana (*Lantana camara*), paper rose (*Operculina ventricosa*), climbing hempweed (*Mikania scandens*), blue buffle grass (*Pennisetum polystachion*), and giant sensitive plant (*Mimosa invisa*) are common, as are small groves of trees including African tulip tree (*Spathodea campanulata*).

3.9.4.1.5 Casuarina Forest

This vegetation community consists of forests of pure ironwood or dominated by ironwood and is referred to as *Casuarina* forest throughout this EIS/OEIS. Commonly called ironwood or Australian pine, this tree species tolerates dry and salty conditions. It often grows in shrub and grass habitat, and in some locations forms sparse woodland with little understory. Ironwood also occurs in exposed areas and in narrow bands along the coast. This species is generally accepted as native to the Mariana Islands and seems to be an early successional species that deters the growth of other species by producing a dense layer of fallen needle-like branches that have compounds inhibiting the growth, survival, and reproduction of other plant species within the immediate vicinity (Pratt 2010).

3.9.4.1.6 Coconut Forest

Coconut forest describes a vegetation community dominated by coconut palms (*Cocos nucifera*). Approximately one third of the island’s coconut forests are located in five stands within the Military Lease Area. These stands are found adjacent to and south of the International Broadcasting Bureau (see Figure 3.9-1).

3.9.4.1.7 Beach Strand

Beach strand vegetation communities are limited to narrow strips in coastal areas and have adapted to excessively drained soils and salt spray from the adjacent coastal waters. Many beach areas are
Occasionally inundated with salt water during storm events, which is a controlling influence on all organisms. Strand vegetation includes beach heliotrope (*Tournefortia argentea*), bur-marigold (*Bidens pilosa*), portia tree (*Thespesia populnea*), false verbena (*Stachytarpheta* spp.), morning glory (*Ipomoea triloba*), lantana, and beach naupaka (*Scaevola taccada*). It also includes *Pemphis acidula* in rocky areas.

### 3.9.4.1.8 Wetland

Wetland vegetation communities are areas of grasses, sedges, herbs, or woody species which are specialized for growing in standing water or soils that are saturated for most of the year. Wetlands are habitats that are subject to permanent or periodic inundation sufficient to support vegetation that is typically adapted for life in saturated soil conditions. These habitats include marshes, swamps, bogs, and similar areas.

Wetland habitats on Tinian are important because of their limited occurrence and the habitat they provide for the federally and CNMI-listed endangered Mariana common moorhen (see Section 3.9.4.4, *Special-status Species*) and migratory birds. Lake Hagoi is a 34-acre (14-hectare) area comprising open-water and wetland vegetation that is the only permanent wetland habitat within the Military Lease Area. A 1995 vegetation map of the area (U.S. Fish and Wildlife Service 1996) showed a band of tall reed (*Phragmites karka*) and large patches of bulrush (*Schoenoplectus litoralis*, formerly *Scirpus litoralis*) around the perimeter. There were also patches of giant swampfern (*Acrostichum aureum*) and the grass *Paspalum distichum*. All of these species are native to Tinian (Raulerson 2006). The DoN (2013b) noted that as of 2012, Lake Hagoi vegetation appears to have changed relative to that mapped in 1995, with the occurrence of additional species such as the indigenous hibiscus (*Hibiscus tiliaceus*), a type of tree. In addition, the range of existing plant species had expanded into previously open-water areas of the wetland. The DoN (2013a) report further noted that the lake's vegetation has been changing continually over the past 50 years, with the expansion of bulrush into the wetland, resulting in a reduction of open water. Particularly rapid changes in the range of bulrush have been documented at Lake Hagoi between 2001 and 2013.

Two additional areas within the Military Lease Area contain water during the wet season: Mahalang and Bateha. The Mahalang complex consists of a number of ephemeral ponds located on a plateau within the northern portion of the Military Lease Area, south of Lake Hagoi (see Figure 3.9-1). At least 24 individual sites form the complex and are located within a matrix of grasslands (herbaceous-scrub), tangantangan, and mixed secondary forest. A subset of these individual sites contains water during the wet season, and all sites are dry during the dry season. Although no specific sizes for these sites were given in previous reports, AECOS and Wil Chee Planning (2009) estimated the two largest features as approximately 1.2 acres (0.5 hectare) each. The majority of the sites are characterized as likely bomb craters from World War II activities (DoN 2013b). Blue buffalo grass, an introduced grass, and various species of weedy vines dominate the interiors of the craters. Other sites in the complex consist of shallow depressions with various weedy vines and herbs. One site contains a dense covering of the introduced wetland species *Ipomoea aquatica* that grows in ponded water during the wet season (DoN 2013b). Results of wetland surveys conducted at a sample of the Mahalang sites in December 2014 indicate that only a single Mahalang site supports wetland vegetation (e.g., *Ipomoea aquatica*) and exhibits the characteristics of an isolated wetland. All other surveyed Mahalang sites do not contain wetland soils, suitable hydrology, or wetland vegetation. See Appendix L, *Tinian Wetland Survey Report*, for more details regarding the Mahalang sites.
The Bateha sites are located within the Military Lease Area (see Figure 3.9-1) and consist of two shallow depressions that contain water during the wet season. These areas are approximately 1-2 acres (0.4-0.8 hectare) each. Numerous other small areas, previously identified as potential wetlands, did not have the characteristics of seasonal wetlands as of December 2012 (DoN 2013b). The larger western site at Bateha is dominated by the introduced, sprawling scrub-shrub giant sensitive plant and also contains the introduced shrub *Cassia alata* along with other weedy species. Blue buffle grass occurs along the perimeter. The eastern site is a deeper depression surrounded by ridges dominated by an overstory of the introduced Formosan koa and blue buffle grass. Candle bush (*Cassia alata*) is dispersed throughout the northern and southern portions of the site (DoN 2013b). Wetland surveys conducted at these two Bateha sites in December 2014 indicate that both sites exhibit characteristics of isolated wetlands, including the presence of wetland soils and wetland vegetation. See Appendix L, *Tinian Wetland Survey Report*, for more details regarding the Bateha sites.

### 3.9.4.1.9 Agriculture

For the purposes of the terrestrial biological resources discussion, the agricultural community is defined as those areas used for the cultivation of food crops. Only 2.5 acres (1.0 hectare) were identified within the Military Lease Area by the U.S. Fish and Wildlife Service (Amidon 2009) (see Table 3.9-2). These occur near the southwest corner of the International Broadcasting Bureau site (see Figure 3.9-1). Portions of the herbaceous scrub vegetation community support cattle (*Bos primigenius*) grazing on Tinian. Refer to Section 3.7, *Land Use*, for further discussion of agriculture and cattle grazing.

### 3.9.4.1.10 Barren (Soil, Sand, or Rock)

Barren, unvegetated areas of soil, sand, or rock primarily occur along Tinian’s coastline. Approximately one third of the island’s barren areas are located within the Military Lease Area and can be found from Puntan Atgidon to Lamanibot Bay (known locally as Dump Coke) and south of Puntan Masalok (see Table 3.9-2 and Figure 3.9-1).

### 3.9.4.1.11 Developed Land

Developed land includes human-occupied or otherwise highly disturbed areas that include lawns, mowed grass fields, and other landscaped areas and impervious surfaces such as buildings, roads, and parking lots. This category includes areas mapped by U.S. Forest Service (2006) as “Urban and Built-up” and “Urban Vegetation.”

### 3.9.4.2 Native Wildlife

#### 3.9.4.2.1 Birds

There are 44 native bird species reported on Tinian, of which 39 are protected under the Migratory Bird Treaty Act. The Marianna common moorhen is a native bird species protected by the Migratory Bird Treaty Act and the federal Endangered Species Act. In addition, another native bird species, Micronesian megapode, is protected only under the federal Endangered Species Act. Section 3.9.4.4, *Special-status Species*, further addresses bird species protected under the Migratory Bird Treaty Act and the federal Endangered Species Act. The remaining five native bird species that do not have a special status include: (1) Micronesian honeyeater (*Myzomela rubrata*); (2) rufous fantail (*Rhipidura rufifrons uraniae*); (3)

Of the 44 bird species native to Tinian, 20 have been regularly detected in surveys conducted on Tinian between 1982 and 2013, during monthly monitoring by the DoN, and from periodic observations by the CNMI Division of Fish and Wildlife (Camp et al. 2009, 2012; DoN 2013c, 2014b). Island-wide surveys for native birds were conducted in 1982, 1996, 2008, and 2013 along a set of transects established by the U.S. Fish and Wildlife Service in 1982 (U.S. Fish and Wildlife Service 2009). Surveying of these standardized transects over time has allowed for analyses of population trends for a subset of Tinian native bird species (Camp et al. 2012; DoN 2014a).

Native bird species commonly found in forest habitats on Tinian include bridled white-eye, rufous fantail, Tinian monarch, Mariana fruit dove, white-throated ground-dove (*Gallicolumba xanthonura*), collared kingfisher (*Todiramphus chloris*), Micronesian honeyeater, and Micronesian starling. The yellow bittern (*Ixobrychus sinensis*) is a native bird species that is commonly present in open areas (DoN 2014a). All native shorebirds (e.g., sandpipers, plovers) and waterbirds (e.g., ducks) are protected under the Migratory Bird Treaty Act and are discussed in Section 3.9.4.4, Special-status Species.

Analysis of the 2013 native bird survey data was conducted by the U.S. Geological Survey to allow direct comparison to the data collection and analyses conducted for the 2008 Tinian surveys (Camp et al. 2009), as well as those done for the 1982 and 1996 surveys (Camp et al. 2012; DoN 2014a). Based on the 2013 analysis, the most abundant native bird species on Tinian were bridled white-eye, rufous fantail, and Tinian monarch (DoN 2014a). The collared kingfisher, white-throated ground-dove, and Mariana fruit dove were the least abundant. Analyses of population trends from 1982 to 2013 indicate increases in population densities for the collared kingfisher, Micronesian starling, rufous fantail, Mariana fruit dove, and white-throated ground-dove. Population densities have decreased for the Micronesian honeyeater. Population densities have remained stable for the bridled white-eye and Tinian monarch (DoN 2014a). For more detailed information on the 2013 native forest bird surveys on Tinian, refer to the *Tinian Monarch* section below and to the *Tinian Wetland Survey Report* provided in Appendix L, Biological Resources Supporting Documentation.

### 3.9.4.2.1.1 Tinian Monarch

Although not protected under the Migratory Bird Treaty Act, the Tinian monarch (Photo 3.9-1) was previously listed under the federal Endangered Species Act and by the CNMI government, and is a native bird species found only on Tinian. The monarch nests in native limestone, mixed introduced, and tangantangan forest communities. Native tree species are preferred monarch nesting sites, and native limestone forest appears to provide higher-quality habitat, as evidenced by higher monarch densities, nesting rates, and reproductive success when compared to mixed introduced and tangantangan forest communities (DoN 1997; Camp et al. 2012).
The Tinian monarch was federally listed as endangered in June 1970 because its population was thought to be critically low due to the destruction of native forests by pre-World War II agricultural practices, and by military activities during and after World War II. Based on forest bird surveys in 1982, which resulted in a population estimate of 39,338 individuals, the Tinian monarch was down-listed to threatened in April 1987. Further population studies in 1994 and 1995 resulted in a population estimate of approximately 52,904 birds. In 1996, surveys conducted along the same routes and using the same methods used in 1982 yielded a population estimate of 55,721 birds (Lusk et al. 2000). The 1996 survey also found a significant increase in forest vegetation density relative to 1982, indicating an improvement in monarch habitat. The U.S. Fish and Wildlife Service proposed delisting the Tinian monarch from the Federal List of Endangered and Threatened Wildlife in February 1999, and the species was federally delisted in 2004 (U.S. Fish and Wildlife Service 2004). The Tinian monarch was also delisted by the CNMI government in 2009 (Commonwealth Register Volume 31, page 29532). As described below, surveys and the associated data analysis conducted in 2008 indicated a significant decrease in the Tinian monarch population compared to the surveys conducted in 1996. Based on these results, the Center for Biological Diversity petitioned the U.S. Fish and Wildlife Service in December 2013 to relist the Tinian monarch as a threatened or endangered species under the Endangered Species Act (Center for Biological Diversity 2013). To date, the species has not been relisted.

The Military Lease Area comprises roughly 66% of the Tinian monarch habitat on the island and supports approximately 52% of the total monarch population (DoN 2014a). After delisting of the Tinian monarch in 2004, the species was monitored for 5 years under the Post-Delisting Monitoring Plan for the Tinian Monarch (U.S. Fish and Wildlife Service 2005). In 2008, monitoring resulted in a population estimate of approximately 33,310 Tinian monarchs, a decline of approximately 40% since 1996. In addition, monarch densities in high-quality habitats calculated from the 2008 surveys declined significantly from densities reported by U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 2005). It was hypothesized that the overall population decline between 1982 and 2008 was associated with reduced bird density in quality habitats, particularly limestone forest (Camp et al. 2012).

In support of this EIS/OEIS, forest bird surveys, including surveys for the Tinian monarch, were conducted throughout Tinian in 2013. This island-wide survey using the original 10 transects established by the U.S. Fish and Wildlife Service in 1982 resulted in a Tinian monarch population estimate of approximately 90,600 birds. Because analytical methods have changed slightly over time, the 1982, 1996, and 2008 survey data were re-analyzed using the same methods used for the 2013 data. Results of these analyses provided population estimates of approximately 95,900 monarchs in 1982, 105,300 monarchs in 1996, and 56,300 monarchs in 2008 (Figure 3.9.2). Given these results, the overall population trend for Tinian monarchs from 1982 to 2013 was stable (DoN 2014a).
The Tinian Military Retention Land for Wildlife Conservation was established in 1999 in an agreement between the CNMI Commonwealth Ports Authority, Federal Aviation Administration, and DoN. This conservation area was established for the protection of endangered or threatened wildlife, particularly the Tinian monarch, following Endangered Species Act consultation by the Federal Aviation Administration with the U.S. Fish and Wildlife Service on expansion of the Tinian Airport (U.S. Fish and Wildlife Service 1998). The 936-acre (379-hectare) conservation area is located in the Military Lease Area, northwest of the corner of Broadway and Cross Island Road (see Figure 3.9-3 in Section 3.9.4.4, Special-status Species).

3.9.4.2.2 Mammals

The only native mammal species on Tinian is the Mariana fruit bat. This bat is listed as threatened under the federal Endangered Species Act and as threatened and endangered by the CNMI government. It is discussed in detail in Section 3.9.4.4, Special-status Species.

3.9.4.2.3 Reptiles

There are eight native terrestrial reptile species reported on Tinian. Of these, the Micronesian gecko (Perochirus ateles) is a special-status species and is described separately in Section 3.9.4.4, Special-status Species. There are two native marine reptile species reported to nest on Tinian: the green turtle (Chelonia mydas) and hawksbill turtle (Eretmochelys imbricata). Both are protected under the federal the Endangered Species Act and the CNMI Endangered Species Act. These marine reptiles are addressed in Section 3.10, Marine Biology, but their beach nesting areas are discussed in Section 3.9.4.4, Special-status Species.

Several native terrestrial reptile species were found during the 2008 surveys on Tinian, including the mourning gecko (Lepidodactylus lugubrus), Micronesian gecko, Indo-Pacific house gecko (Hemidactylus garnotii), oceanic snake-eyed skink (Cryptoblepharus poecilopleurus), littoral skink (Emoia atrocostata),
Pacific blue-tailed skink (*Emoia caeruleocauda*), and Brahminy blindsnake (*Ramphotyphlops braminus*). The mourning gecko was the most abundant lizard species in both mixed and limestone forest habitats, while the Indo-Pacific house gecko was the most abundant and conspicuous gecko in tangantangan forests. The oceanic and littoral skinks were found predominantly within the vicinity of coastal areas. The blue-tailed skink was observed only in native forest at Mount Lasso. The blindsnake was found in both mixed and limestone forest (Rodda et al. 2009).

### 3.9.4.2.4 Amphibians

There are no native amphibians on Tinian.

### 3.9.4.2.5 Invertebrates

There are four native invertebrate species reported on Tinian—three crab species and one snail species. The humped tree snail (*Partula gibba*), proposed for listing as endangered under the federal Endangered Species Act, is the only terrestrial invertebrate special-status species known to occur on Tinian. This species is discussed in Section 3.9.4.4, Special-status Species.

The coconut crab and two species of land crab (*Discoplax hirtipes* [previously *Cardisoma hirtipes*] and *Cardisoma carnifex*) are regulated as game species by the CNMI Division of Fish and Wildlife. A license is required for harvesting these crabs during regulated hunting seasons. The coconut crab is the largest land invertebrate in the world and can reach over 3 feet (1 meter) in length from leg to leg. In addition to being a highly valued game species in the CNMI, it serves important ecological functions including dispersing seeds and scavenging. Although coconut crabs occur in native forests, females regularly migrate to the ocean to spawn. Coconut crab densities on Tinian have been estimated at 2 crabs/acre (5 crabs/hectare) in native forest and 0.7 crab/acre (1.8 crabs/hectares) in tangantangan (Vogt 2009).

Land crabs are a common terrestrial burrowing crab found throughout the Indo-Pacific and are generally associated with wetland or coastal habitats, although juveniles can be found further inland. Their shells can measure 4-5 inches (10-13 centimeters) across. The two species on Tinian are primarily herbivorous, eating leaves and other vegetation (Carpenter and Niem 1998).

### 3.9.4.3 Non-native Wildlife

Non-native species are common on Tinian and can negatively impact native wildlife and vegetation. The non-native species on Tinian currently include at least 5 birds, 10 mammals, 6 reptiles, 1 amphibian, and 3 invertebrates (DoN 2010b, 2013a, 2013c).

#### 3.9.4.3.1 Birds

Common non-native bird species include red junglefowl (or feral chicken [*Gallus gallus*]), rock dove (*Columba livia*), island collared-dove (*Streptopelia bitorquata*), Eurasian tree sparrow (*Passer montanus*), and orange-cheeked waxbill (*Estrilda melpoda*) (DoN 2013a, 2013c, 2014c). Red junglefowl are found throughout the island and are no longer exclusively associated with humans. Rock doves can be found in the Military Lease Area and San Jose. The island collared-dove was introduced to the southern Mariana Islands by the Spanish from the Philippines in the 1700s and is considered common to abundant on Tinian. The most abundant non-native bird is the Eurasian tree sparrow, primarily in the vicinity of San Jose. Flocks of 30 or more orange-cheeked waxbills are seen in grasslands and roadsides (Camp et al. 2009; DoN 2013a, 2013c).
3.9.4.3.2 Mammals

Introduced mammals include three rat species, the house mouse (*Mus musculus*), Asian house shrew (*Suncus murinus*), domestic cat (*Felis catus*), dog (*Canis lupus familiaris*), goat (*Capra hircus*), and cattle. High densities of roof rats (*Rattus rattus*) are found in all habitats of the Military Lease Area. Pacific rats (*Rattus exulans*) and brown rats (*Rattus norvegicus*) also occur on Tinian but in lower densities. Rat densities on Tinian are higher than on many other tropical Pacific islands and are likely detrimental to flora and fauna, including Tinian’s bird species. Asian house or musk shrew densities are high in native and tangantangan forest. Rodents and shrews are predators of native birds, lizards, insects, and snails. The rat’s diet also includes native plants, seeds, and fruit, and high rodent densities are associated with changes in forest composition (Wiewel et al. 2009).

Feral cats are extremely common on Tinian and have been observed hunting in native forest at night (DoN 2013a). Goats have been transported from Aguiguan to Tinian, and a coastal survey in October 2008 confirmed at least 20 goats at Puntan Kastiyu. There is some evidence that feral goats are creating trails, accelerating erosion, and impacting the native vegetation on Tinian (Kessler 2009).

3.9.4.3.3 Reptiles

Introduced reptiles include the oceanic gecko (*Gehyra oceanic*), mutilating gecko (*Gehyra mutilata*), curious skink (*Carlia fusca*), emerald skink (*Lamprolepis smaragdina*), mangrove monitor lizard (*Varanus indicus*), and green anole (*Anolis carolinensis*). Oceanic geckos were reported during the 2008 U.S. Fish and Wildlife surveys and constituted about half of the lizard biomass in limestone forest areas (Rodda et al. 2009). Mangrove monitor lizards were found throughout the island in all habitats (Rodda et al. 2009; DoN 2013a). It should be noted that recent studies indicate that mangrove monitor lizards may be native to some Mariana Islands (Pregill and Steadman 2009).

The brown treesnake (*Boiga irregularis*), while not present on Tinian, has the potential to impact the economy, human health, and island ecology in the CNMI. The brown treesnake’s native range is coastal Australia, Papua New Guinea, and a large number of islands in northwestern Melanesia. This species was inadvertently introduced to Guam after World War II (Rodda and Savidge 2007). As a result of this introduction, 17 of 18 native bird species on Guam were severely impacted, and 12 of the 18 species were likely extirpated (i.e., no longer exist on Guam) (Wiles et al. 2003).

Efforts to control the brown treesnake include preventing the snakes from leaving Guam by cargo, ship, or air vessels. The U.S. military has collaborated with other partners and participated in the development of brown treesnake-specific trapping techniques, detection using sniffer dogs, exclusion fence design, development of toxicants, and toxicant delivery methods. While these efforts have had success, individual brown treesnakes originating from Guam have been found in Kwajalein, Pohnpei, Hawaii (Oahu), Diego Garcia, Spain, Alaska, Texas, Oklahoma, California, and neighboring CNMI islands (Rota, Tinian, and Saipan) (Brown Treesnake Technical Working Group 2009; U.S. Department of Agriculture 2014; Kerrigan 2014).
The potential establishment of the brown treesnake on Tinian is of great concern. As of 2008, there have been 76 alleged brown treesnake detections on Saipan considered credible based upon conditions and the observers’ familiarity with snakes (N. Hawley, CNMI Division of Fish and Wildlife, unpublished data). Nine unconfirmed brown treesnake sightings have been reported on Tinian (Brown Treesnake Technical Working Group 2009).

### 3.9.4.3.4 Amphibians

The marine toad (*Bufo marinus*) is the only known amphibian on Tinian and was likely introduced in 1944, when approximately 4,000 individuals were observed in lily ponds and cisterns. By 1974, the toad was common throughout the island in mixed and limestone forest habitats (DoN 2013a). Marine toads currently occur in high densities at Lake Hagoi. The species possesses large parotid glands that excrete poison and kill potential predators. Marine toads are prolific breeders and can lay up to 70,000 eggs per year, and are possibly a threat to native reptiles on Tinian (DoN 2013a).

### 3.9.4.3.5 Invertebrates

The mangrove crab (*Scylla serrata*), introduced as a potential food source, is the only introduced terrestrial crustacean on Tinian (Commander, U.S. Naval Forces Marianas 2004; DoN 2010b). The predatory manokar flatworm (*Platydemus manokwari*) was introduced to Tinian to help control the introduced giant African snail (*Achatina fulica*). The flatworm poses a serious threat to native tree snails, including the humped tree snail that is proposed for listing under the federal Endangered Species Act (discussed below) (Hopper and Smith 1992; DoN 2014a).

### 3.9.4.4 Special-status Species

#### 3.9.4.4.1 Federal Endangered Species Act-listed and Proposed Species

The status and occurrence of federal Endangered Species Act-listed and proposed species and CNMI-listed species on Tinian are presented below (Table 3.9-3). The observed locations of these special-status species within the Military Lease Area are presented in Figure 3.9-3. Further descriptions of these species are presented in the following subsections.
### Table 3.9. Occurrence of Federally Endangered Species Act-Listed and Proposed Species and CNMI-Listed Species on Tinian

<table>
<thead>
<tr>
<th>English Name</th>
<th>Status*</th>
<th>Habitat</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mariana common moorhen</td>
<td>E</td>
<td>Freshwater wetlands.</td>
<td>Population up to 75 birds at Lake Hagoi, the Mahalang ephemeral ponds, and Bateha sites.</td>
</tr>
<tr>
<td>Micronesian megapode</td>
<td>E</td>
<td>Limestone forest and coconut forest.</td>
<td>Eight reports of individual birds seen within last 28 years, but none were detected during taped-playback surveys in 2008, 2013, and 2014.</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mariana fruit bat</td>
<td>T</td>
<td>Limestone forest, coastal forest, and coconut forest.</td>
<td>Occasional sightings by residents. During three surveys conducted between 2000 and 2008, five fruit bats were observed in 2005.</td>
</tr>
<tr>
<td>Pacific sheath-tailed bat</td>
<td>PE</td>
<td>Roosts in caves during the day and forages for insects over forests at night.</td>
<td>The subspecies is currently known only from Aguiguan and does not occur on Tinian.</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green sea turtle</td>
<td>T</td>
<td>Suitable beaches for basking and nesting.†</td>
<td>Regular nesting documented.</td>
</tr>
<tr>
<td>Hawksbill sea turtle</td>
<td>E</td>
<td>Suitable beaches for basking or nesting.†</td>
<td>One hawksbill nest observed during monthly surveys from 1999-2012.</td>
</tr>
<tr>
<td>Slevin’s skink</td>
<td>PE</td>
<td>Leaf litter of native forest floors.</td>
<td>Not known to currently occur on Tinian.</td>
</tr>
<tr>
<td><strong>Invertebrates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humped tree snail</td>
<td>PE</td>
<td>Intact limestone forest.</td>
<td>Observed during 2013 surveys along Lamanibot Bay (Dump Coke) escarpment.</td>
</tr>
<tr>
<td><strong>Plants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Cycas micronesica</em> **</td>
<td>PT</td>
<td>Forest and savanna ecosystems.</td>
<td><em>Cycas micronesica</em> is not known historically from Tinian. In 2008, the DoN cycad conservation project planted 1,000 cycad seedlings in native limestone forest on Tinian.</td>
</tr>
<tr>
<td><em>Heritiera longipetiolata</em></td>
<td>PE</td>
<td>Moist forest on limestone cliffs and in coastal sites with windy conditions.</td>
<td>Within the Military Lease Area at Unai Masalok on the east coast and along the Lamanibot Bay (Dump Coke) escarpment.</td>
</tr>
<tr>
<td><em>Dendrobium guamense</em></td>
<td>PE</td>
<td>Grows on tree trunks and branches in forest habitats.</td>
<td>Within the Military Lease Area near Unai Dankulo on the east coast.</td>
</tr>
<tr>
<td><em>Solanum guamense</em></td>
<td>PE</td>
<td>Native forest.</td>
<td>Not known to currently occur on Tinian; known from just a single individual on Guam.</td>
</tr>
<tr>
<td><em>Tuberolabium guamense</em></td>
<td>PE</td>
<td>Native forest.</td>
<td>Not known to currently occur on Tinian; known only from a single individual on Guam and two occurrences on Rota.</td>
</tr>
</tbody>
</table>

Figure 3.9-3
Occurrence of Special-Status Species - Tinian Military Lease Area

Legend
- Military Lease
- Existing Tinian Military Retention Land for Wildlife Conservation
- Mariana Common Moorhen
- Mariana Fruit Bat
- Micronesian Megapode
- Micronesian Gecko
- Humped Tree Snail
- Green Sea Turtle Nesting

Note: Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.

3.9.4.4.1.1  Mariana Common Moorhen

The Mariana common moorhen (Photo 3.9-2) is a bird species that relies on emergent vegetation of freshwater marshes, ponds, and placid rivers for breeding, foraging, and shelter (U.S. Fish and Wildlife Service 1991; DoN 2010b). In the Mariana Islands, its preferred habitat includes freshwater lakes, marshes, and swamps. The U.S. Fish and Wildlife Service recovery plan for the Mariana common moorhen identifies Lake Hagoi (estimated at that time at 44 acres [18 hectares] with 2.5 acres [1 hectare] of open water) within the northern portion of the Military Lease Area as primary habitat for the moorhen (U.S. Fish and Wildlife Service 1991) (see Figure 3.9-3).

The 1991 recovery plan estimated the moorhen population on Tinian to be between 20 and 125 birds (U.S. Fish and Wildlife Service 1991). Based on previous reports and surveys from 1989, 1994-1995, and 2001, the moorhen population was estimated to be between 41 and 75 birds (Takano and Haig 2004).

The DoN has conducted monthly or quarterly monitoring of moorhens at Lake Hagoi since 1998. Surveys conducted between November 1998 and September 2013 indicate that total moorhen detections have ranged from 0 to 46 birds per survey, with a mean of 15 individuals detected per survey (DoN 2014d). Yearly averages show that 2003 and 2007 were peak years for adult moorhen numbers at Lake Hagoi (16.9 and 17.1 detections, respectively), and that 2010 was an extremely low year (6.8 detections). These numbers are the means for the year and are index surveys, not absolute population estimates. The number of birds observed is negatively correlated with periodic dry conditions at Lake Hagoi, and the lake was completely dry for much of 2010. Survey results for fiscal years 2011, 2012, and 2013 show a rebound from the low of 2010, with an average of 16, 16, and 16.5, respectively, adult moorhens detected per monthly survey (DoN 2011, 2012, 2013a). The 2013 taped-playback surveys resulted in the detection of 20-23 individual moorhens at 3 survey points on Lake Hagoi (DoN 2014a). This is within U.S. Fish and Wildlife Service’s range of 21-29 moorhens detected per survey during wet season surveys between July 1994 and August 1995 (DoN 2013b). Depredation by rats and mangrove monitor lizards may impact the moorhen population at Lake Hagoi, especially during peak nesting periods (U.S. Fish and Wildlife Service 1996; Vogt 2008a; DoN 2010b).

Prior to 2013, moorhen use of the Mahalang complex of ephemeral ponds and Bateha wetlands had not been regularly monitored. Based upon surveys at the Mahalang complex and Bateha sites in 1994 and 1995, the U.S. Fish and Wildlife Service estimated that Mahalang and Bateha may have supported a total of approximately 10 moorhens (U.S. Fish and Wildlife Service 1996) (Figure 3.9-4).

To obtain a more recent inventory of sites used or potentially used by moorhens, surveys were conducted at the Mahalang ephemeral ponds and the Bateha wetlands during the wet seasons of 2012-2014. As of January 2014, surveys conducted within the Mahalang ephemeral ponds resulted in the following individual moorhen detections: one in MC1 in November and December of 2012, one in M10 in November 2013, one in M07 from May through October 2013, and one in M11 from May through October 2013 (see Figure 3.9-3).
Figure 3.9-4
Past and Current Occurrences of Mariana Common Moorhen within the Military Lease Area

Sources: Hawaiian Agronomics 1985; DoN 2013a, 2013b, 2013c, 2014a
Surveys have also detected moorhens within both Bateha sites BD1 and BD2. Seven surveys between October 2012 and January 2013 resulted in a total of 20 moorhen detections at BD1 (see Figure 3.9-4). This includes a maximum of three visual observations of adults and four visual observations of juveniles on both October 22 and November 25, 2012. An additional 4 detections, of 2 adult and 2 juvenile moorhens, were made in November 2013 (DoN 2014a). Eight surveys conducted between October 2012 and January 2013 at BD2 resulted in 50 moorhen detections, including 4 visual detections of adults and 3 visual detections of juveniles in November 2012 (DoN 2013b).

Overall, the 2012-2014 surveys indicated that approximately four moorhens used the Mahalang ephemeral ponds and approximately four adult and four juvenile moorhens used each of the Bateha wetlands each year during this period (DoN 2014b).

### 3.9.4.4.1.2 Micronesian Megapode

The Micronesian megapode (Photo 3.9-3) is a medium-sized, stocky, brownish-black, ground-dwelling bird. In 1902, the Micronesian megapode was noted as common on Tinian. However, by 1949 these birds were difficult to locate (DoN 1997). Surveys conducted prior to 1999, and monthly surveys since 1999, have confirmed that the megapode occurs within the Military Lease Area on Tinian at very low numbers: one to three megapodes were detected, always individually, in 1985, 1995, 2000, 2001, 2004, 2005, 2009, and 2013. No megapodes were detected during surveys in 1999, 2002, 2003, 2006-2008, and 2014 (Krueger and O’Daniel 1999; Witteman 2001; Vogt 2006; DoN 2010b, 2012, 2014b). All megapode detections have been from the Mount Lasso area, the Maga area (south of Lake Hagoi), and a small area of native forest adjacent to Cross Island Road in the southern portion of the Tinian Military Retention Land for Wildlife Conservation (see Figure 3.9-3). Occasional sightings of megapodes on Tinian may be a result of the movement of transient birds from Aguiguan or Saipan, as there is not a resident breeding population on Tinian at this time (DoN 2013c).

### 3.9.4.4.1.3 Mariana Fruit Bat

Tinian once supported a large number of Mariana fruit bats (Photo 3.9-4). After World War II, however, it was estimated that only 5% of the native forest cover remained on Tinian. Habitat loss and poaching are thought to be the primary reasons for the current near-absence of Mariana fruit bats on the island. No permanent fruit bat colony exists on Tinian. However, bats may fly between islands in the southern Marianas, including Aguiguan (DoN 2013c;
Mildenstein and Mills 2013). Within the Military Lease Area, fruit bats have been observed associated with the native limestone forest in the cliff-line forest in the Maga region north of Mount Lasso, and at other locations in western Tinian (see Figure 3.9-3). There have been sightings of two (in 1979), and as many as four fruit bats (in 1983-1984) in the Kastiyu forest, south of the Military Lease Area. No fruit bats were observed during 1994 and 1995 surveys at five observation stations. However, there were two incidental observations during the 1994-1995 study period, one near San Jose village and one near the south end of the island. No fruit bats were observed during surveys in 2000, 2001, or 2008. The highest number of recent sightings from Tinian occurred in 2005 when approximately five individuals were sighted in cliff-line forest in the Maga region. In 2008, fruit bat surveys were conducted at eight separate count stations at seven locations on Tinian but no bats were observed (Brooke 2009; DoN 2010b, 2013c).

### 3.9.4.4.1.4 Pacific Sheath-tailed Bat

The Pacific sheath-tailed bat (*Emballonura semicaudata rotensis*) is endemic to the Mariana Islands, with populations historically occurring on Guam, Rota, Saipan, Tinian, Aguiguan, and possibly Anatahan and Maug. The subspecies is currently known only from Aguiguan and is proposed for listing as endangered under the Endangered Species Act (U.S. Fish and Wildlife Service 2014). Surveys conducted in 2008 by U.S. Geological Survey biologists, using echolocation stations in native limestone forest, resulted in no detections of sheath-tailed bats on Tinian (U.S. Fish and Wildlife Service 2009). The Pacific sheath-tailed bat is presumed to no longer exist on Tinian and is not discussed further in this EIS/OEIS. This species is being addressed in the Biological Assessment in support of Endangered Species Action section 7 conferencing with the U.S. Fish and Wildlife Service.

### 3.9.4.4.1.5 Sea Turtles

Both the green and the hawksbill sea turtles are known to nest on Tinian (DoN 2010a, 2011, 2012, 2013c). Beaches within the Military Lease Area are surveyed monthly for sea turtle activity (i.e., crawls, nests, potential nests, and body pits). The occurrence of sea turtle nesting activities on land is covered in this section, and occurrence in the nearshore waters is discussed in Section 3.10, Marine Biology.

Green sea turtle abundance and density is highest along the island’s relatively uninhabited east coast (Kolinski 2001). For successful nesting, green sea turtles require deep sand beaches with open ocean exposure and minimal disturbance (DoN 2010b, 2012). Of the 13 distinct beaches or beach complexes on Tinian that could support nesting, 10 are within the Military Lease Area, and 6 of these have been surveyed monthly since 1998: Unai Chulu, Unai Lam Lam, Unai Chiget, Unai Dankulo, Unai Masalok, and Unai Babui (see Figure 3.9-3). Unai Dankulo consists of 13 pocket beaches, separated by rocky outcrops and fronted by a coral reef system (DoN 2014c).

Over 10 years (1998-2007) of monthly nesting beach surveys, data indicate that Unai Dankulo is the beach most used by sea turtles (DoN 2014c). Nearly 50% of all sea turtle activity on the 6 regularly surveyed Military Lease Area beaches was observed on 2 of the 13 pocket beaches at Unai Dankulo. These surveys also indicated that nesting activity is variable, with relatively high levels of activity in 1999 and 2005, and little to no activity in 1998, 2000-2004, 2006, and 2007 (DoN 2014c).

Based on the 1998-2007 surveys, it was believed that green sea turtle nesting activity would occur as early as late January and end in mid-July on most of Tinian’s sandy beaches (DoN 1997). Surveys since October 2008, however, have indicated that nesting activity occurs during all months of the year. These
more recent surveys also indicated a substantial increase in overall sea turtle nesting activity (DoN 2014c), with 2010 and 2012 having the greatest nesting activity. In addition, 2012 was the first year in which Unai Dankulo was not an active nesting beach. Conversely, in 2012, Unai Babui was among the most active beaches despite its complete lack of nesting activity during the previous 10 years of surveys (DoN 2014c). On Tinian, the green sea turtle is threatened by increased human presence, coastal construction, algae/seagrass/reef degradation, and illegal harvesting (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998).

Hawksbill sea turtles use both low- and high-wave energy nesting beaches on insular and mainland sites in tropical oceans of the world. Hawksbills will nest on small pocket beaches and, because of their small body size and great agility, can traverse fringing reefs that limit access to other sea turtle species (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998b). Hawksbill sea turtles are rare on Tinian beaches, and no hawksbill sea turtles were recorded during a 13-month survey in 1994-95 (DoN 2010b). Only one hawksbill nest, found in 2010 at Unai Dankulo, has been observed during monthly surveys from 1999 through 2012 (DoN 2013c). On Tinian, the hawksbill sea turtle is primarily threatened by direct takes from humans. Historically, hawksbill sea turtles have been taken for trade (e.g., tortoiseshell crafts) and, to a lesser extent, for food. Although hawksbill sea turtle eggs are readily consumed, adults are not valued as highly as green sea turtles for food. This may be due to their poor taste and sporadic fatal poisonings from their occasional toxicity (National Oceanic and Atmospheric Administration 1998).

3.9.4.4.1.6  Slevin’s Skink

Slevin’s skink (Emoia slevini), a lizard species, is endemic to the Mariana Islands and is proposed for listing as endangered under the Endangered Species Act (U.S. Fish and Wildlife Service 2014). The species historically occurred on Guam, Rota, Tinian, and Aguiguan. Surveys over the past three decades have indicated Slevin’s skink populations on Guam (Cocos Island), Sarigan, Guguan, Alamagan, Pagan, Asuncion, and Maug (U.S. Fish and Wildlife Service 2014). The species was last observed on Tinian in the 1940s (U.S. Fish and Wildlife Service 2009). Slevin’s skink is presumed to no longer exist on Tinian and is not discussed further in this EIS/OEIS. This species is being addressed in the Biological Assessment in support of Endangered Species Action section 7 conferencing with the U.S. Fish and Wildlife Service.

3.9.4.4.1.7  Humped Tree Snail

The humped tree snail is a species proposed for listing as endangered under the federal Endangered Species Act (U.S. Fish and Wildlife Service 2014). It was historically present on Tinian but was thought to no longer occur on the island because of the presence of the predatory manokar flatworm and rosy wolf snail (Euglandina rosea), the severe loss of native limestone forest habitat, and because it had not been observed on Tinian since 1970 (Berger et al. 2005; DoN 2010b; U.S. Fish and Wildlife Service 2012b; Holland and Sischo 2013). However, surveys from June 22-27, 2013, performed in support of this EIS/OEIS, documented two discrete populations of the humped tree snail within native limestone forest along Lamanibot Bay, which is known locally as Dump Coke (see Figure 3.9-3). A total of 92 individuals were counted between the two sites, including adults, subadults, and juveniles (DoN 2014a). Aged humped tree snail shells were also observed on the ground in native limestone forests in the vicinity of Unai Chiget, south of Lake Hagoi in the Maga area, the Mount Lasso area, and Unai Masalok (DoN
2010b; Holland and Sischo 2013). For more detailed information on the 2013 tree snail surveys, refer to Appendix L, Biological Resources Supporting Documentation.

3.9.4.1.8 Cycas micronesica

*Cycas micronesica* is a tree currently known to occur in the forest and savanna ecosystems of Guam, Rota, Palau, and Yap (Raulerson 2006; U.S. Fish and Wildlife Service 2014), and was recently reported on Pagan (Pratt 2010). *C. micronesica* is not known historically from Tinian. On Guam *C. micronesica* is severely impacted by Asian cycad scale (*Aulacaspis yasumatsui*), the non-native cycad blue butterfly (*Chilades pandava*), and non-native ungulates (e.g., Philippine deer [*Rusa marianna*], water buffalo [*Bubalus bubalis*], and feral pigs [*Sus scrofa*]) (Marler and Lawrence 2012). As a result, DoN has been collaborating with others on a conservation project for *C. micronesica* on Tinian. Following the cycad scale outbreak on Guam in the mid-2000s, in 2005 Joint Region Marianas collected 3,000 cycad seeds from Guam, cleaned the seeds of scale insects, and germinated and raised seedlings in a nursery on Tinian. In 2008, 1,000 of the cycad seedlings were planted in native limestone forest on Tinian. The outplanted cycads on Tinian have since been monitored monthly. As of April 2012, there has been an 81% survivorship of these seedlings (Brooke 2012). Although a *C. micronesica* population thus now occurs on Tinian, it is considered to be an experimental population and was not included within the species’ range in the proposed rule to list *C. micronesica* as a threatened species under the Endangered Species Act (U.S. Fish and Wildlife Service 2014).

3.9.4.1.9 Heritiera longipetiolata

*Heritiera longipetiolata* is a tree species reported from Guam, Saipan, and Tinian (Raulerson 2006) and is known outside the Marianas only from Pohnpei (Costion and Lorence 2012). The species has been proposed for listing as endangered under the federal Endangered Species Act (U.S. Fish and Wildlife Service 2014). Within the Military Lease Area it has been found in coastal forests near Unai Masalok on the east coast and along the Lamanibot Bay (Dump Coke) escarpment (Hawaiian Agronomics International, Inc. 1985). It has also been observed south of the Military Lease Area in native limestone forest along Tinian’s southeastern coast, between Puntan Barangka and Puntan Kastiyu (DoN 2014a; U.S. Fish and Wildlife Service 2014).

3.9.4.1.10 Dendrobium guamense

*Dendrobium guamense* is an orchid species that grows on tree trunks and branches in forest habitats and has been proposed as endangered under the Endangered Species Act. *D. guamense* is known historically from Guam, Rota, Saipan, and Tinian. Currently, a single population of *D. guamense* is known within the Military Lease Area on Tinian, near Unai Dankulo on the east coast (U.S. Fish and Wildlife Service 2014; U.S. Fish and Wildlife Service, R. Rounds, personal communication, 2014).

3.9.4.1.11 Solanum guamense and Tuberolabium guamense

*Solanum guamense*, a shrub in the nightshade family, and *Tuberolabium guamense*, an orchid species, are proposed for listing as endangered under the Endangered Species Act. Although *Solanum guamense* is known historically from Guam, Rota, Saipan, Tinian, Asuncion, Guguan, and Maug, the species is currently known from just a single individual on Guam. *Tuberolabium guamense* is known historically from Guam, Rota, Tinian, and Aguiguan, but it is now known only from a single individual on Guam and two occurrences on Rota (U.S. Fish and Wildlife Service 2014). Both plant species are presumed to no
longer exist on Tinian and are not discussed further in this EIS/OEIS. These species are being addressed in the Biological Assessment in support of Endangered Species Action section 7 conferencing with the U.S. Fish and Wildlife Service.

### 3.9.4.4.2 Species Protected under the Migratory Bird Treaty Act

A total of 39 bird species observed on Tinian, including the Mariana common moorhen discussed above, are protected under the Migratory Bird Treaty Act (Table 3.9-4).

| Barn swallow (Hirundo rustica) | Mariana fruit dove (Ptilinopus roseicapilla) |
| Black kite (Milvus migrans)    | Marsh sandpiper (Tringa stagnatilis)         |
| Black noddy (Anous minutus)    | Northern pintail (Anas acuta)                 |
| Black-crowned night heron (Nycticorax nycticorax) | Northern shoveler (Anas clypeata) |
| Black-winged stilt (Himantopus himantopus) | Pacific golden plover (Pluvialis fulva) |
| Brown booby (Sula leucogaster) | Pacific reef heron (Egretta sacra)           |
| Brown noddy (Anous stolidus)   | Ruddy turnstone (Arenaria interpres)         |
| Collared kingfisher (Todiramphus chloris) | Sooty tern (Onychoprion fuscatus) |
| Common sandpiper (Actitis hypoleucos) | Spectacled tern (Onychoprion lunatus) |
| Common tern (Sterna hirundo)   | Swinhoe’s snipe (Gallinago megala)          |
| Eastern cattle egret (Bubulcus coromandus) | Tufted duck (Aytha fuligula) |
| Eurasian coot (Fulica atra)    | Wandering tattler (Tringa incana)            |
| Eurasian wigeon (Anas penelope) | Whitebrel (Numenius phaeopus)                |
| Gadwall (Anas strepera)        | White-tailed tropicbird (Phaethon lepturus)  |
| Garganey (Anas querquedula)    | White tern (Gygis alba)                      |
| Grey-tailed tattler (Tringa brevipes) | White-throated ground-dove (Gallicolumba xanthonura) |
| Green-winged teal (Anas carolinensis) | White-winged tern (Chlidonias leucopterus) |
| Intermediate egret (Egretta intermedia) | Wood sandpiper (Tringa glareola)            |
| Lesser sand plover (Charadrius mongolus) | Yellow bitttern (Ixobrychus sinensis) |
| Mariana common moorhen (Gallinula chloropus guami) |


Numerous grey-tailed tattlers and wandering tattlers, Pacific reef herons, black noddies, and white terns (including one large colony of more than 30 birds), all protected under the Migratory Bird Treaty Act, were recorded during 2008 shoreline surveys of the Military Lease Area. More shorebirds and seabirds were observed along the western coastline that consists of flat coralline shelves along the water with large boulders in the bays and protection from the prevailing winds (Kessler 2009).

In support of this EIS/OEIS, forest bird surveys were conducted in June 2013 along transects previously surveyed by the U.S. Fish and Wildlife Service in 1982, 1996, and 2008 (Camp et al. 2012; DoN 2014a). Three species protected under the Migratory Bird Treaty Act were detected, including collared kingfisher, Mariana fruit dove, and white-throated ground-dove. Based on these surveys, estimates of species abundance and density on Tinian are available, and detailed discussion is provided below.
3.9.4.4.2.1 Collared Kingfisher

Abundance estimates for collared kingfishers across the four survey efforts (1982, 1996, 2008, and 2013) varied greatly, with a high of approximately 7,300 birds in 2008, and a low of 842 birds in 1982. While the 2013 estimates showed a decrease in kingfisher abundance and density compared to 2008, the 2013 estimates were similar to the 1996 estimates. In terms of abundance and density by habitat type, there were significant decreases in density from 2008 to 2013 in limestone forest, secondary forest, and tangantangan habitats. Although there was a decrease in abundance and density from 2008 to 2013, the overall trend for collared kingfisher abundance and density since 1982 is increasing (DoN 2014a).

3.9.4.4.2.2 Mariana Fruit Dove

Abundance estimates for Mariana fruit doves across the four survey efforts varied from a high of approximately 6,600 birds in 1982, to a low of 2,445 birds in 1996. In terms of abundance and density by habitat type, there were decreases in density from 2008 to 2013 in herbaceous-scrub and tangantangan habitats. The overall trend for Mariana fruit dove abundance and density since 1982, however, is increasing (DoN 2014a).

3.9.4.4.2.3 White-throated Ground-Dove

Abundance estimates for white-throated ground-doves across the four survey efforts varied greatly and showed an increase across all years, with a high of approximately 4,500 birds in 2013, and a low of 535 birds in 1982. In terms of abundance and density by habitat type, there were no significant changes in density from 2008 to 2013. Overall, the trend for white-throated ground-dove abundance and density since 1982 is increasing (DoN 2014a).

3.9.4.4.3 CNMI-Listed Species

The Mariana common moorhen, Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are all CNMI-listed threatened/endangered species. These species are discussed above within the Federal Endangered Species Act-listed and Proposed Species section. One other species, the Micronesian gecko, is a CNMI-listed species.

3.9.4.4.3.1 Micronesian Gecko

The Micronesian gecko is native to Micronesia and is the only CNMI-listed threatened/endangered terrestrial reptile in the CNMI. This gecko has never been abundant on Tinian. It was believed to no longer exist on the island after 1946 but was collected in southern Tinian in August 2003, was sighted in 2007 near Mount Lasso, and was collected in limestone forest on Mount Lasso in 2008 (see Figure 3.9-3) (Rodda et al. 2009; DoN 2010b).

3.9.5 Pagan

3.9.5.1 Vegetation Communities

Pagan consists of two high volcanic cones connected by a wide, low isthmus. A 2010 vegetation survey found that the vegetation communities have been shaped by three primary forces: (1) cultivation and alteration of land cover by humans; (2) grazing and browsing actions of feral domestic animals; and (3) volcanic eruptions that have produced vast quantities of lava and fragmented material (Pratt 2010).
A total of 215 vascular plant species were observed in the 2010 survey. An additional 84 vascular plant species not observed in the 2010 survey were observed in previous vegetation surveys for a total of 299 plant species recorded on Pagan (Pratt 2010).

Non-native plants make up a significant component of the flora of Pagan, with the number of non-native species increasing over the last 50 years. Fosberg (1958, 1960) compiled a list of plant species reported from Pagan based on collections from 1930-1950 and listed 59 non-native plant species and 8 intentional Chamorro introductions. The 2010 vegetation survey documented 102 non-native plant species, an increase of 35 species or 52% since 1950. New non-native plant species recorded in 2010 included ivy gourd (*Coccinia grandis*), which is a serious, rapidly growing pest. Because non-native plant introductions are occurring at a rapid pace and occur over large areas of the island, they are considered a substantial threat to ecosystem health on Pagan (Pratt 2010).

Surveys in 2000 and 2010 found the island’s forests and grasslands “severely overgrazed” due to the abundance of feral cattle, goats, and pigs that have done considerable damage to island vegetation. Overgrazing has resulted in large open areas susceptible to soil erosion. There is a significant lack of native ground cover, deterioration of the forest cover, and a distinct browse line within the vegetation communities where grazing by non-native ungulates (e.g., cattle, goats, pigs) is seen (Cruz et al. 2000; Kessler 2011a).

Supplementing the vegetation survey by Pratt (2010), vegetation communities on Pagan were mapped by Rogers (2010) and are shown in Figure 3.9-5 with the acreages listed in Table 3.9-5.

<table>
<thead>
<tr>
<th>Vegetation Community</th>
<th>Acres</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casuarina Forest</td>
<td>3,197</td>
<td>27.8</td>
</tr>
<tr>
<td>Barren (lava or cinder)</td>
<td>2,531</td>
<td>22.0</td>
</tr>
<tr>
<td>Grassland</td>
<td>1,706</td>
<td>14.8</td>
</tr>
<tr>
<td>Herbaceous-Scrub</td>
<td>1,362</td>
<td>11.8</td>
</tr>
<tr>
<td>Barren (bare ground)</td>
<td>937</td>
<td>8.1</td>
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<tr>
<td>Coconut Forest</td>
<td>858</td>
<td>7.5</td>
</tr>
<tr>
<td>Native Forest</td>
<td>418</td>
<td>3.6</td>
</tr>
<tr>
<td>Mixed Native-Introduced Forest</td>
<td>398</td>
<td>3.5</td>
</tr>
<tr>
<td>Water (Lake)</td>
<td>67</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Sand</td>
<td>28</td>
<td>&lt;1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>11,502</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 3.9-5. Vegetation Communities – Pagan**

Source: Rogers 2010.

Current Pagan vegetation communities described below are based on Rogers (2010) and Pratt (2010).

### 3.9.5.1.1 Casuarina Forest

This vegetation community consists of forests of pure ironwood or dominated by ironwood. This species is generally accepted as native to the Mariana Islands and seems to be an early successional species that then deters the growth of other species due to a dense layer of fallen needle-like branches that have compounds inhibiting the growth, survival, and reproduction of other plant species within the immediate vicinity (Pratt 2010).
3.9.5.1.2 Barren (Lava, Cinder, or Ground)

Barren areas of lava or cinder are found on the northern half of Pagan and consist of land completely covered by volcanic material. Areas of barren ground not covered by lava do not support any vegetation and are found island-wide.

3.9.5.1.3 Grassland

This vegetation community consists of either swordgrass (*Miscanthus floridulus*) or golden false beardgrass (*Chrysopogon aciculatus*), sometimes mixed with Siam weed (*Chromolaena odorata*) (Rogers 2010). Pratt (2010) noted that swordgrass appears to be the dominant grass in the isthmus connecting the northern and southern parts of the island, but other grass species are dominant in northern Pagan.

3.9.5.1.4 Herbaceous-scrub

This vegetation community is open or lava-covered land with a discontinuous canopy cover of grass, shrubs, and/or trees. Rogers (2010) mapped this community in northern Pagan as “lava scrub” or “scrub.” Scrublands on northern Pagan occur on relatively young substrates and primarily are composed of native species such as hopseed bush (*Dodonaea viscosa*).

3.9.5.1.5 Coconut Forest

Coconut forest vegetation communities are prominent on both northern and southern Pagan. Groves of coconut palm are generally in areas formerly used as coconut plantations, and some areas may have been developed during initial habitation by Chamorro people (Pratt 2010). Coconut forests, typically composed of three to eight native tree species in the canopy (Pratt 2010), were estimated to cover 19% of the island in 2000 (Cruz et al. 2000). Rogers (2010) identified a reduced cover of only 7.5%.

3.9.5.1.6 Native Forest

Native forest has been significantly reduced on Pagan by World War II, widespread planting of non-native species, non-native ungulate grazing, periodic development, deforestation, and volcanic eruptions. Native forests on Pagan are important as this habitat provides for the majority of Pagan’s native species, including special-status species, as well as maintaining water quality and reducing fire risk (Morton et al. 2000; Tang et al. 2011; DoN 2014a).

Native forests on northern Pagan, other than those dominated by ironwood, are observed at the base of the old caldera wall north of the isthmus, and growing on rocky substrates of the northeastern slopes. Species include *Aglaia mariannensis*, *Psychotria mariana*, *Neisosperma oppositifolia*, and *Ochrosia mariannensis* (Pratt 2010).

Prior to the 1981 eruption of Mount Pagan and the release and increase in feral animals, native broad-leaf forests were more widespread. Fosberg (1960) reported these forests in the vicinity of Sanhalom Lake (i.e., Upper Lake), and from the north and south slopes of Mount Pagan. In 2010, Sanhalom Lake was surrounded by ironwood forest, with only scattered individuals of other plant species. The release and increase in feral animals also impacted native forests in other areas on Pagan (Pratt 2010).

Common tree species of native forests on southern Pagan include ironwood and the small trees *Aglaia mariannensis* and *Psychotria mariana*. Several uncommon or rare species, some of which were new records for Pagan during the 2010 surveys, were noted in an area referred to as “cycad ravine” in
southern Pagan. This includes *Cycas micronesica*, *Chamesyce serrulata*, *Cordia subcordata*, *Cynometra ramiflora*, *Pisonia grandis*, and *Melochia villosissima*. The rugged nature of the southern forests, the lack of grazing cattle, and the lack of recent cultivation of land have likely been the reason for the presence of a greater native woody plant diversity and abundance in the south versus the north (Pratt 2010).

### 3.9.5.1.7 Mixed Native-introduced Forest

The mixed native-introduced forest vegetation community is a general category for forests that do not fall within another category (Rogers 2010). These forests are often dominated by one or more of the native trees *Aglaia mariannensis*, *Psychotria mariana*, ironwood, *Neisosperma oppositifolia*, or *Ochrosia mariannensis*, and the introduced tangantangan or physic nut (*Jatropha curcas*).

### 3.9.5.1.8 Water (Lake)

This community consists of two lakes: Lagunas Sanhalom and Sanhiyon (Upper Lake and Lower Lake, respectively).

### 3.9.5.1.9 Sand

Sand occurs on the beach areas.

### 3.9.5.1.10 Rare Plants

Several species were noted as rare in the 2010 survey.

*Chamaesyce serrulata*, a small shrub, was present in southern Pagan. The description in Pratt (2010) noted that this species was previously known only from the southern Marianas (Fosberg et al. 1979). Synonym names for the species were listed as present on Pagan in Raulerson’s (2006) checklist of the Mariana Islands. Based on this information, the taxonomy of this species is unclear. *Chamaesyce serrulata* is not on the Costion and Lorence (2012) Micronesia endemics list. No other definitive information about the species, including its current status on other Mariana Islands, is known.

*Hedyotis scabridifolia*, a shrub, was listed in Pratt (2010) but was not documented during the 2010 survey. This species is listed as present on Pagan and Saipan by Raulerson (2006), and is listed as being an endemic species to the Mariana Islands (Costion and Lorence 2012). Wagner et al. (2012) specifies two varieties, var. *stonei* (present on Guam and Rota) and var. *scabridifolia* (present on Saipan). The omission of Pagan as a location for the variety *scabridifolia* on the Wagner et al. (2012) list may be in error because its presence on Pagan was reported by Fosberg et al. (1975) and Raulerson (2006). The eruptions in 1981 and 1986 would have eliminated the species from Mount Pagan because lava flows destroyed the area where this species was formerly reported to have occurred.

*Ischaemum longisetum* var. *raulersoniae* is a grass reported by Pratt (2010) as rare but present near the peaks of southern Pagan. This species is reported as native to the Mariana Islands (Costion and Lorence 2012), with the variety found on Pagan reported on four other northern Mariana islands (Raulerson 2006).

*Lagenophora lanata* is a small herb in the composite family occurring widely on southwestern Pacific islands. Prior to its reported occurrence near the southern peaks on Pagan by Pratt (2010), this species had been previously reported only from the Mariana Islands on Alamagan (Raulerson 2006). The current status of the species on other Mariana Islands is unknown.
3.9.5.2 Native Wildlife

Based on previous island-wide wildlife surveys that were conducted between 2000 and 2010, the following native terrestrial wildlife species have been observed on Pagan: 15 birds, 1 mammal, 7 reptiles, and over 400 invertebrate species (Cruz et al. 2000; Commander, U.S. Naval Forces Marianas 2004; Berger et al. 2005; Marshall and Amidon 2010; Reed et al. 2010; Vogt 2010a, 2010b; Kessler 2011b). Special-status species are addressed separately under Section 3.9.5.4, Special-status Species.

3.9.5.2.1 Birds

Within the last decade, 15 landbird, seabird, and wetland bird species were observed during surveys on Pagan. All are protected under the Migratory Bird Treaty Act except for the Micronesian starling, Micronesian honeyeater, and Micronesian megapode (U.S. Fish and Wildlife Service 2013) (see Section 3.9.5.4, Special-status Species for a list of those protected under the Migratory Bird Treaty Act). The most commonly observed birds during the 2010 survey were the Micronesian starling, Micronesian honeyeater, white tern, and collared kingfisher (Marshall and Amidon 2010; Kessler 2011b). The Endangered Species Act-listed Micronesian megapode is discussed below in Section 3.9.5.4, Special-status Species.

3.9.5.2.2 Mammals

Only one native terrestrial mammal species is currently known to occur on Pagan, the endangered Mariana fruit bat. This species is discussed in Section 3.9.5.4, Special-status Species.

3.9.5.2.3 Reptiles

Native reptile species found during the 2010 surveys include mourning gecko, Indo-Pacific house gecko, Pacific slender-toed gecko (*Nactus pelagicus*), Pacific blue-tailed skink, oceanic snake-eyed skink, and Brahminy blindsnake. Slevin’s skink is proposed for listing under the Endangered Species Act and is discussed in more detail in Section 3.9.5.4, Special-status Species.

The occurrence of the federal Endangered Species Act-listed green and hawksbill turtles in the marine environment is addressed in Section 3.10, Marine Biology, and potential beach nesting areas are discussed in Section 3.9.5.4, Special-status Species.

3.9.5.2.4 Amphibians

There are no native amphibians on Pagan.

3.9.5.2.5 Invertebrates

A terrestrial arthropod survey conducted in 2010 identified 288 species, bringing the total number of known arthropod species on Pagan to 416. Eight of these species are endemic to Pagan (Evenhuis et al. 2010). Coconut crab populations have declined on Pagan within the last few decades, and only one crab was captured on Pagan during a recent 2010 survey. However, coconut crabs were common in the past on the southeast side of the island, which was not sampled in this study. The decline in the coconut crab population may be a result of feral pig depredation as well as direct mortality and degradation of habitat from the 1981 volcanic eruption. In addition to being a highly valued game species in the CNMI, coconut crabs serve important ecological functions as scavengers and seed dispersers (Vogt 2010a).
The humped tree snail is proposed for listing under the federal Endangered Species Act and is discussed in Section 3.9.5.4, Special-status Species.

### 3.9.5.3 Non-native Wildlife

#### 3.9.5.3.1 Birds

The only non-native bird species on Pagan is the red junglefowl (feral chicken).

#### 3.9.5.3.2 Mammals

Non-native mammals found on Pagan include the Oriental house rat (*Rattus tanezumi*), dogs, cats, pigs, goats, and cattle. It is unknown when these domesticated animals were first brought to Pagan, but it is assumed that the pigs and goats were first introduced in the 1600s with the Spanish and after that during attempts to colonize Pagan in the 1800s. Cattle were brought to the island during the German and Japanese administration (early 1900s) when the island was developed for copra production. All livestock were abandoned in 1981 following the volcanic eruption. Surveys of feral ungulates in 2010 resulted in island-wide estimates of approximately 260 cattle, 1,180 pigs, and 3,160 goats. Cattle were found only in northern Pagan, while pigs and goats were observed throughout the island. As a result of the feral ungulate populations, the island vegetation has a long history of being severely overgrazed, particularly in the north (Adams et al. 2010; Amidon et al. 2011; Kessler 2011a).

#### 3.9.5.3.3 Reptiles

Three non-native reptiles were observed during the 2010 survey: mutilating gecko, oceanic gecko, and mangrove monitor lizard. The mutilating gecko was the most common of the three, with densities of 202-364 per acre (500-900 per hectare). The oceanic gecko is currently rare on Pagan, with only two individuals found during the 2010 survey. These non-native geckos could pose a threat to native geckos. Only five observations of the mangrove monitor lizard were made during the 2010 survey. While the population size of the mangrove monitor lizard is unknown, there are thought to be scattered patches of higher densities, with it being more common on the southern peninsula. The mangrove monitor lizard may be a threat to megapodes as they are known to eat megapode eggs (Reed et al. 2010; Vogt 2010b).

#### 3.9.5.3.4 Amphibians

There are no non-native amphibians on Pagan.

#### 3.9.5.3.5 Invertebrates

The highly invasive, non-native crazy ant (*Anoplolepis gracilipes*) is abundant on Pagan. This species can form super colonies, and when they occur in high densities, can devastate plant and invertebrate organisms, thereby posing a potential threat to food resources of the Mariana fruit bat and Micronesian megapode. No super colonies were observed during 2010 surveys, and it is believed that they currently pose no direct threats to megapode or fruit bat populations (Evenhuis et al. 2010).

Evidence of three non-native snail species was found during the 2010 surveys. One single living giant African snail was found along with shells of the land snail *Subulina octona* and the predatory snail *Gonaxis kibweziensis*. These species were observed during surveys on Pagan in 1949 and 1994 and at that time were widely dispersed. The giant African snail was likely introduced for food, while *G.
kibweziensis was introduced to control the giant African snail, and S. octona was most likely introduced by accident on food plants from human migrations (Hadfield 2010).

### 3.9.5.4 Special-status Species

#### 3.9.5.4.1 Federal Endangered Species Act-listed and Proposed Species

Eight federal Endangered Species Act-listed threatened, endangered, or proposed species have been observed on Pagan (Table 3.9-6 and Figure 3.9-6). These species are discussed below. Two other federally listed species, the nightingale reed-warbler (Acrocephalus luscinia) and Mariana common moorhen, are presumed to no longer exist on Pagan (Marshall and Amidon 2010) and are not discussed further.

#### Table 3.9-6. Occurrence of Federally Endangered Species Act-Listed and Proposed Species and CNMI-Listed Species on Pagan

<table>
<thead>
<tr>
<th>English Name</th>
<th>Status*</th>
<th>Habitat</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micronesian megapode</td>
<td>E</td>
<td>E/T</td>
<td>Limestone forest, mixed native-introduced forest, and coconut forest. In 2010, approximately 147 birds were estimated to occur on Pagan.</td>
</tr>
<tr>
<td>Mariana fruit bat</td>
<td>T</td>
<td>E/T</td>
<td>Limestone forest, coastal forest, and coconut forest. Two colonies in the southeast and one in the northeast portions of Pagan, consisting of an estimated 1,017 individuals.</td>
</tr>
<tr>
<td>Green sea turtle</td>
<td>T</td>
<td>E/T</td>
<td>Suitable beaches for basking andnesting.†</td>
</tr>
<tr>
<td>Hawksbill sea turtle</td>
<td>E</td>
<td>E/T</td>
<td>Mid-elevation closed humid forest and montane forest ecosystems. Although Slevin’s skink was not observed during the 2010 surveys on Pagan, it was collected during a survey in 1999 on the southern part of the island.</td>
</tr>
<tr>
<td>Slevin’s skink</td>
<td>PE</td>
<td>-</td>
<td>Intact native forest. Found within the ancient caldera rim of South Pagan volcano.</td>
</tr>
<tr>
<td>Humped tree snail</td>
<td>PE</td>
<td>-</td>
<td>Forest and savanna ecosystems. Recently reported on Pagan in ravines of the southern part of the island.</td>
</tr>
<tr>
<td>Cycas micronesica</td>
<td>PT</td>
<td>-</td>
<td>Forest ecosystems. Historically this species occurred on Pagan, but has not been observed since 1984.</td>
</tr>
<tr>
<td>Bulbophyllum guamense</td>
<td>PE</td>
<td>-</td>
<td>Forest ecosystems.</td>
</tr>
</tbody>
</table>

**Legend:** *E = endangered; ESA = federal Endangered Species Act; PE = proposed endangered; PT = proposed threatened; T = threatened; E/T = the CNMI Administrative Code does not specify whether a species is threatened or endangered: all species are considered threatened and endangered; - = not listed.  
†Occurrence of sea turtles in the marine environment is addressed in Section 3.10, Marine Biology.

**Sources:** Hadfield 2010; Marshall and Amidon 2010; Valdez 2010; Amidon et al. 2011; U.S. Fish and Wildlife Service 2012a, 2014.
Note: Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.
3.9.5.4.1.1 Micronesian Megapode

The Micronesian megapode has been extirpated (i.e., no longer exists) on Guam and Rota, two of the largest southern Mariana Islands, and large populations are only found on three uninhabited northern islands: Sarigan, Guguan, and Asuncion. Megapodes were reported common on Pagan in the 1950s and 1960s; however, populations have been reported low since Mount Pagan’s 1981 eruption that buried at least one nesting area. During surveys in 2010, megapodes were observed only within the southern portion of Pagan within *Casuarina*, coconut, and mixed native-introduced forests (see Figure 3.9-6).

Based upon the 2010 surveys, it was estimated that there were approximately 147 Micronesian megapodes on Pagan. This estimate was slightly higher than the 1990s and 2000 surveys that estimated 50-100 and 134 birds, respectively. The main threats affecting this species are habitat loss and degradation mainly due to forest clearing and browsing by feral goats, pigs, and cattle, and depredation by introduced species, including mangrove monitor lizards, pigs, dogs, and cats. Heavy grazing by feral livestock also prevents megapode occurrence on the northern half of the island (Amidon et al. 2011).

3.9.5.4.1.2 Mariana Fruit Bat

During surveys in 2010, two fruit bat colonies were observed on southern Pagan (Valdez 2010). One colony was estimated to have 347 bats, while the other colony was estimated to have 670 bats. The survey team also attempted to find a colony of an estimated 200 bats on northern Pagan that was reported by a field technician assisting with other biological surveys on Pagan in June 2010. However, this colony was not found during the July 2010 fruit bat surveys. The survey team suspected that fruit bats from the colony on the northern end may have moved to one or both of the two colonies on the southern end of the island.

During a helicopter flight over Pagan, the survey team noticed that the majority of food sources for the fruit bat were isolated in small patches on the northern end of the island and scattered along the ravines of the southern end of the island. It is thought that the Mariana fruit bat population on Pagan continues to be impacted by habitat degradation or loss from feral animals, as well as from illegal hunting (Valdez 2010).

3.9.5.4.1.3 Sea Turtles

No sea turtle nesting crawls were observed on Pagan’s eastern and western beaches during weekly beach surveys conducted by the CNMI Division of Fish and Wildlife sea turtle tagging team during the June 2010 surveys (Kessler 2011b). Sea turtle nesting on Pagan may be impacted by the high densities of feral pigs and cows using and degrading beach habitat. One juvenile green sea turtle was observed resting on Red Beach during the 2010 surveys (Kessler 2011b). In addition, seven beaches on Pagan were surveyed in July of 2013. No active or past nesting activity was observed on any of these beaches (DoN 2014c). The occurrence of sea turtles in the nearshore waters of Pagan is discussed in Section 3.10, Marine Biology.

3.9.5.4.1.4 Slevin’s Skink

Slevin’s skink is known to inhabit mid-elevation closed humid forest and montane forest ecosystems, with most individuals observed on the forest floor using leaf litter as cover. Occasionally, individuals have been observed in low hollows of tree trunks (U.S. Fish and Wildlife Service 2014). Surveys for terrestrial reptiles were conducted by U.S. Geological Survey biologists on Pagan in 2010 (Reed et al.
2010). Although Slevin’s skink was not observed during these surveys, the species was collected in the southern part of Pagan during a CNMI Division of Fish and Wildlife survey in 1999 (see Figure 3.9-6). Slevin’s skink may still be present on Pagan, but if so, it occurs in small numbers (Reed et al. 2010).

3.9.5.4.1.5 Humped Tree Snail

The distribution of the humped tree snail currently extends from Guam, north to Pagan and includes, or once included, populations on nine islands. During the 2010 surveys on Pagan, 345 humped tree snails were found within five survey transects located in the old caldera of the southern volcano (see Figure 3.9-6). The snails were found only in forests of mixed native vegetation with relatively dense understory and ground cover. The humped tree snail was not found in forests around Mount Pagan where the snail had been collected in 1949. Their absence in the north is most likely due to the impacts from the 1981 eruption and the intense grazing from feral cattle. Non-native snail species could also be a potential threat to the humped tree snail. Evidence of non-native predatory snail species *Gonaxis kibweziensis* was found on Pagan during the 2010 surveys (Hadfield 2010).

3.9.5.4.1.6 Cycas micronesica

*Cycas micronesica* is a tree currently known to occur in the forest and savanna ecosystems of Guam, Rota, Palau, and Yap (Raulerson 2006; U.S. Fish and Wildlife Service 2014), and was recently reported on Pagan in ravines of the southern part of the island (Pratt 2010).

3.9.5.4.1.7 Bulbophyllum guamense

*Bulbophyllum guamense* is an epiphytic orchid that occurs in mat-like formations on tree branches of forest ecosystems. Currently it is known from widely distributed occurrences on the southern Mariana Islands of Guam and Rota. Historically this species occurred on Pagan, but has not been observed since 1984 (U.S. Fish and Wildlife Service 2014).

3.9.5.4.2 Species Protected under the Migratory Bird Treaty Act

Twelve species that are protected under the Migratory Bird Treaty Act have been observed on Pagan (Table 3.9-7). The majority (nine species) are seabirds.

<table>
<thead>
<tr>
<th>Black noddy (<em>Anous minutus</em>)</th>
<th>Red-footed booby (<em>Sula sula</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown booby (<em>Sula leucogaster</em>)</td>
<td>Red-tailed tropicbird (<em>Phaeton rubricauda</em>)</td>
</tr>
<tr>
<td>Brown noddy (<em>Anous stolidus</em>)</td>
<td>Sooty tern (<em>Onychoprion fuscatus</em>)</td>
</tr>
<tr>
<td>Collared kingfisher (<em>Todiramphus chloris</em>)</td>
<td>White-tailed tropicbird (<em>Phaeton lepturus</em>)</td>
</tr>
<tr>
<td>Masked booby (<em>Sula dactylatra</em>)</td>
<td>White tern (<em>Gygis alba</em>)</td>
</tr>
<tr>
<td>Pacific reef heron (<em>Egretta sacra</em>)</td>
<td>White-throated ground-dove (<em>Gallicolumba xanthonura</em>)</td>
</tr>
</tbody>
</table>


3.9.5.4.3 CNMI-Listed Species

The federally listed Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are also listed as threatened/endangered by the CNMI. These species are discussed in detail above within the *Federal Endangered Species Act-listed and Candidate Species* section.
3.10 **MARINE BIOLOGY**

Section 3.10 describes the existing conditions of the marine biological resources in the waters surrounding Tinian and Pagan. The analysis of marine biology focuses on marine plants, animals, and habitats that are crucial to the functions of biological systems, of special public importance, or are protected under federal or local law or statute. When species are mentioned for the first time in this section they are introduced by common name, followed by the scientific name in parentheses; thereafter, only the common name is used. If there is no accepted English common name, then only the scientific name is used. Appendix L, *Biological Resources Supporting Documentation*, identifies the scientific and Chamorro and Carolinian names where applicable and provides more detailed information on special-status species found in the waters surrounding Tinian and Pagan. Appendix M, *Marine Biology Technical Memo and Survey Reports*, has additional information and details for information presented throughout this section.

The region of influence for marine biological resources generally includes the waters surrounding Tinian and Pagan from the shoreline to 3.0 nautical miles (5.6 kilometers) offshore. A larger region of influence of 7.3 nautical miles (13.6 kilometers) applies to the potential for behavioral effects to marine mammals from pile driving and extraction activities during construction.

### 3.10.1 Definition

The marine biology section is divided into five categories: marine habitat and essential fish habitat, marine flora, marine invertebrates, fish, and special-status species. Five species of sea turtles are potentially found within the CNMI waters, all of which are listed under the federal Endangered Species Act. Several marine mammals are listed under the Endangered Species Act and all are protected under the Marine Mammal Protection Act. Therefore, sea turtles and marine mammals are considered special-status species for the purposes of this EIS/OEIS.

#### 3.10.1.1 Marine Habitat and Essential Fish Habitat

The U.S. military is preparing an Essential Fish Habitat Assessment for the proposed action in accordance with the Magnuson-Stevens Act. Appropriate consultations with regulatory entities will be completed as part of the EIS/OEIS process, and relevant information will be included in the EIS/OEIS as applicable. Various agency consultations are underway as part of this EIS/OEIS process and as applicable will be summarized in the Final EIS/OEIS. A summary of the in progress assessment is presented in this section.

Due to the overlap of content, the marine habitats and Essential Fish Habitat discussions are both presented in this subsection. For the purposes of this EIS/OEIS, the term “marine habitat” refers to nonliving marine substrate supporting marine organisms within the nearshore waters surrounding Tinian and Pagan. “Essential Fish Habitat” includes marine habitat as well as certain ecological functions. The Magnuson-Stevens Fishery Conservation and Management Act (hereafter referred to as the Magnuson-Stevens Act) defines “Essential Fish Habitat” as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity. “Waters,” when used for the purpose of defining Essential Fish Habitat, include aquatic areas and associated physical, chemical, and biological properties.
used by fish; and may include historical areas of use, where appropriate. “Substrates” include sediment, hard bottom, underlying structures, and associated biological communities.

As a subset of Essential Fish Habitat, “Habitat Areas of Particular Concern” are specific areas that are essential to the life cycle of management unit species that meet one or more of the following criteria:

- The importance of the ecological function provided by the habitat
- The extent to which the habitat is sensitive to human-induced environmental degradation
- Whether, and to what extent, development activities are, or will be, stressing the habitat type
- The rarity of the habitat type

The marine habitat types within the region of influence were determined based on the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979) which groups and defines the habitat types by shared substrate characteristics and ecological functions. They are as follows:

- Hard shores/Rocky Shores (rocky intertidal)
- Soft Shores/Unconsolidated Shore (beaches/tidal delta/mudflats/tidal riverine/estuarine streambeds)
- Hard bottoms/Rocky Bottom (reef/seamount/hydrothermal vents)
- Soft bottoms/Unconsolidated Bottom (lagoons/abyssal plain)
- Aquatic beds (seagrass/Sargassum)

**Hard shores** are the most prevalent marine habitat in the CNMI, and the dominant marine habitat surrounding Tinian and Pagan due to their volcanic origins. Hard shores include aquatic environments that have at least 75% cover of stones, boulders, or bedrock and less than 30% vegetative cover. A diverse array of organisms is supported by the relatively stable rocky substrate provided by hard shores. Environmental gradients between hard shorelines and subtidal habitats are determined by wave action, depth, frequency of tidal inundation, and stability of substrate. Only rock outcrops may persist in areas of extreme wave energy. Boulders scattered in the intertidal and subtidal areas provide substrate for attached macroalgae and sessile (immobile) invertebrates. Plants and animals usually attach themselves to the rocky surfaces, while some animals hide in rocky crevices, under rocks, or burrow into finer substrate between boulders.

**Soft shores** include beaches, tidal flats, deltas, tidal rivers and estuarine systems. Soft shore habitats consist of unconsolidated substrates with less than 75% cover of stones, boulders, or bedrock and less than 30% vegetative cover other than pioneering plants. Pioneering plants are species that are the first to colonize previously disrupted or damaged ecosystems that become established during brief periods when growing conditions are favorable. The particle size of the substrate and the water regime are important factors determining the types of plant and animal present in the area. Soft shores can be irregularly exposed, regularly flooded, irregularly flooded, seasonally flooded, temporarily flooded, intermittently flooded, saturated, or artificially flooded. The distribution and composition of organisms within this habitat, particularly invertebrates, is determined by substrate particle size, the space between the substrate particles, wave action, currents, and salinity (Cowardin et al. 1979).

**Hard bottom** habitats in nearshore waters can include reefs and rocky bottoms colonized by dead and living sedentary invertebrates, such as coral reefs. Rocky bottoms in this habitat form as extensions of intertidal shores or isolated offshore outcrops (rock formations visible from the surface) (Cowardin et al. }
1979). Colonization of this substrate can be determined by the size and shape of the rocks, but also by the depth, less than 650 feet (200 meters), where there may be enough exposure to sunlight for photosynthesis to occur. This determines whether it is encrusted by algae or marine fauna, such as sponges, sea cucumbers, corals, and sea whips (DoN 2013a). Refer to Section 3.10.1.3, Marine Invertebrates, for more information on coral reefs.

**Soft bottoms** include all wetland and deepwater habitats with at least 25% cover of small unconsolidated substrate particles, such as stones and sands and less than 30% vegetative cover. The distribution and composition of organisms within this habitat is determined by exposure to wave action, sunlight, and duration of being underwater, which results in variations in temperature, salinity, and pH (Cowardin et al. 1979). Soft bottom habitats include lagoons, which are semi-enclosed bays between the shoreline and a fringing or barrier reef, generally with sandy bottoms and scattered coral mounds, rubble, seagrass, and algae (DoN 2013a). Soft bottoms are inhabited by soft-sediment communities of mobile invertebrates fed by benthic algae production, chemosynthetic microorganisms, and decaying organic matter sinking through the water column.

**Aquatic beds** include mangroves, seagrass beds and mats of floating seaweed that are generally found in the intertidal or shallow subtidal zone of nearshore waters, where the vegetation grows mainly on or below the water surface (Cowardin et al. 1979). Aquatic bed habitats can be subtidal, irregularly exposed, regularly flooded, permanently flooded, intermittently exposed, semi-permanently flooded intermittently exposed, semi-permanently flooded, or seasonally flooded. Seagrasses are living marine resources and biotic habitats where they dominate the intertidal or shallow subtidal zone, and are therefore not covered in this chapter. Section 3.10.1.2, Marine Flora, has more information on aquatic beds.

**3.10.1.2 Marine Flora**

Aquatic beds represent plant communities that require surface water for growth and reproduction. They are best developed in relatively permanent water or under conditions of repeated flooding. Plants are either attached to the substrate or float freely in the water above the bottom or on the surface. Aquatic beds include algae, aquatic moss, rooted vascular, and floating vascular species (Cowardin et al. 1979).

This *Marine Flora* section will focus on macroalgae and seagrasses as these communities are found within the region of influence. Algae are photosynthetic, nonvascular plants, commonly referred to as “seaweeds.” Algae live on substrates characterized by a wide range of sediment depths and textures and occur in both the subtidal and intertidal zones up to depths of 98 feet (30 meters) (Cowardin et al. 1979). In tropical regions, such as the CNMI, green algae, brown algae, and red algae are common. Algae are a main food source for sea turtles in the CNMI and within the region of influence.

Seagrasses are flowering marine plants that grow entirely underwater. Seagrasses normally occur in water less than 85 feet (26 meters). The distribution of seagrass is influenced by the availability of suitable soft substrates, such as sand or mud, in low wave energy areas at depths that allow sufficient light exposure (Spalding et al. 2003). Distribution and abundance of marine flora depends on several factors including light availability, water quality/clarity, salinity, type of seafloor substrate, currents, tides/water movement, and temperature (Spalding et al. 2003).
Seagrasses also provide a food source for sea turtles and habitat for fishes within the region of influence (Spalding et al. 2003). In addition, seagrasses play a major role in fisheries production and have been shown to provide protection from coastal erosion (Spalding et al. 2003).

### 3.10.1.3 Marine Invertebrates

Invertebrates are animals without backbones. Marine invertebrates are a large and diverse group that includes sponges, corals, snails, octopus, clams, lobsters, crabs, starfish, sea urchins, sea cucumbers, and marine worms (Eldredge 1983; DoN 2005).

True corals are categorized in the phylum Cnidaria which also includes fire corals, anemones, Portuguese man-o-war, jellyfish, box jellyfish and a variety of other related animals. Cnidarians have two basic body forms: free-swimming or floating medusa and sessile polyps. However, because many Cnidaria are colonial, both body forms can be found on some floating colonies such as the Portuguese man-o-war. Additionally, a single coral colony can be comprised of thousands of individual polyps, making it difficult to determine between a coral individual and a coral colony.

Corals are marine invertebrates in the class Anthozoa of the phylum Cnidaria that live individually or in colonies. Fire corals are not technically corals since they are part of the class Hydrozoa; however, fire corals are colonial marine organisms that look like true corals and are included in this discussion (DoN 2013a). Major groups of corals in the region of influence include:

- Stony corals (*Scleractinia*)
- Black and wire corals (*Antipatharia*)
- Soft corals (*Alcyonacea*, synonymous with horny corals and sea fans [*Gorgonacea*] and blue corals [*Helioporacea*])

The term “coral reef” refers to any reef, bank, or shoal comprised mostly of corals. “Reef ecosystem” includes coral and other species of reef plants and animals associated with coral reefs, and the physical environmental factors that directly affect coral reefs (Riegl and Dodge 2008; Brainard et al. 2011). Reefs are usually divided into four broad categories: barrier, bank, fringing, and patch reefs. The Mariana Islands are dominated by fringing reefs, with limited examples of barrier, bank, and patch reefs (Riegl and Dodge 2008; Brainard et al. 2011). Among the four reef types, fringing reefs are along a shoreline. Barrier, bank, and patch reefs do not require a shoreline (Riegl and Dodge 2008). Common reef morphology terms are tied to distinctive zones, which are created by differences in depth, wave action, current movement, light, temperature, and sediments along different parts of the reef. Zones are principally composed of the fore reef (adjacent to the reef crest and closer to the shore than the deep reef), reef crest (peak of the reef slope closest to the water surface and closer to the shore than the deep reef) and back reef (reef shoreward of the reef crest) (Riegl and Dodge 2008; DoN 2014a) (**Figure 3.10-1**). Reef flats (shallow zone located closest to shore), lagoons, and benches may be found shoreward of the reef crest. The fore reef, is often subdivided by depth (e.g., shallow and deep fore reef) or by geomorphology (e.g., spur-and-groove, apron, and sand channel). The fringing reefs of the Mariana Islands are predominately shore-attached with poorly-developed reef crests (Riegl and Dodge 2008; Brainard 2012), meaning the fore reef runs up to mean low water with little or no development of a reef crest between the fore reef and the shoreline. Typical reef crests and reef flats are less than 2 feet (0.6 meter) deep, with some grooves that are as much as 20 feet (6 meters) deep, but less than 3 feet (1 meter) wide (Smith 2012). In order of relative areal extent, fore reef is the most abundant habitat type in the Mariana Islands, followed by reef crest, and

![Figure 3.10-1 Typical Reef Zonation](image)

**Figure 3.10-1 Typical Reef Zonation**

*Note: This figure is intended as a simple representation of reef zonation. Actual zonation will vary reef to reef.*

### 3.10.1.4 Fish

Fish include aquatic animals with a hard bone or cartilage skull and gills, and that lack limbs or digits. Fish are not distributed uniformly throughout the region of influence; fish are closely associated with specific habitats. Fish species, such as large sharks, tuna, and billfishes, range across thousands of square miles; others, such as reef fishes, have small home ranges and restricted distributions (Helfman et al. 2009). The distribution and specific habitats of individual fish are influenced by a number of factors including its developmental stage, size, sex, and reproductive condition. This EIS/OEIS will focus mainly on reef fish.

Fisheries, in terms of habitat requirements, are discussed under *Essential Fish Habitat*. Recreation and commercial fishing are addressed in Section 3.8, *Recreation* and Section 3.15, *Socioeconomics and Environmental Justice*.

### 3.10.1.5 Special-status Species

Special-status species include: (1) those species that currently occur in the wild within the CNMI and are listed as threatened or endangered under the federal Endangered Species Act, (2) candidates or species proposed for listing under the federal Endangered Species Act, (3) those designated by legislative authority in the CNMI as threatened or endangered, (4) Species of Special Conservation Need as identified in the CNMI’s Comprehensive Wildlife Conservation Strategy, and (5) those species protected under the Marine Mammal Protection Act. Brief descriptions and life history information for special-status species, are detailed in Appendix L, *Biological Resources Supporting Documentation*. Special-status species within the region of influence of the proposed action include marine invertebrates, fish, sea turtles, and marine mammals. Marine invertebrates and fish are defined above.
Sea turtles, also referred to as marine turtles, are air-breathing reptiles that are found throughout the world’s tropical and subtropical ocean waters. Habitat use varies among species and within the life stages of individual species, correlating primarily with the distribution of preferred food sources, as well as the locations of nesting beaches. Sea turtle behaviors such as foraging, migrating, and resting take place in the marine environment, where they spend most of their lives. Generally, after hatching, young sea turtles spend time in the open ocean habitat before returning to nearshore foraging grounds. Green turtles have a mainly herbivore diet and feed on seagrasses and algae. Other sea turtle species are omnivores and eat a variety of plants and animals including jellyfish and sponges (Bjorndal 1997). This section addresses sea turtles in the marine environment, which fall under the jurisdiction of the National Marine Fisheries Service. Nesting sea turtles are addressed in detail in Section 3.9, Terrestrial Biology since they are terrestrial at the nesting stage and fall under the jurisdiction of the U.S. Fish and Wildlife Service.

Marine mammals are cited in the Marine Mammal Protection Act as mammals “morphologically adapted to the marine environment,” which include members of the orders Sirenia (i.e., manatees and dugongs), Pinnipedia (i.e., seals and sea lions), and Cetacea (i.e., whales, dolphins, and porpoises), as well as mammals that primarily inhabit the marine environment, such as sea otters (*Enhydra lutris*) and polar bears (*Ursus maritimus*). This EIS/OEIS discusses Cetacea as these are the only marine mammals species located within the region of influence. Sirenia and Pinnipedia will not be discussed in this document. In general, cetaceans are large animals with streamlined bodies that glide through the marine environment (National Oceanic and Atmospheric Administration 2014).

Critical habitat is defined in the federal Endangered Species Act as specific geographic areas essential to the conservation of a threatened or endangered species and may require special management and protection. Critical habitat has not been designated for any marine species within the CNMI.

### 3.10.2 Regulatory Framework

Several laws, regulations, plans, and policies are applicable to the proposed action for marine biological resources. A complete listing of applicable regulations for this EIS/OEIS is provided in Appendix E, Applicable Federal and Local Regulations.

#### 3.10.2.1 Federal Regulations

- Federal Endangered Species Act (16 U.S. Code §§ 1531–1544, as amended)
- Magnuson-Stevens Fishery Conservation and Management Act (16 U.S. Code §§ 703–712, as amended)
- Marine Mammal Protection Act (16 U.S. Code §§1361–1421h, as amended)
- Clean Water Act
  - Sections 401 & 404
- Executive Order 13089, Coral Reef Protection
- Executive Order 13112, Invasive Species
- Executive Order 13158, Marine Protected Areas
- Executive Order 13547, Stewardship of the Ocean, Our Coasts, and the Great Lakes
- Executive Order 12962, Recreational Fisheries, as amended by Executive Order 13474, Methodology
3.10.3 Methodology

Project-specific surveys were performed for coral, sea turtles, and marine mammals in support of this EIS/OEIS. Associated survey reports are in Appendix M, Marine Biology Technical Memo and Survey Reports. The Marine Biology Technical Memo, also included in Appendix M, provides detailed discussion of the coral communities at the beaches in order to support analysis of which coral resources may be affected by the proposed action, as well as details on the acoustic analysis pertaining to marine mammals. In addition, biological surveys that have been conducted in areas that encompass the region of influence were used as key sources of information for this section. A review of data and scientific literature provides an overview of marine resources in the region of influence for this EIS/OEIS.

The Mariana Archipelago Reef Assessment and Monitoring Program surveys, conducted by the National Oceanic and Atmospheric Administration Pacific Islands Fisheries Science Center’s Coral Reef Ecosystem Division, provide the basis of information presented in the Marine Flora and Fish sections. Marianas Archipelago Reef Assessment and Monitoring Program conducted surveys in 2003, 2005, and 2007 around the island and reefs of Guam and the CNMI to provide comprehensive information on the coral reef ecosystem including fish biomass and diversity and benthic habitats including occurrence and cover of macroalgae (both calcified and fleshy), crustose coralline red algae, and turf algae.

3.10.4 Tinian

3.10.4.1 Marine Habitat and Essential Fish Habitat

Due to the overlap of content, the marine habitats and Essential Fish Habitat discussions are both presented in this subsection. The Tinian coastline is generally lined with rocky intertidal areas, steep cliffs, and the occasional sandy beach or mudflat. Table 3.10-1 summarizes the amount of various physical characteristics (e.g., coastline, seafloor area, total reef habitat, and reef flat) for the Mariana Islands, southern CNMI, northern CNMI, and Tinian.

<table>
<thead>
<tr>
<th>Physical Characteristic</th>
<th>Mariana Islands</th>
<th>Tinian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastline</td>
<td>313 miles</td>
<td>38 miles</td>
</tr>
<tr>
<td>Seafloor area from 0-98 feet (0-30 meters) depth</td>
<td>49,984 acres</td>
<td>4,000 acres</td>
</tr>
<tr>
<td>Total Reef Habitat</td>
<td>65,920 acres</td>
<td>5,696 acres</td>
</tr>
<tr>
<td>Reef flat‡</td>
<td>1,728 acres mostly on Guam</td>
<td>64--96 acres</td>
</tr>
</tbody>
</table>

Notes: † Estimations. Estimates based on the sources below.

3.10.4.1.1 Hard Shores

Coastline within the region of influence for Tinian is dominated by hard shores and interspersed with soft shores. The hard shores primarily consist of rocky intertidal areas with steep cliffs and headlands, reinforced by large boulders at the base. Erosion and waves carve out these cliffs and create sea-level benches (DoN 2013a). From the base of these cliffs, the depth of nearshore waters increases rapidly to approximately 23 feet (7 meters) into spur-and-groove formations (hard bottom habitat) that support
high biological diversity. In order of relative areal extent, fore reef is the most abundant coral reef habitat type in the Mariana Islands by a large margin, followed by reef crest, and very small extents of reef flats (Rieggl and Dodge 2008; Brainard 2012). Reef flats occur offshore from many of the beaches within the Military Lease Area, but more generally, reef flats are absent from areas offshore from steep cliffs, which border much of Tinian (Minton et al. 2009).

### 3.10.4.1.2 Soft Shores

Tinian’s shoreline has 13 beaches (10 on the west coast [leeward side] and 3 on the east coast [windward side]) and is mostly undeveloped, except for Tinian Harbor (Figure 3.10-2). These beaches are primarily comprised of medium to coarse sands, gravel, and coral rubble (DoN 2013a). Unai Chulu, Unai Babui, and Unai Lam are small beaches (soft shore habitat) along the northwest coast of Tinian, which is otherwise categorized as hard shore habitat consisting primarily of limestone cliffs. Unai Chulu and Unai Babui transition to narrow reef flats (Tinian has seven well-developed and two poorly-developed reef flats), before moving offshore to spur-and-groove formations (hard bottom habitat). The reef flats at both Unai Babui and Unai Chulu are shallow; ranging from 0.0 to 6.5 feet (0.0 to 2 meters) in depth. The reef crest and outer reef flat at Unai Lam are broad and well developed relative to Unai Babui and Unai Chulu. To the south of the beach, the reef flat zones transitions to a shallow bench. At Unai Babui, the reef slope supports higher diversity for algae, fish, and invertebrates than the reef flat. Conversely, the reef flat at Unai Chulu has higher diversity for algae, but lower diversity for fish and invertebrates (Minton et al. 2009). Unai Masalok is a small beach on the east side of Tinian. The reef area at Unai Masalok is physically complex with moderately deep (12-26 feet [4-6 meters]) regularly spaced grooves in the fore reef, transitioning rapidly to deep fore reef. The fore reef is more topographically complex than the deep fore reef at the beaches on the leeward side of Tinian (DoN 2013a). Coral reef habitat (hard bottom) covers approximately 8.9 square miles (23 square kilometers) of the area around Tinian (Brainard 2012) (see Table 3.10-1; Figure 3.10-2). The transition to hard bottom habitat from the shore at all the Tinian beaches is rapid. The hard bottom substrate moves from narrow reef flat to more well-developed spur-and-groove coral reef substrate (Minton et al. 2009). There are approximately 0.10-0.15 square miles (0.28-0.38 square kilometers) of reef flat around Tinian (Brainard 2012).

### 3.10.4.1.3 Hard Bottoms

Coral reef habitat (hard bottom) covers approximately 5,696 acres (2,305 hectares) of the area around Tinian (Brainard 2012) (see Table 3.10-1). The transition to hard bottom habitat from the shore at all the Tinian beaches is rapid. The hard bottom substrate moves from narrow reef flat to more well-developed spur-and-groove coral reef substrate (Minton et al. 2009). There are approximately 64-96 acres (179-249 hectares) of reef flat around Tinian (Brainard 2012).

### 3.10.4.1.4 Soft Bottoms

Limestone pavement (consolidated substrate, typically composed of calcareous elements, which have become cemented together), coral, and submerged boulders limit the development of soft bottom substrates in intertidal and subtidal areas of the CNMI. Tinian has one lagoon (soft bottom habitat) to the northwest of Tinian Harbor, on the southwest coast, where there are small boat piers and the substrate is dominated by sand and patches of coral (Minton et al. 2009).
Figure 3.10-2
Tinian Marine Habitat Overview

Sources: National Centers for Coastal Ocean Science 2005, Pacific Islands Fisheries Science Center 2007, DoN 2010a
Table 3.10-2. Essential Fish Habitat and Habitat Areas of Particular Concern for Management Unit Species of the Western Pacific Region

<table>
<thead>
<tr>
<th>Fishery Management Plan</th>
<th>Essential Fish Habitat (Juveniles and Adults)</th>
<th>Essential Fish Habitat (Eggs and Larvae)</th>
<th>Habitat Area of Particular Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelagics</td>
<td>Water column down to 3,280 feet (1,000 meters)</td>
<td>Water column down to 656 feet (200 meters)</td>
<td>Water column down to 3,280 feet (1,000 meters) that lies above seamounts and banks</td>
</tr>
<tr>
<td>Bottomfish and Seamount Groundfish</td>
<td>Bottomfish: Water column and bottom habitat down to 1,312 feet (400 meters) Seamount Groundfish: (adults only) water column and bottom from 80 to 600 meters, bounded by 29°-35°N and 171°E-179°W, which is outside of the Action Area</td>
<td>Bottomfish: Water column down to 1,312 feet (400 meters) Seamount Groundfish: (including juveniles) epipelagic zone 0 to 200 meters bounded by 29°-35°N and 171°E-179°W, which is outside of the Action Area</td>
<td>Bottomfish: All escarpments and slopes between 131 feet (40 meters) and 918 feet (280 meters), and three known areas of juvenile pink/crimson snapper habitat located in Hawaii No Habitat Areas of Particular Concern designated for Seamount Groundfish</td>
</tr>
<tr>
<td>Crustaceans</td>
<td>Lobsters: Bottom habitat from shoreline to a depth of 328 feet (100 meters) Deep-water shrimp: The outer reef slopes at depths from 984-2,296 feet (300-700 meters)</td>
<td>Water column down to 492 feet (150 meters) Water column and associated outer reef slopes from 1,804-2,296 feet (550-700 meters)</td>
<td>All banks with summits less than 98 feet (30 meters) from the surface No Habitat Areas of Particular Concern designated for deep-water shrimp</td>
</tr>
<tr>
<td>Coral Reef Ecosystems</td>
<td>Water column and benthic substrata to a depth of 328 feet (100 meters)</td>
<td>Water column and benthic substrata to a depth of 328 feet (100 meters)</td>
<td>All Marine Conservation Areas identified in Fishery Ecosystem Plan, all Pacific Remote Island Areas, many specific areas of coral reef habitat</td>
</tr>
</tbody>
</table>

Notes: All areas are bounded by the shoreline and the outer boundary of the Exclusive Economic Zone (200 nautical miles [370 kilometers] from the coast), unless otherwise indicated.

3.10.4.1.5 Aquatic Beds
Emergent vegetation is not found around Tinian (International Business Publications, USA 2011), but seagrass is found along the coast (see Section 3.10.4.2, Marine Flora for more detailed information on seagrass in the region of influence).

3.10.4.1.6 Essential Fish Habitat
Designated Essential Fish Habitat categories for Tinian are those defined for Pacific pelagics, bottomfish and seamount groundfish, crustaceans, and coral reef ecosystems (Western Pacific Regional Fishery Management Council 2009). Precious corals have not been recorded within the Exclusive Economic Zone in the CNMI, save for pre-World War II reports of harvesting of the precious coral *Corallium* sp., north of Pagan (DoN 2005). There are no Habitat Areas of Particular Concern for precious corals in the CNMI. These categories are summarized in Table 3.10-2. The description of Essential Fish Habitat around Tinian includes
information from the CNMI as a whole. The entire water column and seafloor, from the shoreline to the boundary of the Exclusive Economic Zone, is considered Essential Fish Habitat for at least one species.

Specific Essential Fish Habitat management units are summarized below:

**Pelagics.** Trolling is the most popular fishing method for the pelagic fishing industry. Skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), and dolphinfish (*Coryphaena hippurus*) are the most commonly targeted species. The Essential Fish Habitat for pelagic species at Tinian is the water column down to 3,280 feet (1,000 meters); the waters at those depths that lie above seamounts and banks—including Esmeralda Bank, Tatsumi Reef, and innumerable unnamed seamounts—are defined as Habitat Areas of Particular Concern for pelagic species.

**Bottomfish and Seamount Groundfish.** All 17 of the managed bottomfish species have sustainable recreational, subsistence, and commercial fisheries. Essential Fish Habitat around Tinian includes the water column and bottom habitat down to depths of 3,281 feet (1,000 meters). Habitat Areas of Particular Concern for bottomfish at Tinian include escarpments (underwater steep slopes or long cliffs) and slopes between depths of 131 and 919 feet (40 and 280 meters).

**Crustaceans.** The spiny lobster is the managed crustacean most likely to comprise a fishery in Tinian, although there is likely only recreational or subsistence fishing. The most common species of spiny lobster, *Panulirus* spp., in the CNMI is generally restricted to windward surf zones of oceanic reefs with clear water where there is minimal terrestrial influence (Berger et al. 2005; DoN 2005). There are no Habitat Areas of Particular Concern for crustaceans in the CNMI.

**Coral Reef Ecosystems.** The Essential Fish Habitat for coral reef ecosystems in Tinian encompasses the entire water column and benthic substrate to a depth of 328 feet (100 meters).

### 3.10.4.2 Marine Flora

Of the major species groups of true algae indigenous to the Mariana Islands, there are 109 species of red algae, 31 species of brown algae, and 71 species of green algae (Lobban and Tsuda 2003). According to the Mariana Archipelago Reef Assessment and Monitoring Program algae surveys, Tinian had one of the highest mean macroalgal covers of all the islands in the Mariana Archipelago. The Mariana Archipelago Reef Assessment and Monitoring Program did not note a difference in crustose coralline red algae cover across the archipelago (Brainard 2012).

In 2003, mean macroalgae cover on Tinian fore reefs was 47% (Brainard 2012). The 2003 surveys did not separate macroalgae and algae. The highest mean macroalgal cover was on Tatsumi Reef (offshore of the southeast coast of Tinian), Tinian Harbor (southwest Tinian), and the areas between Puntans Chiget and Asia (northeast Tinian) had moderately dense areas of macroalgal cover. Dominant habitats included pavement or boulder habitats (Brainard 2012). Mean cover of crustose coralline red algae on Tinian fore reef habitats was 6% in 2003. The highest cover was found around Puntan Chiget (northeast region of the island) on spur-and-groove habitats (see Figure 3.10-2).

In 2005, mean macroalgae cover on Tinian fore reefs habitats was 56% and were abundant across the island. The highest areas of cover were in the northeast region of the island between Puntan Asiga and Unai Masalok, and around Tinian Harbor (southwest Tinian). *Halimeda*, a green alga, were found covering large areas in the northeast region near Puntan Tahgong (Brainard 2012). The 2005 survey reported 5% mean cover of crustose coralline red algae. Boulder and pavement habitats had the highest
amount of the red algae cover. As in 2003, the northeast region of Tinian had the highest amount of macroalgae cover.

In 2007, mean macroalgae accounted for 40% of the algae cover on the fore reef around Tinian, while turf algae accounted for 52% (note: the macroalgae and turf algae surveys were conducted using different survey methods so the total cover does not equal 100%). Macroalgae species recorded included: *Halimeda* (green algae), *Padina* (brown algae), *Liagora* (red algae), *Asparagopsis* (red algae) and *Microdictyon* (a green algae). Mean crustose coralline red algae cover was 16% in 2007. Unlike other years, the area with the highest cover of macroalgae was along the northwest corner of the island (Brainard 2012).

The Mariana Islands have three species of seagrass; tape seagrass (*Enhalus acoroides*), narrowleaf seagrass (*Halodule uninervis*), and hartog seagrass (*Halophila minor*). Seagrass, a food source for some sea turtle species, is found along most of the coast of Tinian except for the southeastern region and the lower half of the southwestern region (DoN 2005). Tape seagrass was reported at Unai Chiget reef, Unai Masalok, and Lamonibot Bay (Commander, U.S. Naval Forces Marianas 2004).

### 3.10.4.3 Marine Invertebrates

The oldest and most developed coral reefs of the CNMI are located in the nearshore waters of the southern islands, including Tinian (Starmer et al. 2008). Coral, starfish, sea urchins, sea cucumbers, mollusks, and tube worms are the most common types of invertebrates found on Tinian reefs (DoN 2010). During the *Coral Marine Resource Survey* conducted in support of this EIS/OEIS, giant clams (*Tridacna* spp.) were observed at all beaches surveyed on Tinian, and spider conchs (*Lambis* spp.) were observed at Unai Chulu, Unai Babui, and Unai Masalok (DoN 2014a).

The island of Tinian is virtually surrounded by shore-attached fringing reef (Riegl and Dodge 2008; Brainard 2012). Most of the reef habitat on Tinian has 1-10% coral cover, but patches exceeding 50% cover do occur, particularly in shallow waters (Minton et al. 2009; Brainard 2012; DoN 2014a). Shore-attached fringing reefs are the dominant reef habitat type on Tinian. Well-developed reef crests are less common and reef flats are uncommon. There are seven well-developed reef flats on Tinian. These include Unai Chulu, Unai Babui, Unai Dankulo, Unai Masalok, Unai Barchinas and Unai Leprosarium, and Taga Beach (south of the Tinian Dynasty). There are two additional small or poorly-developed reef flats on the leeward side, one at the south end of the International Broadcasting Bureau property and one approximately 1 mile (1.6 kilometers) south of Puntan Atgidon. There are two additional areas on Tinian that may provide habitat similar to reef flats based on their relatively broad extents of shallow nearshore bathymetry. One is the broad ‘shallow bench’ south of Unai Lam Lam and one is the shallow habitat at the northwestern tip of Tinian Harbor. All of the reef flats on Tinian are extremely small compared with well-developed reef flat habitats in the Mariana Islands such as Tumon Bay and Piti Bay on Guam. Table 3.10-1 in *Section 3.10.4.1, Marine Habitat and Essential Fish Habitat*, summarizes the amount of coastline, seafloor area, total reef habitat, and reef flat for the Mariana Islands and Tinian.

Brief summaries from the *Coral Marine Resources Survey Report* (see Appendix M, *Marine Biology Technical Memo and Survey Reports*, DoN 2014a) are presented in the following sections. The *Coral Marine Resources Survey Report* was conducted in support of this EIS/OEIS and discusses Unai Chulu, Unai Babui, Unai Masalok, Unai Lam Lam, and Unai Dankulo; however, Unai Dankulo is not part of the proposed action for beach landings and is not discussed in the following sections. Refer to Chapter 2,
Section 2.3.2.2, Refinement of Tinian Unit Level Range and Training Area Alternatives for additional information.

### 3.10.4.3.1 Unai Chulu

The reef area at Unai Chulu is physically complex, with very deep, irregularly spaced spurs and grooves in the fore reef that transition rapidly to deep fore reef, with broken rock fragments in the grooves. The bases of the grooves have polished surfaces and polished cobble-sized fragments; indicating regular, active water motion and erosion. Many spurs are undercut by grooves that interconnect with other grooves, resulting in a network of tunnels, grottoes, fissures, and chimneys penetrating from the fore reef under the reef crest, and occasionally from under the reef flat (DoN 2014a, see Appendix M, Marine Biology Technical Memo and Survey Reports).

Reef zonation at Unai Chulu includes distinct deep fore reef, shallow fore reef, reef crest, outer reef flat, inner reef flat, and beach zones. To the south of the beach, the reef flat zone transitions to a shallow bench that is richer with coral cover than the reef flat itself. The habitat is heterogeneous (diverse) across different depths, particularly the shallow bench to the south of the beach, but homogeneous (similar) within the same depths.

The Coral Marine Resources Survey Report conducted in support of this EIS/OEIS revealed a total of 121 coral species with the most abundant species identified as *Goniastrea retiformis* (DoN 2014a, see Appendix M, Marine Biology Technical Memo and Survey Reports). *Goniastrea retiformis*, which is not listed under the federal Endangered Species Act, was also the most abundant species at the other surveyed beaches. Most of the area surveyed revealed low to moderate topographic complexity, low to moderate coral cover, and low sand cover (see Section 3.3 of the Coral Marine Resources Survey Report found in Appendix M for category description). There were scattered patches, however, that did have very high coral cover (50-70%). Representative images of Unai Chulu are presented below (Photos 3.10-1). Unai Chulu coral cover is shown in Figure 3.10-3.
Photos 3.10-1. Representative Images of Unai Chulu
(Clockwise from top left: rocky fore shore; shallow bench; grotto underneath reef crest; reef flat)
Figure 3.10-3
Unai Chulu Coral Cover

Legend
- 1 Meter Contour
- 5 Meter Contour
- Extent of In-Water Survey
- Coral Cover (Percent)
  - 0
  - 1-10
  - >10-30
  - >30-50
  - >50-70
  - >70-100

Sources: Fugro Pelagos 2013a, 2013b; DoN 2014b
3.10.4.3.2 Unai Babui

The reef area at Unai Babui is physically complex, and includes irregularly spaced grooves that are very deep in the fore reef, with broken rock fragments in the grooves. The bases of the grooves have polished surfaces and polished cobbles-sized clasts, indicating high-energy sediment transport and erosion. Many spurs are undercut by grooves that interconnect with other grooves, resulting in a network of tunnels, grottoes, fissures, and chimneys penetrating from the fore reef under the reef crest, and occasionally from under the reef flat (DoN 2014a).

Reef zonation at Unai Babui includes distinct deep fore reef, shallow fore reef, reef crest, outer reef flat, inner reef flat, and beach zones. To the south of the beach, the reef flat zone transitions to a shallow bench that has denser coral cover than the reef flat itself. The habitat is heterogeneous across different depths, particularly the shallow bench to the south of the beach, but is relatively homogeneous within the same depths.

Similar to Unai Chulu, Unai Babui has moderate to high topographic complexity, low to moderate coral cover, low sand cover and patches of very high coral cover (70%-100%). Among the 107 coral species that were recorded during the Coral Marine Resources Survey conducted in support of this EIS/OEIS, the most abundant species was *Goniastrea retiformis*, (DoN 2014a). Representative images of Unai Babui are presented below (Photos 3.10-2). Unai Babui coral cover is shown in Figure 3.10-4.

Photos 3.10-2. Representative Images of Unai Babui
(Clockwise from top left: deep fore reef; shallow fore reef; fissure through reef crest; reef crest)
Figure 3.10-4
Unai Babui Coral Cover

Legend

1 Meter Contour
5 Meter Contour
Extent of In-Water Survey
Coral Cover (Percent)

0
1-10
>10-30
>30-50
>50-70
>70-100

Data Sources: Fugro Pelagos 2013a, 2013b; DoN 2014b
3.10.4.3.3 Unai Lam Lam

The reef area at Unai Lam Lam is physically complex, with regularly spaced grooves that are very deep in the fore reef and transition rapidly to deep fore reef. A groove aligned with the center of the pocket beach is strewn with cobble and boulder-sized rubble, while most other grooves are lined with coarse sand. This feature is a sign of past human disturbance to the groove aligned with the center of the pocket beach. Metal debris observed in this area also suggests past human activities. Many spurs are undercut by grooves interconnecting with other grooves, resulting in a network of tunnels, grottoes, fissures, and chimneys penetrating from the fore reef under the reef crest, and occasionally from under the reef flat (DoN 2014a, see Appendix M, Marine Biology Technical Memo and Survey Reports).

Reef zonation at Unai Lam Lam includes distinct deep fore reef, shallow fore reef, reef crest, outer reef flat, inner reef flat, and beach zones. The reef crest and outer reef flat are broad and well developed relative to Unai Babui and Unai Chulu. To the south of the beach the reef flat zone transitions to a shallow bench. This zone has high coral cover (90%). The habitat is somewhat heterogeneous across different depths and relatively homogeneous within the same depth, but this distinction is less pronounced than at Unai Chulu and Unai Babui. Zonation is still identifiable, but each zone is richer in species diversity than its counterpart at Unai Chulu and Unai Babui. Unai Lam Lam has several unique coral species and growth forms that are not found at the other surveyed beaches, especially branching Acropora species.

Overall, Unai Lam Lam has moderate to high topographic complexity, moderate coral cover, and low sand cover, except for one large offshore patch of 90-100% sand. Areas of Unai Lam Lam have very high coral cover (70%-90%). Among the 108 coral species recorded, the most abundant coral species was *Goniastrea retiformis* (DoN 2014a). Representative images of Unai Lam Lam are presented below (Photos 3.10-3). Unai Lam Lam coral cover is shown in Figure 3.10-5.

Photos 3.10-3. Representative Images of Unai Lam Lam
(Clockwise from top left: reef crest from inside a groove; shallow fore reef; transition from shallow to deeper fore reef; fissure through reef crest)
Figure 3.10-5
Unai Lam Lam Coral Cover

Legend
- 1 Meter Contour
- 5 Meter Contour
- Extent of In-Water Survey

Coral Cover (Percent)
- 0
- 1-10
- >10-30
- >30-50
- >50-70
- >70-100

Data Sources: Fugro Pelagos 2013a, 2013b; DoN 2014b
3.10.4.3.4 Unai Masalok

The reef area at Unai Masalok is physically complex, and includes regularly spaced grooves that are moderately deep in the fore reef, transitioning quickly to deep fore reef that is much more topographically complex than the deep fore reef at Unai Chulu, Unai Babui, or Unai Lam Lam. Relatively few spurs are undercut or tunneled. Most of the reef flat area has low topographic complexity, low coral cover (10%-30%), and low sand cover. The reef flat area is physically and biologically homogeneous.

Among the 113 coral species that were recorded during the survey, the most abundant species was *Goniastrea retiformis* (DoN 2014a).

The habitat changes abruptly across different depths and is relatively homogeneous within the same depths. Most of the reef flat at Unai Masalok was lacking in numbers and variety of species characteristic of inner reef flat habitat. Representative images of Unai Masalok are presented below (Photos 3.10-4). The reef survey area at Unai Masalok was not contiguous due to sea state conditions. Coral cover within the survey area is shown in Figure 3.10-6.

![Unai Masalok Images](3-163_photos)

**Photos 3.10-4. Representative Images of Unai Masalok**
(Clockwise from top left: shallow fore reef; outer reef crest; outer reef flat; inner reef flat)
Figure 3.10-6
Unai Masalok Coral Cover

Legend:
- 1 Meter Contour
- 5 Meter Contour
- Extent of In-Water Survey

Coral Cover (Percent):
- 0
- 1-10
- >10-30
- >30-50
- >50-70
- >70-100

Data Sources: Fugro Pelagos 2013a, 2013b; DoN 2014b
3.10.4.4 Fish

Myers and Donaldson (2003) report 1,106 fish species known in the Mariana Islands and adjacent waters; 1,020 of these are inshore species that inhabit coral reefs. Mariana Archipelago Reef Assessment and Monitoring Program’s standard approach to reporting fish species richness and biomass (the total mass of organisms in a given area) is to calculate the number or mass of fish per square meter or per 100 square meters. The Mariana Archipelago Reef Assessment and Monitoring Program found Tinian’s total fish biomass is going up over time; however, total fish biomass on Tinian was low compared to other sites surveyed in the CNMI in 2003, 2005, and 2007, respectively.

In 2003, reef sharks made up over half of the overall mean biomass on Tinian. Stingrays (Dasyatidae) made up 45% of the total biomass in the 2005 Tinian survey. Barracudas (Sphyraenidae) and sharks made up the largest portions of the total fish biomass in the 2007 survey. In 2007, 11 sharks were encountered including whitetip reef sharks (Triaenodon obesus), black tip reef sharks (Carcharhinus melanopterus) and tawny nurse sharks (Nebrius ferrugineus). Total biomass was higher in the 2007 surveys than the previous years (Brainard 2012). The fish biomass recorded for 2007 on Tinian was higher than the average observed for the southern islands, but was still low relative to other islands in the Mariana Islands. Surgeonfish (Acanthuridae) and parrotfish (Scaridae) accounted for over half the total mean fish biomass when averaged over all three surveys (Brainard 2012).

The Mariana Archipelago Reef Assessment and Monitoring Program’s 2003, 2005, and 2007 Tinian surveys found similar fish species richness within the fore reef habitats surveyed at sites around Tinian (Brainard 2012). Overall, the most abundant fish families documented during the Mariana Archipelago Reef Assessment and Monitoring Program surveys on Tinian were surgeonfish, parrotfish, wrasse (Labridae), and damselfish (Pomacentridae), with the three most common damselfish species being the princess damselfish (Pomacentrus vaiuli), jewel damselfish (Plectroglyphidodon lacrymatus) and the midget chromis (Chromis acares). The two most common surgeonfish species include the striated surgeonfish (Ctenochaetus striatus) and the orange-spine unicornfish (Naso lituratus) (Brainard 2012).

Tinian, along with Saipan and Rota, supports much of the CNMI’s bottomfish fishery, which includes snapper (particularly the long-tail snapper [Etelis coruscans]), grouper (particularly the eight-banded grouper [Epinephelus striatus]), and the redgill emperor (Lethrinus rubrioperculatus) and other emperor-type fish. Managed species targeted by the bottomfish fishing industry are described in more detail in Section 3.10.4.1.6, Essential Fish Habitat.

Damselfish live within coral reefs and depend on these reefs for shelter, reproduction, habitat, and food. Other fish species are not as heavily reliant on coral reef habitats. Several damselfish species are currently in decline due to degradation of certain coral reef habitats, caused by mass bleaching events and ocean acidification. Threats such as ocean warming and ocean acidification may directly affect these damselfish species by impairing sensory capabilities, behavior, and aerobic capacity (ability to get oxygen to the muscles) (Center for Biological Diversity 2012).

During the various marine resources surveys conducted in support of this EIS/OEIS, fish species were also recorded and summarized in a species list report. The survey found 265 fish species around Tinian. Unai Chulu had 175 species, Unai Babui had 158 species, Unai Lam had 67 species, and Unai Masalok had 101 species.
3.10.4.5 Special-status Species

3.10.4.5.1 Marine Invertebrates

Seventeen marine invertebrates have been designated by the CNMI Division of Fish and Wildlife as Species of Special Conservation Need. Five of the 17 have been reported in Tinian waters (Berger et al. 2005), see Table 3.10-3.

Table 3.10-3. CNMI Marine Invertebrate Species of Special Conservation Need of Tinian

<table>
<thead>
<tr>
<th>Common Name/ Scientific Name</th>
<th>Reported within Tinian Waters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghost Crab (Ocypode spp)</td>
<td>No</td>
</tr>
<tr>
<td>Rock Crab (Grapus spp)</td>
<td>No</td>
</tr>
<tr>
<td>Spiny Lobster (Panulirus spp)</td>
<td>Yes</td>
</tr>
<tr>
<td>Land Hermit Crab (Coenobita spp)</td>
<td>No</td>
</tr>
<tr>
<td>Surf redfish (sea cucumber)  (Actinopyga mauritiana)</td>
<td>Yes</td>
</tr>
<tr>
<td>Black teatfish (sea cucumber) (Holothuria whitmaei)</td>
<td>Yes</td>
</tr>
<tr>
<td>Sea urchin (Toxopneustidae)</td>
<td>No</td>
</tr>
<tr>
<td>Giant clam (Tridacna spp)*</td>
<td>Yes</td>
</tr>
<tr>
<td>Pectinate venus (Gaftrarium pectinatum)</td>
<td>No</td>
</tr>
<tr>
<td>Common spider conch (Lambis lambis)</td>
<td>No</td>
</tr>
<tr>
<td>Horned helmet shell (Cassis cornuta)</td>
<td>No</td>
</tr>
<tr>
<td>Tapestry turban shell (Turbo petholatus)</td>
<td>No</td>
</tr>
<tr>
<td>Rough turban (Turbo setosus)</td>
<td>No</td>
</tr>
<tr>
<td>Silver-mouth turban (Turbo argyrostroma)</td>
<td>No</td>
</tr>
<tr>
<td>Triton’s trumpet shell (Charonia tritonis)</td>
<td>Yes</td>
</tr>
<tr>
<td>Octopus (Octopus spp)</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: *Tridacna spp includes the Fluted giant clam (Tridacna squamosa) and the Elongate giant clam (Tridacna maxima).

3.10.4.5.1.1 Coral Species

Twenty-two coral species are listed under the federal Endangered Species Act; 20 of which were newly listed in August 2014. Fifteen of the newly listed species occur in the Indo-Pacific, four are likely to occur in the CNMI, Acropora globiceps, Acropora retusa, Pavona diffuens, and Seriatopora aculeata (National Marine Fisheries Service 2014a; Veron 2014).

Based on the Coral Marine Resources Survey Report conducted in support of this EIS/OEIS (DoN 2014a, see Appendix M, Marine Biology Technical Memo and Survey Reports), Acropora globiceps was the only coral species listed under the federal Endangered Species Act that was reported in Tinian nearshore waters; however the presence of the other three listed coral species is conceivable. Acropora globiceps was recorded at Unai Chulu, Unai Babui, Unai Lam, and Unai Masalok (Table 3.10-3) (DoN 2014a). Acropora globiceps colonies ranged in size from smaller than 7.9 inches (20 centimeters) to 36.6 square feet (3.4 square meters) (DoN 2014a, see Appendix M, Marine Biology Technical Memo and Survey Reports).

Species profiles for the special-status coral species listed in Table 3.10-4 can be found in Appendix L, Biological Resources Supporting Documentation.
Table 3.10-4. Special-status Coral Species of Tinian

<table>
<thead>
<tr>
<th>Coral (Genus/Species)</th>
<th>Endangered Species Act Status</th>
<th>Reported within Tinian Region of Influence(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acropora globiceps</td>
<td>Threatened</td>
<td>Yes; C B L M (^2)</td>
</tr>
<tr>
<td>Acropora retusa</td>
<td>Threatened</td>
<td>No</td>
</tr>
<tr>
<td>Pavona diffluens</td>
<td>Threatened</td>
<td>No</td>
</tr>
<tr>
<td>Seriatopora aculeata</td>
<td>Threatened</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes: \(^1\) The region of influence for marine biological resources includes the waters surrounding Tinian from the shoreline to 3.0 nautical miles (5.6 kilometers) offshore.

\(^2\) C = Unai Chulu, B = Unai Babui, L = Unai Lam, and M = Unai Masalok.


Acropora globiceps grow in small colonies and are usually described as digitate (having divisions arranged like those of a bird’s foot or small hand). Each of the “digits,” or branches, has varying size and appearance depending on the level of wave action and exposure; however, branches are always short and compacted closely together. Colonies are found in the intertidal zone, upper reef slopes, and reef flats in water depths shallower than 26 feet (8 meters). Acropora globiceps can be found in areas exposed to heavy wave action (Brainard et al. 2011).

Acropora retusa coral colonies are usually brown in color. They have a digitate morphology similar to Acropora globiceps, and form plates with thick short branchlets. Axial corallites are indistinct and radial corallites lay flat down the sides of branchlets (Brainard et al. 2011). The species is often confused with others in the digitate group with such as Acropora globiceps (Veron 2014). Acropora retusa occurs on upper reef slopes and tidal pools. They occur at depths ranging from 1 to 15 feet (0.3 to 5 meters). This species provides habitat structure for organisms small enough to shelter in branches of relatively compact colonies.

Pavona diffluens has a very narrow latitudinal and longitudinal distribution and is found in the region of the Red Sea and Arabian Gulf. It has also been reported in the northern Mariana Islands and American Samoa; however, it is considered unlikely to occur in the CNMI (Brainard et al. 2011). Pavona diffluens has been reported in most reef habitats in water depths ranging from 16 feet (5 meters) to 67 feet (20 meters) (Brainard et al. 2011).

Seriatopora aculeata coral colonies have short, tapered branches, typically fused in clumps. They have irregularly distributed corallites and their tentacles are commonly extended during the day. The colonies are pink or cream, and branches are thicker than other Seriatopora aculeata (Brainard et al. 2011). Seriatopora aculeata occupies shallow reef environments ranging in depths from 10 to 131 feet (3 to 40 meters) (Brainard et al. 2011). With irregular clumps of thick short branches, this species contributes to the overall reef structure and small-volume habitat.

3.10.4.5.2 Fish Species

Special-status fish species documented in the CNMI include the scalloped hammerhead shark (Sphyrna lewini), humphead wrasse (Cheilinus undulatus), and gray reef shark (Carcharhinus amblyrhynchos) (Table 3.10-4). The scalloped hammerhead shark Indo-West Pacific Distinct Population Segment is listed as threatened under the Endangered Species Act. The National Marine Fisheries Service considers the humphead wrasse a Species of Concern. This species has also been designated by the CNMI Division of Fish and Wildlife as a Species of Special Conservation Need. The CNMI also lists the gray reef shark as a
Species of Special Conservation Need (Table 3.10-4) (Berger et al. 2005). Species profiles of the species listed in Table 3.10-5 can be found in Appendix L, Biological Resources Supporting Documentation.

During the various marine resources surveys conducted in support of this EIS/OEIS, fish species were also recorded and summarized in a species list report. The humphead wrasse was observed at Unai Lam. The scalloped hammerhead shark was not observed at any site on Tinian during the surveys conducted in support of this EIS/OEIS (DoN 2013b), but it has been observed within the Mariana Islands (Dr. T. Donaldson, University of Guam, personal communication, 2014). It is possible that the Endangered Species Act-listed scalloped hammerhead shark may be present within the vicinity of Tinian, but it has not been documented in the nearshore environment of the CNMI. Tinian is located within the range of this migratory species, and the offshore pelagic waters, coral reefs, and turbid, nearshore waters surrounding the island of Tinian have the potential to serve as foraging, breeding, and nursery habitat for the scalloped hammerhead shark. The possibility that scalloped hammerhead sharks could occur in areas of potential impact by physical disturbance, acoustics, or indirect impacts is considered remote. Such occurrence would probably involve the transient occurrence of a small number of individuals whose most likely response would be to leave the immediate area in response to underwater noise and poor foraging conditions due to previous disturbance to the habitat.

### Table 3.10-5. Special-status Fish Species of Tinian

<table>
<thead>
<tr>
<th>Common Name/Scientific Name</th>
<th>Endangered Species Act Status</th>
<th>National Marine Fisheries Status</th>
<th>CNMI Status</th>
<th>Reported within Tinian Region of Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalloped hammerhead shark (Sphyrna lewini)</td>
<td>Threatened (Indo-West Pacific Distinct Population Segment)</td>
<td>—</td>
<td>None</td>
<td>No&lt;sup&gt;(1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Humphead Wrasse (Cheilinus undulatus)</td>
<td>None</td>
<td>Species of Concern</td>
<td>Species of Special Conservation Needs</td>
<td>Yes&lt;sup&gt;(2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Gray reef shark (Carcharhinus amblyrhynchus)</td>
<td>None</td>
<td>None</td>
<td>Species of Special Conservation Needs</td>
<td>Yes&lt;sup&gt;(1)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

**Notes:**
1. Not observed during surveys in support of the EIS/OEIS (DoN 2014a), but reported in Tinian waters in other sources (Dr. T. Donaldson, University of Guam, personal communication, 2014; Berger et al. 2005).
2. Observed at Unai Lam during surveys in support of the EIS/OEIS (DoN 2014b).
3. The Comprehensive Wildlife Conservation Strategy identified species in greatest need of conservation and uses the phrase “species of special conservation need.” Berger et al. 2005 outlines the criteria used to select species for this designation.


### 3.10.4.5.3 Sea Turtles

Sea turtle species and their expected occurrences in the Tinian region of influence are listed in Table 3.10-6.

### Table 3.10-6. Special-status Sea Turtle Species of Tinian

<table>
<thead>
<tr>
<th>Common Name/Scientific Name</th>
<th>Endangered Species Act Status</th>
<th>CNMI Status</th>
<th>Reported within the Tinian Region of Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green sea turtle (Chelonia mydas)</td>
<td>Threatened</td>
<td>Species of Special Conservation Need</td>
<td>Yes&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Hawksbill sea turtle (Eretmochelys imbricata)</td>
<td>Endangered</td>
<td>Species of Special Conservation Need</td>
<td>Yes&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Leatherback sea turtle (Dermochelys coriacea)</td>
<td>Endangered</td>
<td>None</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Notes:**
1. Observed during 2013 surveys in support of the EIS/OEIS (DoN 2014b).
2. The Comprehensive Wildlife Conservation Strategy identified species in greatest need of conservation and uses the phrase “species of special conservation need.” Berger et al. 2005 outlines the criteria used to select species for this designation.
The green sea turtle occurs in most oceans, including the western, central, and eastern Atlantic, Mediterranean Sea, western, northern and eastern Indian, southeast Asia, and the western, central, and eastern Pacific. In the Pacific, the green sea turtle occurs around most of the islands, including the Hawaiian Island chain, American Samoa, Guam, and CNMI (DoN 2014b). The hawksbill sea turtle occurs throughout the tropics, from 30 degree North latitude to 30 degrees South latitude in the Atlantic, Pacific, and Indian Oceans and associated water bodies, including the Caribbean Sea and Gulf of Mexico. In the Pacific, the hawksbill sea turtle occurs around most islands, including the Hawaiian Islands, American Samoa, Guam, and CNMI. The green turtle and the hawksbill turtle have nearshore resident juvenile populations in the Mariana Islands, based on flipper tag data (Summers et al. 2012). A separate migratory population of nesting green turtles also occurs across the archipelago, based on satellite telemetry data (Summers 2011).

The leatherback turtle is the most widely distributed of all sea turtles, found from tropical to subpolar oceans; however, is uncommon in the Tinian region of influence (Gilman 2008; Myers and Hays 2006; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992). Leatherbacks are also the most migratory sea turtles and are able to tolerate colder water than other species. Leatherback and olive ridley turtles are thought to remain primarily in the open ocean throughout their lives. There have been two reliable observations of the leatherback turtle (Hadpei, personal communication, 2013) in pelagic waters. The leatherbacks were sighted by a CNMI sea turtle biologist in 2004 and 2008 during personal recreational offshore fishing southwest of Marpi Reef, approximately 5 miles (8 kilometers) offshore of Banzai Cliff on Saipan. The sightings were identified as adults coming up for breaths of air. One turtle was observed just north of the buoy and one was observed between Banzai Cliff and the buoy.

One olive ridley turtle account (Pritchard 1977) in the Mariana Islands was documented in the 1970s and recent available data suggest this species is not present in the region of influence. The loggerhead turtle nests north of the Mariana Islands and migrates to foraging grounds in Mexico; however, oceanographic conditions may be a barrier to its regular occurrence within the Mariana Islands. No sighting of a loggerhead sea turtle has been documented in the Mariana Islands. The rarity of olive ridley and loggerhead sea turtles in the Mariana Islands, in addition to their pelagic existence minimizes the potential of any impacts to these three species from this action to discountable; therefore, these species will not be discussed further in this EIS/OEIS.

Because of continued poaching of both nesting and in-water sea turtles in the populated Southern Mariana Islands (Berger et al. 2005; Maison et al. 2010), sub-adult and adult sea turtles are generally skittish in the presence of humans. Based on observations during the Sea Turtle Marine Resources Survey Report (DoN 2014b, Appendix M, Marine Biology Technical Memo and Survey Reports), recent recruits and smaller juveniles may not be as adversely conditioned to humans (DoN 2014b). The Comprehensive Wildlife Conservation Strategy for the CNMI (Berger et al. 2005) states that the “green sea turtles are considered a delicacy and are generally reserved for special cultural occasions, primarily by the Carolinian community.” Poaching of hawksbill sea turtles for the curio trade was also a noted threat in the Comprehensive Wildlife Conservation Strategy for the CNMI (Berger et al. 2005). Previous sea turtle research on Tinian is detailed in the Sea Turtle Marine Resources Survey Report (DoN 2014b, Appendix M, Marine Biology Technical Memo and Survey Reports). The green sea turtle is the only sea turtle species known to commonly occur in nearshore waters of Tinian. Based on 1999-2001 data, there
were an estimated 832 green sea turtles within the waters of Tinian in 2001 (Kolinski et al. 2004). Hawksbills are also observed from time to time, and are expected to frequent nearshore areas within the vicinity of known nesting areas, as well as adjacent suitable foraging areas. Recent survey efforts to gain a better understanding of the nearshore habitat use by sea turtles near strategic sites, mostly in Guam, Tinian, and Saipan, have documented hawksbill sea turtles migrating from Tinian to Guam (Jones and van Houtan 2014).

During the July 2013 Sea Turtle Marine Resource Survey conducted in support of this EIS/OEIS (DoN 2014b), an estimated 255 sea turtles were observed in Tinian waters. Surveys of various methods were conducted in the northwest, west, southwest, east and northeast zones around the island. Sea turtle densities are not uniform across Tinian. Along the northwestern coast of Tinian, specifically in the waters fronting Unai Chulu, Unai Babui, and Unai Lam Lam, sea turtle densities based on the towboard and swim transect surveys were relatively low. Sea turtle densities on Tinian are highest along the northeast, southeast, and southwest, with high density pockets of sea turtles in sheltered waters of the western coast. The survey estimates the sea turtle population on Tinian to be between 845 and 1,178 individuals. This equals between 46-471 sea turtles per square mile (18-182 sea turtles per square kilometer), depending on survey method used. Approximately 94% of the sea turtles observed were identified as green sea turtles, and approximately 75% of the green sea turtles were juvenile (Photo 3.10-17). Based on this information, there is an estimated population of 795 to 1,107 green sea turtles and 50 to 71 hawksbill sea turtles in the waters around Tinian (DoN 2014b).

Details on the survey methods (e.g. cliffline surveys, snorkel/scuba swimming surveys, and opportunistic sightings) are provided in the Sea Turtle Marine Resources Survey Report (DoN 2014b, see Appendix M, Marine Biology Technical Memo and Survey Reports).

![Photo 3.10-17. Juvenile green sea turtle observed feeding during DoN 2013 survey at Unai Chulu on Tinian](image-url)
3.10.4.5.4 Marine Mammals

Historically, the Mariana Islands were a prominent whaling ground in the eighteenth century, with many catches of humpback whales and a lesser number of sperm whales (Townsend 1935). In the 1960s and 1970s, Japanese whaling companies conducted extensive tag (i.e., discovery tags) and recovery programs for large commercially hunted whale species in the North Pacific, including the Mariana Islands (Masaki 1972; Ohsumi and Masaki 1975). Most of the marine mammal information from this island group before 2006 comes from information attained after a marine mammal strandings/beaching, which is a relatively infrequent occurrence (Kami 1976, 1982; Donaldson 1983; Eldredge 1991, 2003; Trianni and Kessler 2002; Wiles 2005; Trianni and Tenorio 2012) and opportunistic sightings (Eldredge 1991, 2003; Miyashita et al. 1996; Wiles 2005; Jefferson et al. 2006). A marine mammal survey (DoN 2014c) was conducted in support of this EIS/OEIS (see Appendix M, Marine Biology Technical Memo and Survey Reports) and the survey results are summarized in the following paragraphs.

Earlier marine mammal surveys were limited to large-scale surveys that briefly passed through the Mariana Islands (Miyazaki and Wada 1978; Miyashita et al. 1996; Shimada and Miyashita 2001; Ohizumi et al. 2002). A few single-species surveys were directed primarily at humpback whales (Darling and Mori 1993; Yamaguchi 1995, 1996; Yamaguchi et al. 2002). Beginning in 2006, dedicated marine mammal surveys were conducted in the southern Mariana Islands (Mobley 2007; Oleson and Hill 2010; HDR 2011, 2012; Ligon et al. 2011; Hill et al. 2012, 2013). In January-April 2007 there was a large-scale, visual and acoustic line-transect survey of cetaceans and sea turtles conducted for the entire Mariana Islands Range Complex (DoN 2007). Analysis of some of the data from this Mariana Islands Sea Turtle and Cetacean Survey was later published and has provided current density estimates for some cetaceans in waters surrounding the Mariana Islands (Fulling et al. 2011; Norris et al. 2012).

Several marine mammal species have been detected or observed in the nearshore environment within 3.0 nautical miles (5.6 kilometers) of Tinian (E. M. Oleson and Hill 2010; Fulling et al. 2011; Ligon et al. 2011; Hill et al. 2012, 2013; DoN 2014c). According to the five-year report (Hill et al. 2014), spinner dolphins were the most frequently encountered species (54% of encounters). All of the locations where these encounters occurred were in depths less than 300 meters, and the vast majority of the locations were in depths less than 100 meters. Spinner dolphins were also encountered at offshore reefs (Marpi Reef and Rota Bank; 17-18 kilometers from shore). Ligon et al. (2011) did not sight spinner dolphins off Tinian during a survey around the island, but did report anecdotal evidence of ferries seeing spinner dolphins off Tinian Harbor on the southwestern coast of the island. This species is highly likely to be island-associated with single groups associated with more than one island. No individuals have been documented moving between the southern islands of the CNMI and Guam or Rota Bank. Genetic evidence suggests a more diverse population than the visual data supports. Martien et al. (2014) suggest that the genetic transfer within the Marianas may be facilitated by offshore individuals that make temporary visits to nearshore populations or by males moving among the insular populations.

According to the five-year report (Hill et al. 2014), pantropical spotted dolphins were the second most frequently encountered species. The groups were encountered in the widest range of depths, as well as the deepest depths (333 meters to 3012 meters). Bottlenose dolphins ranked third highest in encounter rates. In addition, one sighting of spotted dolphins (offshore of Saipan near Malakis Reef a.k.a Ruby Seamount) was the farthest from shore (52.8 kilometers) of all cetacean encounters. Four groups of bottlenose dolphins were observed during encounters with one or more other species (short-finned
pilot whales, false killer whales, rough-toothed dolphins, and spinner dolphins). Their locations ranged 18-734 meters in depth and 0.3-18.7 kilometers distance from shore. Genetic analysis has indicated that bottlenose dolphins around the Mariana Islands contain genetic material common with Fraser's dolphin (*Lagenodelphis hosei*), a pelagic dolphin species. This suggests that the local population has some level of hybridization with Fraser’s dolphin (Martien et al. 2014). Bottlenose dolphins would be expected to have island associated and pelagic populations. Photo-identification and telemetry data suggest that a nearshore population is distributed among the southern islands of CNMI and as far north as Sarigan in the Northern Mariana Islands (Martien et al. 2014).

According to the five-year report (Hill et al. 2014), short-finned pilot whales were the fourth most observed species by National Marine Fisheries Service. They were encountered in depths that ranged from 215 meters to 967 meters. Two groups of pilot whales were associated with bottlenose dolphins. Genetic analysis revealed significant genetic differences between individuals off Saipan, Tinian, and Aguigan (3-Islands complex) and those collected from individuals off Guam and Rota suggesting limited gene flow and interaction between the populations (Martien et al. 2014). Individuals resighted between these locations suggest that the genetic differences may be a reflection of the groups not mixing socially, that there is male-mediated gene flow, or that the 3-islands region is an area of overlap between the two populations, one population's range extending to the north and the other extending south to Guam (Martien et al. 2014).

National Marine Fisheries Service false killer whale encounters occurred in depths that ranged from 88 meters to 2107 meters and distances from shore of 0.7-7.9 kilometers (Hill et al. 2014). Blainville’s beaked whale and Cuvier’s beaked whale may also occasionally occupy the waters near Tinian, as they have been acoustically detected; however, these species have not been confirmed within 3.0 nautical miles (5.6 kilometers) of shore (Baumann-Pickering et al. 2012; DoN 2014c). The humpback whale, minke whale, sei whale, pygmy killer whale, rough-toothed dolphins, short-finned pilot whale, blue whale, and fin whale are also known to occur in Tinian waters as discussed below (DoN 2014c; E. Oleson 2014; National Oceanic and Atmospheric Administration 2014). However, the blue whale and fin whale have been heard in Tinian waters; however, blue whale and fin whale calls can be heard over great distances (thousands of miles) and cannot be used to determine the presence of these species in particular areas.

Sperm whales have been visually and acoustically detected near Tinian (Hill et al. 2012, 2013; Norris et al. 2012; DoN 2014c). Sperm whales were encountered three times by National Marine Fisheries Service, at depths of 374 meters, 1971 meters, and 1617 meters depth, at varying distances from land (1.1 kilometers, 22.0 kilometers and 19.4 kilometers, respectively (Hill et al. 2014). Evaluation of the sperm whale acoustics suggests the CNMI waters are predominantly used by females with possible social links between the eastern and western North Pacific Ocean (Hill et al. 2013).

Humpback whales have been observed within 3.0 nautical miles (5.6 kilometers) of Tinian during the winter and spring months (Hill et al. 2012, 2013; DoN 2014c). Humpback whales currently are not considered to have island-associated populations due to their annual migrations (Hill et al. 2013; DoN 2014c; DoN 2007). Potential breeding behaviors, including singing) have been acoustically and visually documented in the nearshore waters of Tinian and Saipan (Norris et al. 2012; DoN 2014c; DoN 2007). Observed potential breeding behaviors suggest these areas may represent important wintering/breeding habitats (Fulling et al. 2011; Norris et al. 2012; DoN 2014c; DoN 2007). In addition,
research indicates that there is overlap of acoustic features between humpback whales in the waters of Hawaii and the CNMI, as well as possibly with the Philippines (Norris et al. 2012).

Minke whales have been acoustically detected in the proximity of the Mariana Islands during the winter and spring (DoN 2014c). Acoustic detections have originated from the waters east of Tinian and Saipan, near some of the deepest parts of the Mariana Trench (Norris et al. 2012). It is believed that these waters likely represent wintering areas for minke whales. Sei whales were visually and acoustically detected during the winter/spring surveys of Norris et al. (2012), with most sightings associated near, but not in, the deepest parts of the Mariana Trench. Previous studies have found sei whales to be a frequently sighted species (DoN 2007; Fulling et al. 2011).

Melon-headed whales have been sighted within 3.0 nautical miles (5.6 kilometers) of the coast of Tinian (Oleson and Hill 2010; Fulling et al. 2011; Hill et al. 2012, 2013). Melon-headed whales have been encountered twice by National Marine Fisheries Service in relatively large group sizes (300-400 animals at a depth of 1,014 meters 15.1 kilometers from shore and approximately 100 animals at a depth of 1,975 m 6.5 kilometers from shore (Hill et al. 2014).

Acoustic and visual data collected during the summer and winter-spring months documented eight marine mammal species in Tinian waters during both time periods (Hill et al. 2013). These include common bottlenose dolphins, false killer whales, pantropical spotted dolphins, pygmy killer whales, rough-toothed dolphins, short-finned pilot whales, spinner dolphins and sperm whales (DoN 2007, 2014c; Norris et al. 2012; Hill et al. 2013). Rough-toothed dolphins were encountered at depths that ranged from 260 meters to 616 meters and distances from shore were 0.4-10.4 kilometers (Hill et al. 2014).

In total, 14 marine mammal species have been documented in the waters surrounding Tinian, with 8 confirmed within 3.0 nautical miles (5.6 kilometers) of the shore (Mobley 2007; E. M. Oleson and Hill 2010; Fulling et al. 2011, 2013; Hill et al. 2012, 2013; Norris et al. 2012; Trianni and Tenorio 2012; DoN 2014c; DoN 2007). These species are presented in Table 3.10-7. Species profiles for the species listed in Table 3.10-6 can be found in Appendix L, Biological Resources Supporting Documentation.

### Table 3.10-7. Marine Mammals Species with Reported Occurrence in the Region of Influence Surrounding Tinian

<table>
<thead>
<tr>
<th>Common Name/Scientific Name</th>
<th>Marine Mammal Protection Act Status</th>
<th>Endangered Species Act Status</th>
<th>CNMI Status</th>
<th>Regional Occurrence in Guam-CNMI Waters</th>
<th>Reported within the Tinian Region of Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sperm whale (Physeter macrocephalus)</td>
<td>Depleted</td>
<td>Endangered</td>
<td>-</td>
<td>Regular</td>
<td>Regular</td>
</tr>
<tr>
<td>Sei whale (Balaenoptera borealis)</td>
<td>Depleted</td>
<td>Endangered</td>
<td>-</td>
<td>Rare</td>
<td>Regular</td>
</tr>
<tr>
<td>Blue whale (Balaenoptera musculus)</td>
<td>Depleted</td>
<td>Endangered</td>
<td>-</td>
<td>Rare</td>
<td>Rare</td>
</tr>
<tr>
<td>Fin whale (Balaenoptera physalus)</td>
<td>Depleted</td>
<td>Endangered</td>
<td>-</td>
<td>Rare</td>
<td>Rare</td>
</tr>
</tbody>
</table>
### Table 3.10-7. Marine Mammals Species with Reported Occurrence in the Region of Influence Surrounding Tinian

<table>
<thead>
<tr>
<th>Common Name/Scientific Name</th>
<th>Marine Mammal Protection Act Status¹</th>
<th>Endangered Species Act Status</th>
<th>CNMI Status²</th>
<th>Regional Occurrence in Guam-CNMI Waters³</th>
<th>Reported within the Tinian Region of Influence⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humpback whale (Megaptera novaeangliae)</td>
<td>Depleted</td>
<td>Endangered</td>
<td>-</td>
<td>Rare</td>
<td>Regular</td>
</tr>
<tr>
<td>Common Minke whale (Balaenoptera acutorostrata)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Rare</td>
<td>Regular</td>
</tr>
<tr>
<td>Short-finned pilot whale (Globicephala macrorhynchus)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Regular</td>
<td>Regular</td>
</tr>
<tr>
<td>False killer whale (Pseudorca crassidens)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Regular</td>
<td>Regular</td>
</tr>
<tr>
<td>Melon-headed whale (Peponocephala electra)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Regular</td>
<td>Regular</td>
</tr>
<tr>
<td>Common bottlenose dolphin (Tursiops truncatus)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Regular</td>
<td>Regular</td>
</tr>
<tr>
<td>Pantropical spotted dolphin (Stenella attenuata)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Regular</td>
<td>Regular</td>
</tr>
<tr>
<td>Spinner dolphin (Stenella longirostris)</td>
<td>-</td>
<td>-</td>
<td>Species of Special Conservation Need</td>
<td>Regular</td>
<td>Regular</td>
</tr>
<tr>
<td>Blainville’s beaked whale (Mesoplodon densirostris)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Regular</td>
<td>Regular</td>
</tr>
<tr>
<td>Cuvier’s beaked whale (Ziphius cavirostris)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Regular</td>
<td>Regular</td>
</tr>
</tbody>
</table>

**Notes:**

¹ Status from Carretta et al. 2014. All marine mammals are protected under the Marine Mammal Protection Act. Populations or stocks that have fallen below the optimum sustainable population level are considered “Depleted.” The Hawaii stocks of sperm whale, sei whale, blue whale, fin whale, and the American Samoa stock of humpback whale are also listed as “Strategic” under the Marine Mammal Protection Act; this status would apply if research determines that these are the stocks that inhabit CNMI waters.

² The Comprehensive Wildlife Conservation Strategy identified species in greatest need of conservation and uses the phrase “species of special conservation need.” Berger et al. 2005 outlines the criteria used to select species for this designation.

³ Regular = a species that occurs as a regular or usual part of the fauna of the area, regardless of how abundant or common it is; Rare = a species that occurs in the area only sporadically. Occurrence designations from the Navy’s Mariana Islands Marine Resource Assessment (DoN 2012/2013, updated with new information as described in DoN 2013, (DoN 2014c; E. Oleson 2014; National Oceanic and Atmospheric Administration 2014).

⁴ The region of influence for marine mammals includes the waters surrounding Tinian from the shoreline to 3.0 nautical miles (5.6 kilometers) offshore. However, the potential for acoustic effects due to pile driving/extraction extends to approximately 7.3 nautical miles (13.6 kilometers) from shore.

**Sources:** DoN 2014c; E. Oleson 2014; National Oceanic and Atmospheric Administration 2014.
The *Marine Mammal Survey* conducted in support of this EIS/OEIS (Appendix M, *Marine Biology Technical Memo and Survey Reports*) collected data about the occurrence and distribution of mammals around Tinian and Pagan. The study area selected for the survey was between 0 and 3.0 nautical miles (5.6 kilometers) from the coast of Pagan and Tinian; which is the same as the region of influence for this EIS/OEIS. Data collection events were conducted on the leeward inshore waters of Tinian in 2 days. A total of 38.8 nautical miles (71.8 kilometers) of predetermined transect lines were completed at Tinian and no marine mammals were sighted.

### 3.10.5 Pagan

#### 3.10.5.1 Marine Habitats

The Pagan coastline is rocky and rugged, but several beaches allow access to the northern part of the island (Sukhraj et al. 2010). Pagan is a younger active volcanic island, and its coral communities are mostly a thin layer on top of igneous substrate, rather than built-up limestone reef (Sukhraj et al. 2010). In general, Pagan has patch reef habitat, particularly on the southern half of the island and in the deeper waters adjacent to South Beach (Suhkraj et al. 2010; DoN 2014a). Green, Red, and Blue Beach are on the west (leeward) shore of Pagan. North Beach is a small, isolated beach on the northern tip of the island. South Beach is a long, crescent-shaped beach on the east (windward) side of Pagan that experiences constant wave energy due to the persistent trade winds from the east. Gold Beach is also on the windward side of Pagan and is located at the end of an irregularly shaped, cliff-lined cove (DoN 2014a).

*Figure 3.10-7* provides an overview of marine habitat around Pagan. *Table 3.10-8* summarizes the amount of various physical characteristics (e.g., coastline, seafloor area, total reef habitat, and reef flat) for the Mariana Islands, and Pagan.

<table>
<thead>
<tr>
<th>Physical Characteristics</th>
<th>Mariana Islands (†MC)</th>
<th>Pagan (†VHC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastline</td>
<td>313 miles</td>
<td>25 miles</td>
</tr>
<tr>
<td>Seafloor area from 0-98 feet (0-30 meters) depth</td>
<td>49,984 acres</td>
<td>4,025 acres</td>
</tr>
<tr>
<td>Total Reef Habitat</td>
<td>65,920 acres</td>
<td>4,416 acres</td>
</tr>
<tr>
<td>Reef flat†</td>
<td>1,728 acres mostly on Guam</td>
<td>Possibly 0.22 acre</td>
</tr>
</tbody>
</table>

*Notes:* † Estimations. See below for estimation confidence levels below; ‡ other habitat types (i.e., reef crest, fore reef, and deep bank), or particular values could only be approximated with confidences below Medium Confidence. Because their inclusion would not be informative, the estimates were not presented. Measurements and estimations have different uncertainties associated with them. For the purposes of this discussion, uncertainty is expressed using the Intergovernmental Panel on Climate Change treatment of uncertainties (Intergovernmental Panel on Climate Change 2007, 2013). The uncertainty guidance draws a distinction between levels of confidence in scientific understanding and the likelihood of specific results. Confidence and likelihood here are distinct concepts but are often linked in practice. The standard terms used to define levels of confidence in this report follow the Intergovernmental Panel on Climate Change approach, namely: VHC= Very high confidence; MC= Medium confidence;.

Figure 3.10-7
Pagan Marine Habitat Overview
3.10.5.1.1 Hard Shores

Coastline within the region of influence for Pagan is dominated by hard shores, as is the case for the CNMI in general, though Pagan is interspersed with soft shores (resulting in beaches that allow access to the northern part of the island). In the vicinity of Blue Beach, Sukhraj et al. (2010) noted the northern and southern ends of Laguna Bay have hardened shorelines extending into the ocean (hard bottom habitat).

3.10.5.1.2 Soft Shores

Soft shore habitat in Pagan includes the following beaches: North Beach, Gold Beach, South Beach, Green Beach, Red Beach, and Blue Beach. In the general vicinity of South Beach, Sukhraj et al. (2010) determined that the beach (soft shore) immediately transitions to hard bottom habitat (spur-and-groove formations). This area is exposed to high energy conditions due to onshore winds and lack of a protective embayment.

In the southern portion of Blue Beach, Sukhraj et al. (2010) noted there is a semi-protected embayment (Laguna Bay), this beach does not have a reef flat, having instead a sandy bottom with occasional rocks and boulders to a depth of at least 30 feet (10 meters). Similarly, surveys performed in the vicinity of Green Beach noted the lack of a reef flat and a sandy substrate with sporadic rocks and patches of coral (hard bottom) to the north and south of the sandy area. A semi-protected embayment in the vicinity of Red Beach also lacks a reef flat and has a sandy bottom bounded to the north and south by patches of coral (hard bottom).

3.10.5.1.3 Hard Bottoms

Hard bottom habitat in the South Beach region is characterized by large coral reef features (reef benches and platforms) that are exposed at low tide and decrease rapidly to depth beyond the reef flat boundary (Sukhraj et al. 2010).

The distribution and cover of hard bottom habitat consisting of coral reef around Pagan are described in detail under Section 3.10.5.3, Marine Invertebrates, and general coral nearshore benthic habitat is illustrated in Figure 3.10-7. Coral reef habitat (hard bottom) covers approximately 4,416 acres (1,787 hectares) of the area around Pagan and is estimated to have 0.22 acre (0.08 hectare) of reef flat (Brainard 2012).

3.10.5.1.4 Soft Bottoms

There are no lagoons in Pagan (Minton et al. 2009).

3.10.5.1.5 Aquatic Beds

There are no mangrove areas around Pagan (International Business Publications, USA 2011) and seagrass was not noted in any of the surveys referenced for this section. Detailed information on macroalgal cover within the region of influence can be found under Section 3.10.5.2, Marine Flora.

3.10.5.1.6 Essential Fish Habitat

Designated Essential Fish Habitat categories for Pagan are those defined for Pacific pelagics, bottomfish and seamount groundfish, crustaceans, and coral reef ecosystems (Western Pacific Regional Fishery
Management Council 2009). The entire water column and seafloor, from the shoreline to the boundary of the Exclusive Economic Zone, is considered Essential Fish Habitat for at least one species.

### 3.10.5.2 Marine Flora

In 2003, mean macroalgae cover on Pagan fore reefs was 46% (Brainard 2012). The northernmost part of the west region of the island had the highest mean macroalgal cover (Brainard 2012). The dominant habitat in this area was spur and groove pavement with rock boulders. Sand flats were interspersed throughout the area. Mean cover of crustose coralline red algae on Pagan fore reef habitats was 7% in 2003. The highest cover was found on west region of the island on pavement and rock boulder habitats.

In 2005, mean macroalgal cover on Pagan fore reefs habitats was 18%. The highest areas of cover were in the north region of the island west of Tarage (North Beach). The 2005 survey reported 12% mean cover of crustose coralline red algae with the highest cover in the south region of the island. Mean macroalgae was reported at 17% in 2007 with the highest cover in the south region of the island. *Asparagopsis* (red algae), *Padina* (brown alga), *Halimeda* (green alga), and cyanobacteria were the dominate species reported (Brainard 2012). Mean crustose coralline red algae cover was 14% in 2007. Unlike other years, the area with the highest cover was along the northwest coast of the island.

Overall, the highest cover of macroalgal populations were in the northern areas of Pagan and included *Halimeda* (green alga), *Caulerpa* (green algae), *Neomeris* (green alga), *Padina* (brown alga), *Asparagopsis* (red algae), and *Liagora* (red algae).

### 3.10.5.3 Marine Invertebrates

Like Tinian, the most common types of non-coral invertebrates found along Pagan’s reefs are starfish, sea urchins, sea cucumbers, mollusks, and tube worms. During the *Coral Marine Resource Survey* conducted in support of this EIS/OEIS (see Appendix M, *Marine Biology Technical Memo and Survey Reports*), giant clams were observed at all six surveyed beaches on Pagan (DoN 2014a). Spider conchs were observed at Green and Red Beaches (DoN 2014a).

Pagan is surrounded by heterogeneous habitat types including shore-attached fringing reefs, non-constructional volcanic sediments (from boulders to sand beaches), uncolonized volcanic substrate, and uncolonized primary coral framework (old coral limestone that currently only supports scattered corals), which is unique to Pagan (Riegl and Dodge 2008; Houk and Starmer 2010). Pagan has no reef flat habitats that can be readily measured. Patch reef habitat is located on the southern half of the island and in the deeper waters adjacent to South Beach (Suhkraj et al. 2010; DoN 2014a). Most of the reef habitat on Pagan has 5-20% coral cover, but patches to 50% cover are not uncommon (Suhkraj et al. 2010; Brainard et al. 2011; DoN 2014a).

A *Coral Marine Resource Survey*, provided in Appendix M (*Marine Biology Technical Memo and Survey Reports*), was conducted in support of this EIS/OEIS and is summarized in the subsections below. The survey focused on substrate shallower than 12 feet (4 meters) (DoN 2014a).
3.10.5.3.1 Green Beach

Overall, Green Beach has low topographic complexity, low coral cover, and high sand cover. There is a relatively large and contiguous area in the center of Green Beach that has especially low cover for organisms and high cover for sand. The central portion of Green Beach is largely devoid of sessile plants or animals. The visibility and apparent water quality at Green Beach is degraded relative to the other leeward beaches on the island, potentially from human sources. The seafloor had a number of kitchen scraps including chicken and cow bones (DoN 2014a).

A total of 70 coral species were recorded during the survey. Green Beach has relatively large heads of Porites corals, with one of the largest measuring 98 feet (29.8 meters) in circumference. These large corals were found across the entrance to Green Beach oriented from north to south, though many were also growing throughout the northern and southern rock formations. Representative images (Photos 3.10-28) of Green Beach are presented below. Green Beach coral cover is shown in Figure 3.10-8 (DoN 2014a).

![Photos 3.10-28. Representative Images of Green Beach](Center of beach; corals on northern rocky outcrop)
Figure 3.10-8
Green Beach Coral Cover

Legend
- 1 Meter Contour
- 5 Meter Contour
- Extent of In-Water Survey

Coral Cover (Percent)
- 0
- 1-10
- >10-30
- >30-50
- >50-70
- >70-100

Data Sources: Fugro Pelagos 2013a, 2013b; DoN 2014b
3.10.5.3.2 Red Beach

The majority of the area surveyed at Red Beach has low topographic complexity, low coral cover, and high sand cover. No portions of the Red Beach seafloor were of high complexity, and none had moderate or high coral cover. A total of 90 coral species were recorded during the survey (DoN 2014a). The majority of the coral was observed at depths shallower than 12 feet (4 meters) at the headlands to the north and south of Red Beach, but not directly in front of the sandy beach. Representative images of Red Beach are presented below. Red Beach coral cover is shown in Photos 3.10-29 and Figure 3.10-9.

Photos 3.10-29. Representative Images of Red Beach
(Clockwise from left: large *Porites rus* colony on southern headland; northern headland – inner; southern headland, showing many small coral colonies and juvenile giant clam; center of beach)
Figure 3.10-9
Red Beach Coral Cover

Legend
- 1 Meter Contour
- 5 Meter Contour
- Extent of In-Water Survey
- Coral Cover (Percent)
  - 0
  - 1-10
  - >10-30
  - >30-50
  - >50-70
  - >70-100

Data Sources: Fugro Pelagos 2013a, 2013b; DoN 2014b
3.10.5.3.3 Blue Beach

Blue Beach is in a semi-protected embayment on the northwest coast of Pagan and is not fronted by a shallow reef flat. Most of the area surveyed at Blue Beach has low topographic complexity, low coral cover, and high sand cover. Within the survey area, there are no portions of the Blue Beach seafloor that have high complexity, nor have moderate or high coral cover. The bottom substrate is coarse-grain igneous sand and cobble. Where corals occur, the dominant substrate is igneous and there is no evidence of carbonate framework buildup (DoN 2014a). A total of 108 coral species were recorded during the surveys. Representative images of Blue Beach are presented below. Blue Beach coral cover is shown in Photos 3.10-30 and Figure 3.10-10.

Photos 3.10-30. Representative Images of Blue Beach
(Clockwise from top left: center of beach; center of beach; patches of richer coral growth at northern headland; southern headland)
Legend

- 1 Meter Contour
- 5 Meter Contour
- Extent of In-Water Survey

Coral Cover (Percent)

- 0
- 1-10
- >10-30
- >30-50
- >50-70
- >70-100

Figure 3.10-10
Blue Beach Coral Cover

Data Sources: Fugro Pelagos 2013a, 2013b; DoN 2014b
3.10.5.3.4 North Beach

The shoreline of North Beach is a shore-attached fringing reef crest with karst characteristics (chemically weathered limestone). Grooves are relatively regular, narrow, and deep. Other narrow grooves run diagonally to the shore’s normal spur-and-groove pattern, and these have the physical characteristics of cracks or fissures. Many of the spurs are deeply undercut, and fracturing seems likely in this geologically active setting (Riegl and Dodge 2008). The bases of grooves often have polished surfaces indicating high-energy sediment transport and erosion. Thirty-three coral species were recorded at North Beach, which is low relative to other sites on Pagan (DoN 2014a). Representative images of North Beach are presented in Photos 3.10-31.

Photos 3.10-31. Representative Images of North Beach
(Clockwise from top left: fissures in shallow fore reef; corals on shallow fore reef; fissures in fore reef; typical shallow fore reef)
3.10.5.3.5 South Beach

South Beach is fronted by a fringing reef. Most of the area surveyed at South Beach has low to moderate topographic complexity, low to moderate coral cover, and low to high sand cover in various locations. The reef area is physically complex, with narrow regular grooves in the shallow fore reef transitioning rapidly to deep fore reef morphology of low-relief relict spurs, punctuated by large Porites colonies (typically 10-20 feet [3-6 meters] in diameter). The bottom substrate is limestone, and no igneous substrate or clasts were visible. The bases of grooves shallower than 16 feet (5 meters) often had polished surfaces and polished cobble-sized clasts, indicating high-energy sediment transport and erosion. The shoreline of South Beach is a shore-attached fringing reef crest with karst characteristics (chemically weathered limestone). Shallower than 10 feet (3 meters), the South Beach fringing reef is homogenous. An exception is the prominent sand channel running from offshore to inshore just east of the center of South Beach. This sand channel is about 330 feet (100 meters) wide and runs up to the exposed shore-attached fringing reef crest. A total of 101 coral species were recorded at South Beach. Representative images of South Beach are presented in Photos 3.10-32. South Beach coral cover is shown in Figure 3.10-11.

Photos 3.10-32. Representative Images of South Beach
(Clockwise from top left: typical shallow fore reef; typical deeper fore reef; typical large Porites head; deeper sand channel)
Figure 3.10-1
South Beach Coral Cover

Legend
- 1 Meter Contour
- 5 Meter Contour
- Extent of In-Water Survey
- Coral Cover (Percent)
  - 0
  - 1-10
  - >10-30
  - >30-50
  - >50-70
  - >70-100

Sources: Fugro Pelagos 2013a, 2013b; DoN 2014b
3.10.5.3.6 Gold Beach

Gold Beach is located at the end of an irregularly shaped, cliff-lined cove. The shoreline of Gold Beach is a shore-attached fringing reef crest. The cliff walls and steep fringing reef are a result of incoming waves from several directions. This wave action often results in rough seas and dangerous waves. This water motion transports sand to deeper waters. Gold Beach has moderate topographic complexity, high coral cover, and low or no sand cover. The bottom substrate is limestone. The reef area is physically complex, with deep irregular grooves and fractures. The bases of grooves have polished surfaces, indicating high-energy sediment transport and erosion. Because of dangerous conditions, most survey efforts could not be safely conducted in the shallows of Gold Beach (DoN 2013a). Habitats shallower than 6 feet (2 meters) were inaccessible and areas shallower than 12 feet (4 meters) were too rough to survey (DoN 2013a). During the limited survey effort, a total of 92 coral species recorded at Gold Beach. Representative images of Gold Beach are shown in Photos 3.10-33, and Gold Beach coral cover is shown in Figure 3.10-12.

Photos 3.10-33. Representative Images of Gold Beach
(Clockwise from top left: Southern half of Gold Beach, topographically complex shallow fore reef, topographically complex deeper fore reef, typical shallow fore reef)
Figure 3.10-12
Gold Beach Coral Cover

Legend

- 1 Meter Contour
- 5 Meter Contour
- Extent of In-Water Survey

Coral Cover (Percent)

- 0
- 1-10
- >10-30
- >30-50
- >50-70
- >70-100

Sources: Fugro Pelagos 2013a, 2013b
3.10.5.4 Fish

The Mariana Archipelago Reef Assessment and Monitoring Program conducted Pagan fish surveys in 2003, 2005, and 2007, and provide the basis of information in this section. The surveys found that total fish biomass on Pagan was high compared others Mariana Islands.

In 2003, snappers and reef sharks dominated in terms of biomass at Pagan. Surgeonfish, mainly the orangespine unicornfish (*Naso lituratus*), also largely contributed to Pagan’s 2003 total fish biomass. Surgeonfish were the dominant species in 2005 and 2007, but total fish biomass results were similar to that in 2003.

The Mariana Archipelago Reef Assessment and Monitoring Program surveys found similar fish species richness for the fore reef habitats surveyed at various survey sites around Pagan. The fish species richness remained consistent for all three years, with wrasses being the most represented family, recording an average of 27 species per year. Overall, the most abundant fish families include wrasse and damselfish, with the most common species being the ornate wrasse (*Thalassoma pavo*), Vanderbilt’s chromis (*Chromis vanderbilti*), and the midget chromis.

During the various marine resources surveys conducted in support of this EIS/OEIS, fish species were recorded and summarized in a species list report. The survey found 278 species of fish at Pagan. Green Beach had 82 species, Red Beach had 180 species, Blue Beach had 64 species, North Beach had 35 species, Gold Beach had 86 species, and South Beach had 160 species.

3.10.5.5 Special-status Species

3.10.5.5.1 Marine Invertebrates

Seventeen marine invertebrates have been designated by the CNMI Division of Fish and Wildlife as Species of Special Conservation Need; nine of which are confirmed to be present in Pagan waters (*Table 3.10-9*) (Berger et al. 2005).
### Table 3.10-9. Marine Invertebrates Identified by the CNMI Division of Fish and Wildlife

<table>
<thead>
<tr>
<th>Marine Species of Special Conservation Need in Pagan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common Name/Scientific Name</strong></td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Ghost Crab (<em>Ocypode</em> spp)</td>
</tr>
<tr>
<td>Rock Crab (<em>Grapus</em> spp)</td>
</tr>
<tr>
<td>Spiny Lobster (<em>Panulirus</em> spp)</td>
</tr>
<tr>
<td>Land Hermit Crab (<em>Coenobita</em> spp)</td>
</tr>
<tr>
<td>Surf redfish (sea cucumber) (<em>Actinopyga mauritiana</em>)</td>
</tr>
<tr>
<td>Black teatfish (sea cucumber) (<em>Holothuria whitmaei</em>)</td>
</tr>
<tr>
<td>Sea urchin (<em>Toxopneustid</em> spp)</td>
</tr>
<tr>
<td>Giant clam (<em>Tridacna</em> spp)</td>
</tr>
<tr>
<td>Pectinate venus (<em>Gafrarium pectinatum</em>)</td>
</tr>
<tr>
<td>Common spider conch (<em>Lambis lambis</em>)</td>
</tr>
<tr>
<td>Horned helmet shell (<em>Cassis cornuta</em>)</td>
</tr>
<tr>
<td>Tapestry turban shell (<em>Turbo petholatus</em>)</td>
</tr>
<tr>
<td>Rough turban (<em>Turbo setosus</em>)</td>
</tr>
<tr>
<td>Silver-mouth turban (<em>Turbo argyrostroma</em>)</td>
</tr>
<tr>
<td>Triton’s trumpet shell (<em>Charonia tritonis</em>)</td>
</tr>
<tr>
<td>Octopus (<em>Octopus</em> spp)</td>
</tr>
</tbody>
</table>

**Notes:**
2. *Tridacna* spp includes the Fluted giant clam (*Tridacna squamosa*) and the Elongate giant clam (*Tridacna maxima*).

### Table 3.10-10. Special-status Coral Species of Pagan

<table>
<thead>
<tr>
<th>Coral (Genus/Species)</th>
<th>Endangered Species Act Status</th>
<th>Reported within Pagan Region of Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Acropora globiceps</em></td>
<td>Threatened</td>
<td>Yes; Gr R B N S Gd</td>
</tr>
<tr>
<td><em>Acropora retusa</em></td>
<td>Threatened</td>
<td>No</td>
</tr>
<tr>
<td><em>Pavona diffluens</em></td>
<td>Threatened</td>
<td>No</td>
</tr>
<tr>
<td><em>Seriatopora aculeata</em></td>
<td>Threatened</td>
<td>No</td>
</tr>
</tbody>
</table>

**Notes:**
1. The region of influence for marine biological resources includes the waters surrounding Tinian and Pagan from the shoreline to 3.0 nautical miles (5.6 kilometers) offshore.
2. Gr = Green Beach, B = Blue Beach, R = Red Beach, N = North Beach, S = South Beach, Gd = Gold.

**Sources:** DoN 2014a; National Marine Fisheries Service 2014a.

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**3.10.5.5.1.1 Coral Species**

Coral species that are listed under the Endangered Species Act and confirmed to occur in Pagan’s nearshore environment are provided in Table 3.10-10. Based on the Coral Marine Resources Survey conducted in support of the EIS/OEIS (see Appendix M, Marine Biology Technical Memo and Survey Reports), one coral species listed under the Endangered Species Act, *Acropora globiceps*, was recorded at Green Beach, Red Beach, Blue Beach, North Beach, Gold, and South Beach (Table 3.10-10) (DoN 2014a).
The Coral Marine Resources Survey Report conducted in support of this EIS/OEIS (DoN 2014a, see Appendix M, Marine Biology Technical Memo and Survey Reports) surveyed and recorded Endangered Species Act coral species at each beach. 

_Acropora globiceps_ was recorded in the vicinity of Green Beach, Red Beach, Blue Beach, North Beach, Gold Beach, and South Beach (DoN 2014a). Surveys conducted at Green Beach recorded 20 colonies of _Acropora globiceps_. The average size of a colony was 16 square inches (106 square centimeters) with the largest colony measuring 73 square inches (471 square centimeters). A total of 31 colonies were recorded at Red Beach with an average colony size of 11 square inches (73 square centimeters) and 5 colonies were recorded at South Beach, averaging in size of 30 square inches (196 square centimeters). _Acropora globicep_ was not found directly in front of the sandy beach at Blue Beach, or at depths shallower than 12 feet (4 meters). Survey efforts at Gold Beach were limited due to rough sea conditions.

_Acropora retusa, Pavona diffluens,_ and _Seriatopora aculeata_ were not observed during the survey (DoN 2014a); however, their presence is conceivable.

### 3.10.5.5.2 Fish

Special-status fish species documented in the CNMI include the scalloped hammerhead shark, humphead wrasse, and gray reef shark. During the various marine resources surveys conducted in support of this EIS/OEIS, fish species were also recorded and summarized in a species list report. No Endangered Species Act listed or candidate species were observed on Pagan (DoN 2013b).

### 3.10.5.5.3 Sea Turtles

The green sea turtle, hawksbill sea turtle, and leatherback sea turtle are potentially found in the Pagan region of influence. These species and their expected occurrences in Pagan waters are listed in Table 3.10-11.

<table>
<thead>
<tr>
<th>Common Name/Scientific Name</th>
<th>Endangered Species Act Status</th>
<th>CNMI Status</th>
<th>Confirmed in Pagan Region of Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green sea turtle (<em>Chelonia mydas</em>)</td>
<td>Threatened</td>
<td>Species of Special Conservation Need</td>
<td>Yes¹</td>
</tr>
<tr>
<td>Hawksbill sea turtle (<em>Eretmochelys imbricata</em>)</td>
<td>Endangered</td>
<td>Species of Special Conservation Need</td>
<td>Yes²</td>
</tr>
<tr>
<td>Leatherback sea turtle (<em>Dermochelys coriacea</em>)</td>
<td>Endangered</td>
<td>None</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes: ¹The region of influence for marine biological resources includes the waters surrounding Pagan from the shoreline to 3.0 nautical miles (5.6 kilometers) offshore.

²Observed during 2013 surveys in support of the EIS/OEIS (DoN 2014b).

³The Comprehensive Wildlife Conservation Strategy identified species in greatest need of conservation and uses the phrase “species of special conservation need.” Berger et al. 2005 outlines the criteria used to select species for this designation.
Assessments using the Kolinski 2003 data estimated the Pagan sea turtle population to be between 21 and 83 sea turtles, with 96% identified as green sea turtles and 4% hawksbill sea turtles (Kolinski 2003). The July 2013 Sea Turtle Marine Resource Survey (see Appendix M, Marine Biology Technical Memo and Survey Reports) conducted in support of this EIS/OEIS identified green and hawksbill sea turtles (Photo 3.10-33) in Pagan nearshore waters (DoN 2014b). Based on the survey, the sea turtle population at Pagan is estimated at 448 individuals. No conclusion could be made regarding any seasonal or infrequent transient sea turtles to the area or regarding the resident sea turtle home range or foraging habits across the islands. The population results from Kolinski’s survey and the survey conducted in support of this EIS/OEIS differ; although this analysis cannot determine the cause of the difference, possible explanations include seasonality, changes in habitat or sea turtle behavior, or an increase in sea turtle population (DoN 2014b).

On Pagan, surveys of various methods were conducted along the northwest, west, south, east, and the Green-Red-Blue Beach complex zones around the island. Sea turtle densities appear relatively uniform based on towboard data, with density calculations of 122 sea turtles per square mile (47 sea turtles per square kilometer). Cliffline data for the two sectors (northwest and west), provided the highest density estimates, of 196 sea turtles/square mile (75.8 sea turtles/square kilometer) and 262 sea turtles/square mile (101 sea turtles/square kilometer), respectively. Along the northwest coast, the difference in calculated densities between the two methods could be due to a greater density of sea turtles occurring closer to shore; topography prohibited conducting the towboard survey closer to shore due to diver safety issues. The cliffline density estimates for the west sector result largely from observations at a single location, where a greater extent of available habitat and sheltered waters may support an increased density in this portion of the west sector of Pagan.

Based on the total number of sea turtles identified during the DoN 2013 survey, there are an estimated 297 green sea turtles, consisting mostly of juveniles and subadults. An estimated population of 151 hawksbill sea turtles was recorded, also consisting of mostly juveniles and subadults (DoN 2014b). Hawksbill sea turtles are a substantial percentage of the sea turtles in the waters around Pagan, which is unique for the CNMI as these sea turtles are rarely recorded in waters around the Rota, Guam, Aguijan, Tinian, and Saipan (DoN 2014b).

### 3.10.5.4 Marine Mammals

Several studies have included Pagan waters within their study areas (Yamaguchi 1995; Ohizumi et al. 2002; Trianni and Kessler 2002; Norris et al. 2012; DoN 2007; Fulling et al 2011), including the 2013 survey conducted in support of this EIS/OEIS summarized in the section below.

The Marine Mammal Survey conducted in support of this EIS/OEIS identified five marine mammals in the nearshore waters of Pagan using both acoustic and visual methods. These included sperm whales,
common bottlenose dolphins, spinner dolphins, Cuvier’s beaked whales, and Blainville’s beaked whales. The five marine mammal species confirmed in the nearshore environment of Pagan, and their Marine Mammal Protection Act and Endangered Species Act designations, are presented above in Table 3.10-12.

Table 3.10-12. Marine Mammals with Reported Occurrence in the Region of Influence Surrounding Pagan

<table>
<thead>
<tr>
<th>Common Name/Scientific Name</th>
<th>Marine Mammal Protection Act Status</th>
<th>Endangered Species Act Status</th>
<th>CNMI Status</th>
<th>Reported within the Pagan Region of Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sperm whale (Physeter macrocephalus)</td>
<td>Depleted</td>
<td>Endangered</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>Common bottlenose dolphin (Tursiops truncatus)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>Spinner dolphin (Stenella longirostris)</td>
<td>-</td>
<td>-</td>
<td>Species of Special Conservation Need</td>
<td>Yes</td>
</tr>
<tr>
<td>Blainville’s beaked whale (Mesoplodon densirostris)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>Cuvier’s beaked whale (Ziphius cavirostris)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes:  
1 Status from Carretta et al. 2014. All marine mammals are protected under the Marine Mammal Protection Act. Populations or stocks that have fallen below the optimum sustainable population level are considered “Depleted.” The Hawaii stocks of sperm whale, sei whale, blue whale, fin whale, and the American Samoa stock of humpback whale are also listed as “Strategic” under the Marine Mammal Protection Act; this status would apply if research determines that these are the stocks that inhabit CNMI waters.

2 The Comprehensive Wildlife Conservation Strategy identified species in greatest need of conservation and uses the phrase “species of special conservation need.” Berger et al. 2005 outlines the criteria used to select species for this designation.

3 Regular = a species that occurs as a regular or usual part of the fauna of the area, regardless of how abundant or common it is; Rare = a species that occurs in the area only sporadically. Occurrence designations from the Navy's Mariana Islands Marine Resource Assessment (DoN 2012/2013), updated with new information as described in DoN 2013, (DoN 2014c; E. Oleson 2014; National Oceanic and Atmospheric Administration 2014).

4 The region of influence for marine mammals includes the waters surrounding Pagan from the shoreline to 3.0 nautical miles (5.6 kilometers) offshore. However, the potential for acoustic effects due to pile driving/extraction extends to approximately 7.3 nautical miles (13.6 kilometers) from shore.


The marine mammal survey conducted in support of this EIS/OEIS was the first systematic survey that focused on the Pagan nearshore environment (within 3.0 nautical miles [5.6 kilometers]) (DoN 2014c).

Most spinner dolphin sightings and detections were on the east side of Pagan, and all sightings were within 0.54 nautical mile (1.0 kilometer) of shore (DoN 2014c). Generally, spinner dolphins were sighted near Green Beach on the west side (DoN 2014c). Of the spinner dolphins observed, 75% of the groups included calves (DoN 2014c). Results of the photo-identification analyses indicate that spinner dolphins identified at Pagan were later resighted in the same survey.

Bottlenose dolphins were observed twice on Pagan, both on the west side of the island, although one sighting was near the northern tip. Both sightings were within 0.54 nautical mile (1.0 kilometer) of shore
and one was 0.25 nautical mile (0.46 kilometer) from Blue Beach. This sighting was in relatively shallow water of 118 feet (36 meters), while the other was in moderately deep water of 1,535 feet (468 meters).

There were three sightings of unidentified dolphins, all on the west side of the island, although one was near the southern tip. They were seen in a range of water depths, from 95 to 2,385 feet (29 to 727 meters) and at a range of distances from shore, 0.27 to 1.1 nautical miles (0.5 to 2 kilometers). One of the unidentified groups was thought to be spinner dolphins, due to their slim profile. The other two groups were thought to be bottlenose dolphins, based on slightly robust bodies and pronounced dorsal fins. The body proportions of these dolphins was too short and not robust enough to be larger species, such as melon-headed whales or pygmy killer whales (DoN 2014c).

In addition to the confirmed sightings, recordings of unidentified dolphins and assumed Delphinid vocalizations were collected and compared to pre-recorded vocalizations of rough-toothed dolphins, false killer whales, spotted dolphins, striped dolphin (*Stenella coerulealba*), spinner dolphins, and bottlenose dolphins (DoN 2014c). Vocalizations that matched the striped/spinner category were most likely associated with spinner dolphins (DoN 2014c).

The sperm whale was the only large species of whale detected during the survey. The acoustic detection of sperm whales indicates its presence; however, the sonobuoy methods used in this study are not able to estimate the locations of the vocalizing animals. The sperm whales were detected off the west side of the island from using sonobuoys off Red Beach and Blue Beach, and Green Beach areas (DoN 2014c).

Two species of beaked whales, Cuvier’s and Blainville, were also identified. The Cuvier’s beaked whale was detected visually within 1.5 nautical miles (2.7 kilometers) of shore off the southwestern end of the island, while the Blainville’s beaked whale was detected acoustically in the more northern waters (DoN 2014c); however the precise location cannot be determined from the acoustic detection. As with sperm whales, both beaked whale species are usually associated with deep waters. The presence of these species within 3.0 nautical miles of shore is likely attributed to the proximity of deep waters close to the Pagan shore. All detections came from deep water, close to shore, and both species are likely common around Pagan as the are other Mariana Islands (DoN 2014c).
3.11 Cultural Resources

Section 3.11 provides a summary of the general condition and character of cultural resources on Tinian and Pagan. The region of influence for cultural resources, which is equivalent in this case to the area of potential effect under the National Historic Preservation Act, includes the land and waters of Tinian and Pagan (out to a distance of 1,000 feet [300 meters]; the distance is based on the footprint of amphibious training under the proposed action), because of ground disturbance caused by construction, training activities, and maintenance operations associated with the no-action alternative and proposed action alternatives that have the potential to impact cultural resources. Indirect impacts to cultural resources may result from access restrictions to certain types of resources, inadvertent disturbance due to an increase in population, or soil erosion from land-clearing activities.

Currently, Department of Defense actions within this area are covered by two Programmatic Agreements—one for military training activities relating to the Mariana Islands Range Complex EIS/OEIS (DoN 2010a) and one for the Guam and CNMI Military Relocation EIS (DoN 2010b) to establish four ranges on Tinian.

3.11.1 Definition

Cultural resources are defined as the collective evidence of past human activities and accomplishments, and typically include archaeological resources, architectural properties, and traditional cultural properties. These terms are defined below.

- **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 or Built Properties**: Those standing buildings, dams, canals, bridges, and other structures which have historic, engineering, or aesthetic significance.
- **Traditional Cultural Properties**: A specific type of historic property that is often classified as a site. They usually consist of landscapes with a defined overlay of traditional cultural significance derived from associations with cultural practices and beliefs of a living community that are rooted in its history, and are important in maintaining the continuing cultural identity of the community. Traditional cultural properties may include sites carrying religious importance or have ceremonial significance.

Under the National Historic Preservation Act, 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 National Register of Historic Places. Under NEPA, impacts to historic properties and other resources of cultural importance are evaluated. Examples of other resource types include: cultural practices, cemeteries, memorials, sacred sites, medicinal plants, or other resources that hold special traditional, religious, or cultural significance.
3.11.2 Regulatory Framework

A brief listing of the regulatory framework governing cultural resources follows and is described in greater detail in Appendix N, *Cultural Resources Technical Memo*. A complete listing of applicable regulations is provided in Appendix E, *Applicable Federal and Local Regulations*.

- Abandoned Shipwreck Act, 43 U.S. Code § 2101-2106
- Historic Sites Act, 16 U.S. Code § 461-467
- National Historic Preservation Act, 54 U.S. Code 300101 et seq.
- Sunken Military Craft Act of 2004, 10 U.S. Code 113-118
- Determinations of Eligibility for Inclusion in the National Register of Historic Places (36 CFR 63)
- National Historic Landmarks Program (36 CFR 65)
- Curation of Federally-Owned and Administered Archeological Collections (36 CFR 79)
- Protection of Historic Properties (36 CFR 800)
- Preservation of American Antiquities (43 CFR 3)
- Executive Order 11593, Protection and Enhancement of the Cultural Environment
- Executive Order 13287, Preserve America

3.11.3 Methodology

The process for identifying and evaluating historic properties is established under the National Historic Preservation Act and other laws and regulations. National Historic Preservation Act Section 106 regulations direct federal agencies to make reasonable and good faith efforts to identify historic properties (36 CFR § 800.4(b)(1)) in regards to a proposed action. Agencies are to take into account past planning, research and studies; the magnitude and nature of the action and the degree of federal involvement; the nature and extent of potential effects on historic properties; and the likely nature and location of historic properties within areas that may be affected.

For this EIS/OEIS, the DoN used a combination of methods (i.e., archival research, ground surveys, archaeological and architectural surveys, ethnography and oral histories) to identify historic properties and other cultural resources described in Section 3.11.1, Definition, and analyze potential impacts for each alternative. The DoN reviewed previous studies to identify existing information on historic properties and resources of cultural importance within the area of potential effect and identified the locations that would require additional study. Additional surveys and archival and oral history studies were conducted as part of this EIS/OEIS.

3.11.4 Tinian

The Tinian region of influence includes the Military Lease Area and adjacent submerged lands, and improvement areas north of Tinian International Airport, at the Port of Tinian, and access roads from the Port of Tinian to the Military Lease Area. A summary of the prehistory and history of Tinian is included in Appendix N, *Cultural Resources Technical Memo*. A general timeline of major historic events is included in Figure 3.11-1.
Figure 3.11-1  Major Historic Events for Tinian and Pagan
3.11.4.1 Previous Cultural Resource Studies and Recorded Resources

3.11.4.1.1 Military Lease Area

Our analysis identified 52 cultural resource investigations in the Military Lease Area, north of Tinian International Airport, and the Port of Tinian improvements area. These include archaeological assessments, Phase I surveys, Phase II testing, data recovery excavations, architectural surveys, and traditional cultural property studies, as well as a cultural landscape study. Testing and/or intensive excavation have been part of nine major studies. Extensive research of archives in the U.S., Japan, and Micronesia, including references to collections of historical maps and photographs, supplemented the intensive excavation. Appendix N, Cultural Resources Technical Memo, provides specific detail on these studies and the resources recorded.

Approximately 98% of the Military Lease Area has been surveyed for archaeological resources with only a portion of the property leased by the International Broadcasting Bureau on the western side of the island, yet to be surveyed. Previous studies identified 356 archaeological sites; of these, 2 are listed in the National Register of Historic Places (North Field National Historic Landmark and the Unai Dankulo petroglyphs) and 319 are considered eligible for listing in the National Register of Historic Places. These include Pre-Contact latte sites; most of the Japanese Administration sites such as shrines, defensive caves, farmsteads, and internment camps; World War II sites; and petroglyphs. There are no intact buildings within the Military Lease Area that retain architectural integrity. There are only remnant structures associated with pre-war Japanese farmsteads and World War II Japanese and American military structures. As such, these structures are considered archaeological resources.

North Field, the landing beaches, and Ushi Point were collectively designated a National Historic Landmark for their role in World War II. The landmark comprises structures and structural remains, four runways and sites used to assemble and load the atomic bombs that were dropped on Hiroshima and Nagasaki (Figure 3.11-2). As defined by the National Register nomination form (Thompson 1984), the National Historic Landmark boundaries include 26 recorded archaeological sites; however only a few of the features within the National Historic Landmark are considered to be contributing features to the Landmark (Table 3.11-1). The entire National Historic Landmark is within the area of potential effects and impacts to any contributing features of the National Historic Landmark would be considered an impact the integrity of the National Historic Landmark over all.

<table>
<thead>
<tr>
<th>Table 3.11-1. Contributing Features to the North Field National Historic Landmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributing Feature</td>
</tr>
<tr>
<td>Landing Beach White 1</td>
</tr>
<tr>
<td>Landing Beach White 2 and Japanese Pillbox</td>
</tr>
<tr>
<td>North Field Runways, Taxiways, and Service Aprons</td>
</tr>
<tr>
<td>Air Operations Building</td>
</tr>
<tr>
<td>Two Air Raid Shelters</td>
</tr>
<tr>
<td>Japanese Service Apron</td>
</tr>
<tr>
<td>Air Administration Building</td>
</tr>
</tbody>
</table>
Potential traditional cultural properties within the Military Lease Area include three beaches: Unai Chulu, Unai Dankulo, and Unai Masalok. Based on discussions from Tinian residents, additional resources such as medicinal plants are collected by cultural practitioners from the native limestone forests within the Military Lease Area (DoN 2014a). Memorials such as the Hinode American Memorial, the Mount Lasso Shrine, the 86th Street Shrine, the NKK Shrine, and the Ushi memorial are also found in the Military Lease Area.

### 3.11.4.1.2 North of Tinian International Airport

All of the area north of the Tinian International Airport runways has been surveyed for archaeological resources. Within the Tinian International Airport area, two archaeological sites have been recorded that are considered eligible for listing in the National Register of Historic Places. These include one farm site from the Japanese Administration era and one World War II American military site (West Field) (Dixon and Welch 2002). The area immediately north of Tinian International Airport runways was originally constructed by the Japanese during World War II. The U.S. military expanded the airfield to provide a base to support B-29 operations against Japan in 1945.

### 3.11.4.1.3 Port of Tinian

Seventeen studies have been conducted at the Port of Tinian and adjacent areas (see Figure 1, Appendix N, Cultural Resources Technical Memo). In 2008, an architectural survey and archival study for the entire Port of Tinian, which included all structures along the wharf or quay, was conducted (Thursby 2010). Some of the port features, including the breakwater, although lacking in architectural integrity, are considered eligible for listing in the National Register of Historic Places as an archaeological site.

In 2014 and 2015, archaeological surveys of the area around the port and adjacent to 6th and 8th Avenues were completed (DoN 2014a, DoN 2015). Two sites were recorded in the proposed port improvement area and consisted of Japanese tank debris from World War II, World War II-era American Administration concrete pads, and a prehistoric pottery scatter. Because the sites are so deteriorated, they are not eligible for listing in the National Register of Historic Places. Thirteen sites were identified along the proposed road corridors from the Port of Tinian and the Military Lease Area. These include Pre-Contact artifact scatters, concrete foundations, railroad remnants, and World War II defenses. Eight of the sites are eligible for listing in the National Register of Historic Places and five sites are not eligible.

### 3.11.5 Pagan

The Pagan region of influence includes the island and adjacent submerged lands. This broad area was identified because proposed military training activities could impact cultural resources described in Section 3.11.1, Definition, across the island and along the shoreline. A summary of the prehistory and history of Pagan is included in Appendix N, Cultural Resources Technical Memo. A general timeline of major historic events is included in Figure 3.11-1.

### 3.11.5.1 Previous Cultural Resource Studies and Recorded Resources

Eight cultural resource investigations have been conducted on Pagan; these include a historical overview, intensive and reconnaissance level surveys, limited archaeological excavations, and traditional cultural property studies (see Figure 2 in Appendix N, Cultural Resources Technical Memo). Extensive research of archives in the U.S., Japan, and Micronesia, including reviews of collections of historical...
maps and photographs, supplemented the fieldwork completed for this EIS/OEIS. Appendix N, Cultural Resources Technical Memo, Section 2.2.2, provides specific detail on these studies and the resources recorded.

Approximately 60% of the island is covered in lava or has topography with slopes greater than 30%, which are unlikely to contain historic properties. Of the areas with less than 30% slope, approximately 33% of Pagan has been surveyed for archaeological resources. However, many of these areas are in the central portion of the island and are not located near coastlines where most sites tend to be found. Unsurveyed areas with the potential to contain historic properties occur primarily in the southern portion of Pagan. To provide information on unsurveyed areas, archaeological surveys were supplemented by aerial inspections and oral history interviews with former residents, which included additional information on the presence of Pre-Contact villages and other resources of cultural importance in the area (Athens 2009; DoN 2014b). A total of 181 sites have been identified through archaeological surveys for Pagan (Athens 2009; Higelmire and DeFant 2013) including a survey conducted in support of this EIS/OEIS (Athens 2009; Higelmire and DeFant 2013; DoN 2014b). Of the 181 sites, 110 were evaluated and recommended as eligible to the National Register of Historic Places and 71 were recommended not eligible. Most of the sites are located in the relatively flat areas in central Pagan, south of the Mount Pagan caldera. Sites with latte features tend to be concentrated on low terraces above beaches. Sites on south Pagan are found along the edges of the caldera, in the limited pockets of relatively level areas. Additionally, Japanese military sites are found in cliff sides and on top of high points overlooking beaches.

Potential traditional cultural properties include traditional fishing areas and traditional healing locations, as well as South Beach (Regusa), Red Beach (Shomshon), Paliat, Pialama, Apansanmena, and a mortar/medicine stone.

Resources of cultural importance include a variety of medicinal plants, including fofgo (morning glory vine), gàoso’soa’ (type of bush), puntan talisai (tips of Terminalia catappa), galak (Asplenium nidus, a fern), niyok (coconut), Flores Mayu (a flower) and ahgao (Premna obtusifolia, a tree). Gathering locations for these plants are widely dispersed across the island, and occur in upland settings and along cliff lines adjacent to the shore. Beaches and near-shore reefs used as traditional fishing areas occur along the coast. There are also named locations for the gathering of resources such as gaddo’ (wild yam), gapgap (arrowroot), su ni (taro), pugua (betel nut), dagu (yams), and kahet (oranges). These are dispersed resource patches that tend to cluster along the southwestern and eastern coasts of the island. Shomshon Bay is used for mortuary practice. The gathering of betel nuts as a cultural practice occurs in certain locations along the steep slopes on the isthmus and is associated with marriage rituals.
3.12 **VISUAL RESOURCES**

Section 3.12 describes the existing visual resources that may be impacted as a result of the proposed action. Visual resources include scenic areas, thoroughfares, and access ways that provide natural-appearing or aesthetically pleasing places or views. Visual resource descriptions focus on well known specific places, views, and scenic overlooks. These resources also include viewsheds that people are accustomed to seeing as part of the general landscape. The region of influence for visual resources includes the islands and surrounding scenic vistas of Tinian and Pagan. The specific study areas are provided under the description for each island.

Visual resources are often associated with historic, cultural, and recreational resources. Descriptions of visual resources that are also recreational resources are discussed in Section 3.8, *Recreation*. Descriptions of visual resources that are also cultural resources are discussed in Section 3.11, *Cultural Resources*.

3.12.1 **Definition**

Natural views include shorelines, seascapes, and cliffs. Man-made views include unique buildings, landscaping, parks, and cultural features. Views are described in terms of foreground, middle-ground, and background elements. For this analysis, the foreground is defined as up to 0.25 mile (0.4 kilometer) from the viewpoint; middle-ground is defined as between 0.25 mile (0.4 kilometer) and 3 miles (5 kilometers) from the viewpoint; and background is defined as greater than 3 miles (5 kilometers) from the viewpoint. Visual resources are further defined by:

- Dominant landscape features (e.g., a tall water tower in a landscape otherwise composed of low vegetation, and one- or two-story buildings)
- Diversity (e.g., cattle grazing adjacent to a former World War II military facility with the central highlands as a backdrop)
- Elements of line, color, form, and texture
- Distinctive visual edges (e.g., a housing tract adjacent to a forested area)

3.12.2 **Regulatory Framework**

NEPA requires federal agencies to consider scenery and aesthetic resources in federally supported projects. Federal agencies, including the Federal Highway Administration, the U.S. Forest Service, and the Bureau of Land Management, have developed guidance to implement NEPA with respect to the evaluation of visual resources.

3.12.3 **Methodology**

The methodology for analysis of visual impacts in this EIS/OEIS is based on the guidelines found in the *Bureau of Land Management Manual H-8410-1 – Visual Resource Inventory* (Bureau of Land Management 1986a), and *Bureau of Land Management Manual 8431 – Visual Resource Contrast Rating* (Bureau of Land Management 1986b). The Bureau of Land Management guidance was chosen as the
methodology for this proposed action, as it has the desired flexibility to accommodate the varying landforms and visual environments found within the project area.

The methodology consists of the following steps:

1. Establish the visual character and visual quality of the affected environment. Visual character includes elements such as landforms, vegetation, water surfaces, and modifications that give a landscape its visually aesthetic qualities. The visual quality of a landscape is determined by factors such as its uniqueness, harmonious appearance, prominence, diversity, and viewer sensitivity.

2. Determine Key Observation Points to represent the most critical viewpoints related to visual quality and the aesthetic experience. These are usually along commonly traveled routes or at other public observation points. Factors considered in selecting Key Observation Points include:
   - Visual quality of the landscape
   - Angle of observation
   - Number of potential viewers
   - Length of time a facility or activity is in view
   - Relative size of facilities and activities
   - Season of use
   - Light conditions (e.g., time of day and shadowing)

### 3.12.4 Tinian

#### 3.12.4.1 Regional Visual Environment and Study Area

The island of Tinian is characterized by a series of limestone plateaus, steep slopes, and cliffs. The steep cliffs along the shoreline are concentrated on the southeast and northwest sides of the island and provide a dramatic visual backdrop. The central part of the island is a relatively flat plateau extending from the village of San Jose along Broadway Avenue corridor, north almost to North Field. The same type of flat plateau is located along the 8th Avenue corridor. Both of these corridors have intermittent forested areas within grassland, and topography that provide broad views north and south on the island, with the north-central highlands area situated between the two corridors. Unlike other islands in the Mariana Island chain, Tinian has large areas of relatively flat expanses, such as North Field.

The study area for visual analysis on Tinian consists of the Military Lease Area that covers the northern two-thirds of the island. The study area includes three major visual environments, shown in Figure 3.12-1. Key Observation Points are shown, indicating their respective number and view orientation.

- **North Lowland:** North Field sits on a relatively flat plateau that slopes away to the ocean on the north, east, and west sides of the island (see Section 3.2, Geology and Soils, Figure 3.2-2). There is some undulation across the plateau. The southern side of the plateau is defined by a steep escarpment that connects to the Mount Lasso ridge line. Lake Hagoi is the lowest point on North Field plateau, with a minimum elevation of approximately 10 feet (3 meters) above MSL.
Figure 3.12-1
Tinian Key Observation Points
- **West Tinian**: Western Tinian includes the highlands of the central plateau west of Broadway. This area extends north from Marpo Valley and is broad and gently sloping, with the majority of the vertical relief along the western shoreline. The north central highland area is within the northern part of the central plateau and midway between the east and west coasts of the island. The maximum elevation of the highland is 545 feet (166 meters) above MSL on Mount Lasso (see Section 3.2, *Geology and Soils*, Figure 3.2-2). Eighth Avenue provides the central corridor through this area with steep cliffs extending along the west side of Riverside Drive where the steep slopes extend to the sea.

- **East Tinian**: This land area extends north from Marpo Valley (see Section 3.2, *Geology and Soils*, Figure 3.2-2) and includes all of central Tinian east of Broadway, and portions of northern Tinian. The plateau is broad and gently sloping, with the majority of the vertical relief along the southern and northern boundaries. Unlike western Tinian, the shoreline areas in the windward (eastern) side of the Military Lease Area consist of gently sloping topography to the sea and beach areas. Most of these areas are rocky and windier than their counterparts on the leeward (western) side of the island.

### 3.12.4.2 North Lowland

The north lowland area (Photo 3.12-1) is primarily composed of previously developed and disturbed lands with an historic World War II-era airfield (North Field) extending from east to west. With the exception of the cleared airfield, northern Tinian is mostly overgrown with vegetation carpeting the area around the airfield and associated facilities. Views from within the north lowland area are generally close-in and somewhat constrained due to the surrounding dense vegetation. The dominant feature of the north lowland area is the National Historic Landmark at North Field. Both the north and northeast coastlines are covered with low, windblown vegetation and generally afford open and expansive views of Saipan, the Pacific Ocean, and the Philippine Sea. The northwest coastline is better protected, with denser vegetation than that of the leeward side. Views from the northwest coastline are open and expansive toward the Philippine Sea and horizon beyond.

#### 3.12.4.2.1 Key Observation Points within the North Lowland

Seven Key Observation Points were identified in the north lowland for the visual analysis. The Key Observation Points are named for the primary element within their viewshed. The actual Key Observation Point includes not only the primary element they were named for, but the surrounding landscape as well. These points are shown on Figure 3.12-1.

- 1: National Historic Landmark at North Field
- 2: Unai Chulu
The National Historic Landmark at North Field is listed in the National Register of Historic Places and is regularly visited by tourists. The aesthetic value of North Field lies in its visual landscapes, relationship of various structures to each other, and the comparison of what the area looked like during World War II (at its height of development) to what it looks like today (remnant airfield facilities surrounded by overgrown vegetation). The field and surrounding facilities are now overgrown and abandoned, but the historic significance remains and the associated aesthetic values continue to draw visitors year round.

The viewshed from this Key Observation Point, looking south, includes pavement in the foreground and dense vegetation in the middle-ground and background (Photo 3.12-2). Degraded tarmac, Japanese air raid shelters, and other World War II structures make up other views from this Key Observation Point. The entire area was once open and clear, to accommodate the World War II air combat operations. However, the visual connections and relationships between airfield buildings and structures are presently much harder to recognize amidst the significant overgrown vegetation. Two bomb loading pits are preserved at North Field. The aprons surrounding these bomb pits were preserved in a mostly paved, unvegetated state, so that the views around and between the bomb pits are unobstructed. The bomb pits themselves are covered by protective enclosures of metal and lexiglas with historical photos and text within.

Locations, descriptions, and photos of representative structures within North Field are provided in Section 3.8, Recreation. According to the Tinian Mayor’s Office, the atomic bomb pits at North Field have approximately 100 visitors per day (DoN 2014). The North Field National Historic Landmark is the site of anniversary tours sponsored by private tour operators, such as Stephen Ambrose Historical Tours. The North Field National Historic Landmark is also a destination of the Tinian Dynasty North Side tour.

Photo 3.12-2. Key Observation Point 1 – National Historic Landmark Looking Toward Mount Lasso
3.12.4.2.1.2 2: Unai Chulu, 3: Unai Babui, and 4: Unai Lam Lam

Unai Chulu (Photo 3.12-3), Unai Babui (Photo 3.12-4), and Unai Lam Lam (Photo 3.12-5), are located on the west coast of Tinian. The largest of these beaches, Unai Chulu, is the easiest to access. Unai Chulu is popular with visitor groups who come with tours for various beach activities. Unai Chulu is a long, wide beach with open vegetated areas located between the beach and the densely vegetated area further inland. These areas are commonly used for picnics and social gatherings, as they provide an open view of the beach and the ocean. Unai Babui is a smaller beach (e.g., less sand area) with rugged coral outcrops along the shoreline edge and thick vegetation extending close to the shoreline’s edge. The shallow reef flat is easily seen from the coastline. Unai Lam Lam is made up of a small sandy cove that is a beach even smaller than Unai Babui. The vegetation is thick and extends to the edge of the sand and coral outcroppings.

Photo 3.12-3. Key Observation Point 2 – View of Beach Area and Expansive View Corridor of Unai Chulu

Photo 3.12-4. Key Observation Point 3 – Unai Babui Looking North Toward Saipan

Photo 3.12-5. Key Observation Point 4 – View of Rocky Coast and Narrow Expanse at Unai Lam Lam
3.12.4.2.1.3  5: Ushi “Cross” Point A and 6: Ushi “Cross” Point B

Ushi “Cross” Point A (Photos 3.12-6 and 3.12-7) is the northern-most point of the island. It contains several memorials to various residents from Tinian, primarily fishermen. These whitewashed memorials are in sharp contrast to the natural surroundings that consists of a landscape of green, low vegetated ground cover, and the ocean with the island of Saipan in the distance. The area also contains a small three-sided memorial chapel and a maritime navigational aid beacon on a concrete base. It is exposed to a nearly continuous breeze from the trade winds coming off the ocean, which also create windswept vegetation along the shoreline and whitecaps in the waters offshore. Unlike other parts of Tinian, the shoreline immediately around the point contains no large jungle areas, only low shrubbery and ground cover. This allows expansive views from east to west including the Philippine Sea and the island of Saipan.

Photo 3.12-6. Key Observation Point 5 – View North toward Saipan from Ushi “Cross” Point

Photo 3.12-7. Key Observation Point 5 – Saipan across Channel from this View near Ushi “Cross” Point

Ushi “Cross” Point B (Photos 3.12-8 and 3.12-9) is in the same location as Key Observation Point 5 described above, but is directly south and facing away from the ocean. This view mostly consists of a green, low vegetated ground cover. The memorials and a U.S. Geological Survey navigational aid facility are in the foreground, and a gently sloping trail leading through a forested area is in the middle-ground.

Photo 3.12-8. Key Observation Point 6 – Memorial Chapel at Ushi “Cross” Point

Photo 3.12-9. Key Observation Point 6 – View Looking South from Ushi “Cross” Point
3.12.4.2.1.4 7: Blow Hole

The Tinian Blow Hole (Photo 3.12-10) is on the northeastern side of Tinian on a rocky outcrop common to this part of the island. A natural phenomenon made by weather and waves has carved a cave under the limestone ledge over the years. Waves enter the underwater cave and exit forcefully via a hole above, resulting in columns of water shooting high in the air. The coastal feature of low growing vegetation and coral outcrops forms the foreground, the rugged coastline’s green/blue water composes the middle-ground, and Saipan in the distance makes up the background of this scenic vista that is often visited by tourists. Wind provides a more dramatic display as water is carried in a spray, sometimes resulting in a rainbow.

3.12.4.3 West Tinian

West Tinian consists of the portion of the central plateau centered on 8\textsuperscript{th} Avenue along with the central highlands area. Eighth Avenue traverses the island in a north-south direction and connects the memorials, historic sites and recreational features of the western side of Tinian (Photo 3.12-11). Eighth Avenue also connects directly to the North Field Historic Landmark complex. Dominated by Mount Lasso, the central highlands area is situated in north-central Tinian and just south of the north lowlands. The steep topography along the eastern edge of Mount Lasso consists of some native limestone forest vegetation. The steep, rugged terrain here is not conducive to farming and was not cleared for sugarcane under the Japanese rule. Native vegetation therefore remains. The western coast of west Tinian consists of steep cliffs, starting south of Unai Chulu and accessed via Riverside Drive. West Tinian is visually dominated by the International Broadcasting Bureau transmitter antenna array consisting of tall towers and suspended antennas west of 8\textsuperscript{th} Avenue in central west Tinian.
3.12.4.3.1 Key Observation Points within West Tinian

Three Key Observation Points were identified within west Tinian for the visual analysis:

- 8: Mount Lasso Scenic Lookout A
- 9: Mount Lasso Scenic Lookout B
- 10: 8th Avenue-North of the Airport

These points are shown on Figure 3.12-1.

3.12.4.3.1.1 8 and 9: Mount Lasso Scenic Lookout A and B

South of North Field, Mount Lasso is a scenic lookout point frequently visited by tourists. As Tinian’s highest point, the location was an important communications and visual reconnaissance center during World War II. Both Japanese and American radar systems were located on top of Mount Lasso during World War II, and concrete mountings for the facilities remain (Photo 3.12-12). The approach to the lookout involves passing the foundation of a former U.S. Army hospital from the World War II era and a Japanese Shinto shrine near the lookout area.

Views to the northeast (Mount Lasso Scenic Lookout A) afford a panoramic view over the eastern half of Tinian with Saipan in the background to the north, where development on the south end of Saipan is visible (Photo 3.12-13).
Views to the southeast (Mount Lasso Scenic Lookout B) provide a view of the jungle landscape, eastern coast of Tinian, Pina Plateau and the Pacific Ocean (Photo 3.12-14). Views to the west are blocked by dense vegetation. Due to a topographical plateau below the lookout in the middle-ground, the views of Broadway Avenue and structures along the route are blocked. Areas to the south, including the village of San Jose, are not visible from the Mount Lasso Scenic Lookout.

Photo 3.12-14. Key Observation Point 9 – View from Mount Lasso Scenic Lookout Southeast toward the Pina Plateau in South Tinian

3.12.4.3.1.2 10: 8th Avenue-North of the Airport

This point is just north of the Tinian International Airport, where 8th Avenue turns directly north after bordering the airfield. The scenery changes from a completely cleared airfield and surrounding area of maintained low ground cover to a dense jungle extending along both sides of 8th Avenue as it heads north (Photo 3.12-15). The development in this area consists of fenced agricultural fields and a small pull-off to allow for access to the water filling station. This roadway serves as a primary route to the National Historic Landmark at North Field.

Photo 3.12-15. Key Observation Point 10 – Looking North on 8th Avenue South Towards the Airport

3.12.4.4 East Tinian

This area consists of the central plateau east of the escarpment flanking the Mount Lasso area just east of Broadway Avenue (Photo 3.12-16). Like the central plateau in west Tinian, it is a layered limestone plateau mostly blanketed by dense vegetation. Some areas of fenced, semi-cleared agricultural lands are located in this area. Street trees along Broadway Avenue provide an impression of this area during the World War II era. The Broadway Avenue corridor traverses the island in a north-south direction and is an important route that connects the memorials,

Photo 3.12-16. Aerial View of East Tinian Looking West with the Airport in the Distance at the Upper Left Corner
historic sites, and recreational features of the central plateau and North Field Historic Landmark complex.

### 3.12.4.4.1 Key Observation Points within East Tinian

Five Key Observation Points were identified within east Tinian for the visual analysis:

- **11: Broadway North**
- **12: Broadway South A**
- **13: Broadway South B**
- **14: Unai Dankulo**
- **15: Unai Masalok**

These points are shown on Figure 3.12-1.

#### 3.12.4.4.1.1 11: Broadway North

Along this stretch of Broadway Avenue, tall vegetation has been cleared out to a distance of 600 feet (180 meters) on both sides of the roadway, allowing light to penetrate (Photo 3.12-17). These cleared strips contain palm trees that were planted in a linear configuration when the road was built during World War II. The cleared conditions provide a more expansive viewshed in both northward and southward directions than those seen along many of the other existing roads. These views are seen as one travels along the roadway from San Jose to the American memorial round-about. Broadway Avenue is a primary north-south road utilized by both visitors and residents.

#### 3.12.4.4.1.2 12 and 13: Broadway South A and B

These two Key Observation Points are located near the center of the island at the highest point along Broadway Avenue (Photos 3.12-18 and 3.12-19). This is where the developed areas of the village of San Jose and airport transition to the rural northern two-thirds of Tinian in the Military Lease Area. Cattle, cleared agricultural fields, and interspersed trees are visible toward the north in the foreground and middle-ground. Dense jungle vegetation is visible in the background.

The Broadway South A Key Observation Point 12 mirrors the views of the Broadway North Key Observation Point 11. The Broadway South B Key Observation Point 13 faces south (Photo 3.12-19). It provides a view to the Carolinas Plateau, Marpo Valley to the southeast, and development in the village of San Jose. Broadway Avenue is a primary north-south roadway utilized by both visitors and residents.
3.12.4.4.1.3 14: Unai Dankulo

This area is accessible through a forested trail that opens to an expansive beach extending north. The beach and flat nearshore environment allow direct vehicle access to picnic spots that are located within somewhat shaded coconut groves adjacent to the beach (Photo 3.12-20). While more windswept than the leeward beaches, the wind is buffered by inland vegetation. Views from this beach include the adjacent shoreline of Tinian, parts of Saipan in the distance, and the open ocean. The beach consists of an open, relatively flat area of coarse sand with chunks of coral near the water, with the sand becoming more fine-grained as it transitions towards the coconut grove and understory vegetation. Unai Dankulo is frequented by shore-based spear fishermen and is accessed by local tour companies (Mariana Visitors Authority 2014).

3.12.4.4.1.4 15: Unai Masalok

Like Unai Lam Lam and Unai Babui, this beach is accessible via a narrow rocky foot trail (Photo 3.12-21). The beach itself is a narrow cove, fringed by large rock outcroppings. The beach provides views northeast to Saipan and some limited views of Tinian’s eastern coast to the north and south. This beach is small, less open than Unai Dankulo,
and is surrounded by steep topography. Vegetation extends nearly to the edge of the water. Seashells and pieces of coral are mixed with the fine white sand at this beach. This location is somewhat unique due to the variations in the brown colors of the rock and soil and the deep green colors of the vegetation.

3.12.5 Pagan

Pagan has officially been uninhabited since the 1981 volcanic eruption and the evacuation of the island for safety reasons. However, small groups of private citizens do occasionally visit the island, small scientific parties have conducted research on the island, and one group of ecotourists have toured the island. There are currently two tour options being offered for Pagan: Pagan ecotour adventure and the Silver Explorer cruise ship. There is a 10-person minimum for the Pagan ecotour (Goodridge, W.F.J., personal communication, August 28, 2014) and the Silver Explorer cruise ship accommodates 132 guests and 117 crew members (Silversea Expeditions 2012).

Key Observation Points are, by definition, those features and views that are accessible visually to the public (e.g., residents and regular visitors). Designating Key Observation Points on Pagan would imply a permanent or regular viewing audience. Therefore, the visual environment on Pagan is described in general terms below and shown in Figure 3.12-2.

In general, with few man-made alterations, the dramatic views of Mount Pagan on the north end of the island, South Pagan Volcano on the south end, and ocean beyond provide relatively unspoiled view corridors and experiences for both visitors to the island and for travelers passing nearby on marine vessels.

3.12.5.1 North Pagan

Natural features that dominate the North Pagan area include Mount Pagan, and two brackish, inland lakes (Figure 3.12-2 and Photo 3.12-22).

Photo 3.12-22. View of Inland Brackish Lagoon near Green Beach with a Japanese Monument in Foreground
Figure 3.12-2
Pagan Visual Resources
The active volcano at the center of the North Pagan provides a unique landmark visible from most parts of the island, as its caldera emits a stream of gasses on a near-continual basis. The 1981 volcanic eruption of Mount Pagan left the landscape of northern Pagan with large areas of barren lava, surrounded by vegetation (Photo 3.12-23). The north shoreline of Mount Pagan is covered by dense, green vegetation that becomes less dense as one moves inland towards Mount Pagan. The barren lava areas provide a dark gray or black landscape. The western shoreline of North Pagan is dominated by a large black sand beach and contiguous brackish water lake just inland from the shore. The eastern shoreline of North Pagan has rockier beach areas and steeper terrain that is less accessible from inland areas.

Photo 3.12-23. View of North Pagan (looking south) showing Mount Pagan and Landscape

The largest man-made feature in North Pagan is the landing strip constructed in an east-west direction extending inland from the shoreline of Green Beach (Photo 3.12-24). Over two-thirds of this former grass landing strip was covered by a massive lava flow as a result of the 1981 volcanic eruption of Mount Pagan. This lava flow covered much of the landing strip with approximately 20 feet (6.1 meters) of lava, rendering the landing strip severely impaired. This rugged and barren lava flow provides a sharp contrast to both the vegetated area found at its immediate periphery and the large conical volcano in the background. Remnants of World War II Japanese equipment (guns, airplanes) and structures (bunkers) are still evident in North Pagan, primarily in the flat area surrounding the former air strip (see Figure 3.12-2, Photos 1 and 3). This flat area generally remains clear of thick vegetation. There is a Japanese shrine on Banneera Point (see Figure 3.12-2, Photo 2).

Photo 3.12-24. North Pagan Landing Strip (looking east) with Green Beach in the forefront
Dirt/grass vehicle pathways are located inland from the western shoreline of North Pagan and provide access to inland lakes, the various beach areas, and the former landing strip area.

### 3.12.5.2 Central Pagan

Central Pagan consists of the center portion of a narrow isthmus that connects North Pagan with South Pagan. Central Pagan consists of a rugged, steep escarpment containing open green grasslands and near-vertical drops to the sea. Beach areas are limited, as most of the shoreline in central Pagan is rocky and vertical, providing dramatic shoreline formations (Photos 3.12-25 and 3.12-26).

![Photo 3.12-25. View of Central Pagan Looking South](image)

![Photo 3.12-26. Off-Shore View of West Side of Central Pagan](image)

### 3.12.5.3 South Pagan

South Pagan consists of a narrow peninsula dominated by the South Pagan Volcano (Photo 3.12-27). Like central Pagan, this area is steep, with difficult terrain. The lack of shoreline makes this area difficult to access. South Pagan has a few archaeological sites and remnants of coconut groves. There are dramatic, unspoiled visual corridors in the area from both land and off-shore locations.

![Photo 3.12-27. Central Pagan View Towards South Pagan](image)
3.13 TRANSPORTATION

Section 3.13 provides a summary of the general condition and character of transportation facilities and infrastructure on the islands of Tinian and Pagan. Transportation refers to the act or process of moving people or goods and includes those resources, infrastructure, systems and devices used for moving passengers or goods from one place to another. Common forms of transportation include airplanes, pedestrians, trains, automobiles, two-wheeled vehicles (e.g., bicycles, motorcycles), and boats. The region of influence for transportation includes the air, ground, and marine transportation facilities and infrastructure on and surrounding Tinian and Pagan. Airspace and air traffic management resources are included in Section 3.6, Airspace. A discussion of resources that fall under Section 4(f) of the Department of Transportation Act of 1966 is included in Section 4.19, Section 4(f) Evaluation.

3.13.1 Definition

Air transportation resources refer to the existing public airport facilities, specifically the Tinian International Airport and the Pagan airfield, as well as private and military air transportation facilities that would potentially be affected by the proposed action.

Ground transportation includes transportation facilities and infrastructure; specifically, the road features that would support vehicle traffic, public transportation service, and pedestrian and bicycle facilities. Level of Service is a measurement used to describe the performance of a road and ranges from Level of Service A, which indicates free-flow of traffic or excellent conditions, to Level of Service F, which indicates congested or overloaded conditions. For a detailed description of Level of Service categories refer to Table 2.1-2 in Appendix O, Transportation Study.

Marine transportation refers to marine vessels and facilities used to support commercial, military, and recreational uses.

3.13.2 Regulatory Framework

The regulatory framework governing transportation is briefly summarized below and described in greater detail in Appendix O, Transportation Study. A complete listing of applicable regulations is provided in Appendix E, Applicable Federal and Local Regulations.

3.13.2.1 Air Transportation

Reference is made to the following order, instruction and the CNMI regulations where applicable:

- Federal Aviation Administration Order 1050.1E Change 1, Environmental Impacts: Policies and Procedures
- DoN, Office of the Chief of Naval Operations Instruction 5090.1C Change Transmittal 1, Environmental Readiness Program Manual
- Commonwealth Ports Authority Title 40-10, Airport Division
3.13.2.2 Ground Transportation

Applicable laws, regulations, and standards include the following:

- CFR Title 23, Highways
- CNMI Administrative Code: Commonwealth Department of Public Works Title 155-20.1, Public Rights-of-way and Related Facilities Regulations

3.13.2.3 Marine Transportation

The following federal and CNMI regulations are applicable:

- 33 CFR Part 165.1403
- 33 CFR Part 110.239
- 33 CFR Part 166
- 33 CFR Part 167 Commonwealth Ports Authority Title 40-20
- CNMI Administrative Code: Commonwealth Department of Public Works Title 155-20.1, Public Rights-of-way and Related Facilities Regulations

3.13.3 Methodology

3.13.3.1 Air Transportation

The preparation of the affected environment discussion for air transportation relied upon a review of the current Tinian International Airport Layout Plan, reports and records from the Federal Aviation Administration and the Commonwealth Ports Authority, site visits, meetings with the Commonwealth Ports Authority and air carriers, and information in the public domain, such as local newspapers and other environmental impact statements, etc.

3.13.3.2 Ground Transportation

The preparation of the affected environment discussion for ground transportation relied on available traffic analyses and engineering evaluations prepared for the Commonwealth Department of Public Works, available traffic data, and the Highway Capacity Manual (Transportation Research Board 2000) methodology to determine roadway Level of Service. This approach is not used for Pagan since only all-terrain vehicle pathways exist on the island and the Highway Capacity Manual methodology does not address the unique characteristics of all-terrain vehicle pathways or trail users. Therefore, a qualitative discussion of the affected environment for ground transportation on Pagan is provided based on observations and site visits.

3.13.3.3 Marine Transportation

The preparation of the affected environment discussion of the marine transportation relied upon available records and reports pertaining to the existing port facilities of Tinian and Pagan, as well as
marine traffic patterns in adjacent waters. Current conditions were evaluated through research, interviews with authorities, and a site visit to Tinian Harbor and the Port of Tinian.

3.13.4 Tinian

3.13.4.1 Air Transportation

3.13.4.1.1 Tinian International Airport

Tinian International Airport is classified by the Federal Aviation Administration as a primary commercial service airport and is designed for code D-V aircraft such as 777/747 with a single east-west runway (Runway 08/26) of 8,600 feet (2,621 meters) long and 150 feet (46 meters) wide. Runway 08/26 is paved and marked for precision approaches with centerline, runway designation, threshold, aiming point, touchdown zone markings, and edge stripes. The runway pavement is asphalt and is in good condition. Tinian International Airport also has two apron taxiways, connecting the aircraft parking apron to the parallel Taxiway A. Both taxiways are 75 feet (23 meters) wide with approximately 35 foot wide (10.5 meter) shoulders on each side. The taxiway pavement is asphalt and is in good condition. The apron is the ramp area north of the passenger terminal building. The apron area is approximately 35,000 square yards (29,000 square meters), including an apron edge taxi lane. The apron area connecting to Hangar One west of the passenger terminal building is mainly for general aviation. The existing pavement of the apron is asphalt. Figure 3.13-1 illustrates the Tinian International Airport facilities.

Tinian International Airport is owned, managed, and operated by the Commonwealth Ports Authority and is used primarily for interisland travel between the islands of Saipan, Rota, and Guam. Star Marianas Air provides passenger charters between the islands of Saipan and Tinian, and cargo charters between Guam, Rota, Tinian, and Saipan. The current fleet for Star Marianas Air consists of seven Cherokee Six aircraft and three twin-engine Navajo aircraft all based at Hangar One in Tinian International Airport. Arctic Circle Air provides air cargo services and has expanded to include passenger flights. No regularly scheduled international flights currently operate at Tinian International Airport. Arrangements for immigration and customs services at Tinian International Airport must be made in advance with Chief Immigration Saipan. As indicated during a meeting with Star Marianas Air personnel, there are limitations in existing hospital capacity for handling emergency incidents involving large jet aircraft.

The U.S. military has previously coordinated with the Commonwealth Ports Authority for military training activities at Tinian International Airport. Temporary time slots for the exclusive use of the airfield by the military have been arranged for previous training exercises. U.S. military aircraft and chartered air carriers have operated at Tinian International Airport for transportation purposes as part of previous activities associated with Exercise Forager Fury 2012 and Forager Fury II in 2013. They include B747-400 for delivery of gear and equipment, B737 for transportation of personnel, and C-17 Globemaster III / KC-130J Hercules for delivery of equipment, vehicle, and fuel.

In 2013 there were approximately 49,116 operations (an average of 134 flight operations per day) at Tinian International Airport (Federal Aviation Administration 2014). For more details on the existing facilities at Tinian International Airport, see Appendix O, Transportation Study.
Figure 3.13-1
Tinian International Airport Facilities

Runway 08
Latitude: 14-59-49.0200 North
Longitude: 145-36-26.5900 East
Elevation: 237 feet
Traffic Pattern: Left

Runway 26
Latitude: 15-00-05.2200 North
Longitude: 145-37-52.7000 East
Elevation: 271 feet
Traffic Pattern: Right

Tinian International Airport

Commercial (Public) Taxiway

Legend
- Military Lease Area Boundary

Source: NAVFAC PAC 2013
3.13.4.1.2 North Field

There is an existing expeditionary landing field located in the northern portion of the Military Lease Area, i.e. North Field, which is used exclusively by the military. The North Field is not a transportation facility open to the public. North Field is a largely unimproved World War II-era airfield located in the northern portion of the Military Lease Area (see Photo 3.5-1). It remains in use as an expeditionary landing field and supports military fixed wing and helicopter training activities (DoN 2010). The U.S. military currently conducts training at North Field. These training activities have included airlift of personnel and cargo drops into the Military Lease Area (approximately 60 times per year) (DoN 2014) as well as firefighting, search-and-rescue, and expeditionary airfield clearance and flight operations during recent Forager Fury exercises.

3.13.4.1.3 Heliports

Three heliports (two owned by Dynasty Hotel and Casino and one by Americopters) currently exist on Tinian, all within 2.5 miles (4 kilometers) south of Tinian International Airport in the vicinity of the Dynasty Hotel and Casino. The heliports are used by private and charter helicopters for transportation to and from Saipan International Airport to the Dynasty Hotel and Casino.

3.13.4.2 Ground Transportation

3.13.4.2.1 Road Network

Tinian has about 68 miles (110 kilometers) of roads. Most roads were designed, developed, and constructed in 1944 to accommodate heavy truck traffic when the U.S. military population on Tinian was about 150,000. Many of the existing roads throughout Tinian are now in poor condition and traffic volumes are low. There are no roads that are part of the Interstate Highway System on Tinian. Two north/south roads, Broadway Avenue and 8th Avenue, connect the village of San Jose to the Military Lease Area and areas north of the Tinian International Airport. Two east/west roads (Canal Street [Route 202] and Route 201) connect the village of San Jose to 8th Avenue and Broadway Avenue. These roads have the highest traffic volumes with about 1,520 and 2,240 vehicles per day, respectively.

The current state and general conditions of the existing road network, average daily traffic volumes, and roadway Level of Service are shown in Figure 3.13-2 and described below for roadways within and outside of the Military Lease Area. For additional photos of the existing roads refer to Photo 2.1-1 to Photo 2.1-13 in Appendix O, Transportation Study.

Within the Military Lease Area:

- **Broadway Avenue:** Within the Military Lease Area, Broadway Avenue is a two-lane, divided, paved road with 20 foot (6 meter) wide lanes and a 32 foot (10 meter) wide median (Photo 3.13-1). Lack of maintenance has resulted in the southbound lane to become moderately to severely overgrown and unsuitable for use by wheeled vehicles. Broadway Avenue carries about 90 vehicles per day within the Military Lease Area.
Notes:
1) All roads operate under capacity at acceptable level of service (LOS) A
2) The numbers shown adjacent to road segments are Average Daily Traffic Volume (vehicles per day, both directions)
3) Traffic Data Source: CNMI Comprehensive Highway Master Plan (Commonwealth Department of Public Works 2008)
• **8th Avenue:** Within the Military Lease Area, 8th Avenue is an 18 foot (5 meter) wide two-lane, undivided, paved road. This segment was previously a divided road with two 18 foot (5 meter) wide lanes and a 36 foot (11 meter) wide median. Lack of maintenance has resulted in the southbound lane being moderately to severely overgrown and unsuitable for use by wheeled vehicles. 8th Avenue carries up to 90 vehicles per day on this segment within the Military Lease Area.

• **86th Street:** 86th Street is a two-lane, undivided, paved road in poor condition that runs from 8th Avenue to Broadway, north of Tinian International Airport. 86th Street carries about 100 vehicles per day.

• **Other Roads:** Other roads within the Military Lease Area are typically unpaved, moderately to severely overgrown, with traffic volumes of less than 100 vehicles per day.

**Outside of the Military Lease Area:**

• **Broadway Avenue:** Outside of the Military Lease Area, Broadway Avenue is a two-lane, divided, paved road with 20-foot (6-meter) wide lanes and a 32-foot (10-meter) wide median. Broadway Avenue carries about 1,470 vehicles per day south of 42nd Street, and 390 vehicles per day north of 42nd Street outside of the Military Lease Area.

• **8th Avenue:** This road has two distinct segments outside of the Military Lease Area:
  o 42nd Street to Tinian International Airport, 8th Avenue is a 24-foot (7-meter) wide two-lane, undivided, unpaved road in poor condition. 8th Avenue carries about 180 vehicles per day on this segment.
  o Near Riverside Drive intersection, 8th Avenue is an 18-foot (5-meter) to 22-foot (7-meter) wide two-lane, undivided, paved/gravel road in poor condition. 8th Avenue carries approximately 180 vehicles per day on this segment.

• **Canal Street (Route 202):** Canal Street (Route 202) is two-lanes, undivided, with no median, and connects the village of San Jose to Broadway Avenue and residential and recreational areas to the northeast. Canal Street (Route 202) carries approximately 1,520 vehicles per day.

• **Route 201:** Route 201 is two-lanes, undivided, with no median, and connects the village of San Jose to Broadway Avenue and residential and recreational areas to the east. Route 201 carries about 2,240 vehicles per day.

• **42nd Street:** 42nd Street is two-lanes, undivided, with no median, that runs from 8th Avenue to Broadway, north of the village of San Jose. 42nd Street carries approximately 150 vehicles per day.

• **Other Roads:** Other roads not listed here are typically two lanes, undivided, with no median, and carry between 25 and 300 vehicles per day.

Based on the analysis conducted in the CNMI Comprehensive Highway Master Plan (Commonwealth Department of Public Works 2008), all roads on Tinian are operating under capacity at acceptable Level of Service A in their existing condition, as evidenced by free flowing traffic and no traffic delays.

### 3.13.4.2.2 Transit Network

There is no existing transit service on Tinian due to the relatively low population density.
3.13.4.2.3 Pedestrian and Bicycle Network

Limited designated bicycle paths are located along major roads and in main tourist attractions (Commonwealth Department of Public Works 2008). Isolated sidewalks can be found along short segments of some roads within San Jose. In general, continuous sidewalks do not exist on the majority of the roads on Tinian. Typically, the outside lane or shoulder, which is generally unpaved, functions as a pedestrian/bicycle space. Bicyclists are required to share the road with vehicles on existing travel lanes, and pedestrians are required to walk on the unpaved shoulder or landscaped area off to the side of the roads.

3.13.4.3 Marine Transportation

3.13.4.3.1 Harbor and Port Facilities

Tinian Harbor (shown on Photo 3.13-2) is located near the town of San Jose and is accessible via a channel with a navigable width of 500 feet (152 meters) and a minimum depth of 27 feet (8 meters) (survey conducted May 2007). The harbor was constructed in 1944 to accommodate up to eight Liberty Ship cargo vessels (U.S. Commander Pacific Fleet 1999), each with a length of about 465 feet (142 meters), a beam (maximum width) of 57 feet (17 meters), and a draft [maximum hull depth below water] of up to 28 feet (8 meters). The Port of Tinian consists of a main wharf, two finger piers, and a breakwater. The main wharf has a usable length of 1,600 feet (488 meters), with depths varying between 24 and 29 feet (7 and 9 meters). The two finger piers (Pier 1 and Pier 2) are southwest of the main wharf (Global Security 2005). A concrete boat ramp used by Amphibious Assault Vehicles is north of the finger piers and adjacent to a public dock and a public boat ramp. An adjacent grassy staging area is used for vehicles brought ashore or for staging, cleaning, and reloading (U.S. Commander Pacific Fleet 1999). A mooring buoy 2 miles (3 kilometers) from Tinian Harbor has been removed, but the anchoring system is still in place and could be used for large draft ships (DoN 2013).

The two finger piers are in a state of disrepair and are unusable. The Municipality of Tinian declared a state of emergency in October 2009 to repair these piers.

The DoN estimates that the main wharf has the capacity to process 4,500 tons (4,082 metric tons) of cargo daily. Figure 3.13-3 shows recent annual data for revenue tonnage in and out of the port. The Commonwealth Ports Authority estimates that the harbor has the capacity to accommodate passenger vessels holding up to 1,500 passengers.
The main wharf has a single mobile crane with a capacity of 50 tons (45 metric tons). A tugboat and lightering barge (smaller barge to transport cargo and passengers from larger-draft vessels that cannot enter the harbor) are available on an as-needed basis at Tinian Harbor (T. Gotti, Ambyth Shipping, personal communication December 4, 2012). The Port of Tinian also has a facility for biosecurity/brown treesnake \((\textit{Boiga irregularis})\) control, with a capacity of four shipping containers. Current lighting at the Port of Tinian is insufficient for nighttime operations.

The harbor is used by commercial and supply barges, as well as U.S. Coast Guard vessels and military supply shipments on Joint High Speed Vessels. Gasoline and diesel fuel can be obtained at the Mobil Oil tank compound at the Port of Tinian.

Fuel supply and regular day-to-day commodities are shipped through Tinian Harbor. Fuel is shipped by a fuel tanker on a monthly basis. The fuel tanker is berthed at the main wharf area, where its fuel is piped to storage tanks located about 300 feet (91 meters) inland. Usual stay time for the fuel tanker is 1 day. Tinian’s commodities are transported from Saipan via a privately owned SM5 Boat (Landing Craft Mechanized, Mark-6) that transits daily. The SM5 Boat is off-loaded at the shore ramp facility located near the small floating boat pier.

For larger shipments, typically once every 60 days, a tug and barge are used to bring intermodal containers from Saipan. When the larger cargo quantity is delivered, the barge is docked at the main wharf. The stay time for the barge is typically 1 day.

### 3.13.4.3.2 Marine Shipping Traffic Patterns

Shipment of cargo (to and from Saipan) typically transits to the west of Tinian due to the calmer waters. Large vessels maintain a distance of about 1 mile (2 kilometers) offshore, while smaller vessels come
3.13.5 Pagan

3.13.5.1 Air Transportation

The Pagan airfield (Photo 3.13-3) is classified by the Federal Aviation Administration as a basic general aviation airport and is considered a public airport. It is owned and managed by the Commonwealth Ports Authority and administered by the Department of Public Lands. It is unattended and has no scheduled flights. Limited charter flights/air taxi and general aviation operations occur at the airstrip for visitors, but no aircrafts are based there. The volcanic eruption in 1981 significantly reduced the runway’s length. The Pagan airfield currently has a single runway (Runway 11/29) measuring 1,500 feet (457 meters) long and 120 feet (37 meters) wide. The runway surface is turf and gravel, with a load-bearing capacity of 4,000 pounds (1,800 kilograms) for single-wheel aircraft. For more details on the existing facilities at the Pagan airfield, see Appendix O, Transportation Study.

3.13.5.2 Ground Transportation

There are no roads, transit networks, or pedestrian or bicycle facilities on Pagan and no significant vehicular traffic patterns. Only all-terrain vehicle pathways exist and their use is limited. For photos of the existing pathways refer to Photos 2.2-1 through 2.2-4 in Appendix O, Transportation Study. All residents of Pagan were evacuated to Saipan in May 1981 after the eruption of Mount Pagan; as a result there currently are no permanent residents (U.S. Census Bureau 2010), only visitors to the island.

3.13.5.3 Marine Transportation

3.13.5.3.1 Port Facilities

Pagan has no functional marine port facilities. The only pier on the island was built in the 1940s. The medium-depth pier was 200 feet (61 meters) in length when completed, but is severely degraded and not usable in its current condition (Photo 3.13-4). The pier was described as being in need of repair in the 1970s (Office of Transition Studies and Planning 1978), and there has been no regular...
maintenance since residents were evacuated from the island in 1981. When the island was inhabited, cargo and passengers for delivery to the island had to be transferred to vessels with smaller drafts at sea (i.e., lightering) (Office of Transition Studies and Planning 1978). Anchorage is possible in bays offshore and visitors use smaller vessels to get from anchored boats to shore.

3.13.5.3.2 Marine Shipping Traffic Patterns

No substantial marine traffic occurs within the vicinity of Pagan. Regular, but infrequent, tourism and research vessels occur within adjacent waters (described in Section 3.8, Recreation). While no regular schedule exists, tourism and research vessels are not expected to visit more than once per month.
3.14 UTILITIES

Section 3.14 provides a summary of the general condition, and character of, the utilities on the islands of Tinian and Pagan. The region of influence for utilities includes the U.S. government and public utilities on Tinian and Pagan.

3.14.1 Definition

Utilities refer to public utilities provided to the general population for basic services, including electrical power, potable water, wastewater services, stormwater infrastructure, municipal solid waste, and information technology/communications services.

3.14.2 Regulatory Framework

The Commonwealth Utilities Corporation is the public corporation that owns and is responsible for providing electrical power, water, and wastewater services for the CNMI. CNMI Public Law 15-35 established the Public Utilities Commission as the agency for regulatory purposes such as approval of prices, fees, charges, and terms/services for the Commonwealth Utilities Corporation.

A listing of regulatory guidelines is provided in Appendix E, Applicable Federal and Local Regulations. The Commonwealth Utilities Corporation is subject to all applicable regulatory requirements and the CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality administers the following programs as delegated by the U.S. Environmental Protection Agency:

- Clean Air Act
- Clean Water Act
- Resource Conservation and Recovery Act
- Safe Drinking Water Act
- CNMI Wastewater Treatment and Disposal Rules and Regulations
- CNMI Underground Injection Well Regulations
- CNMI Water Quality Standards

The CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality has the following responsibilities:

- **Electrical Power**: Administers air emission permits and regulation enforcement required for power generation facilities in the CNMI.
- **Potable Water**: Oversees issues related to water quality including safe drinking water.
- **Wastewater**: Enforces the CNMI Wastewater Treatment and Disposal Rules and Regulations, the CNMI Well Drilling and Well Operations regulation, the CNMI Water Quality Standards, and U.S. Environmental Protection Agency National Pollutant Discharge Elimination System permitting requirements related to wastewater treatment and disposal.
- **Stormwater**: Oversees issues related to stormwater control, quality, and permits. They have prepared stormwater management criteria and guidance for implementation of appropriate stormwater design features as well as island stormwater practice design specifications.
- **Solid Waste:** Functions as the regulatory body that would issue the required permits to operate any new landfills, incinerators, and solid waste transfer stations, or other solid waste handling facilities. The planned solid waste facilities associated with CNMI Joint Military Training (CJMT) operations would also come under the regulatory umbrella of the CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality.

The Federal Communications Commission regulates all commercial information technology/communications activities in the CNMI.

### 3.14.3 Methodology

Site visits, facility and system tours (electrical generating facility, water system), document searches and reviews, and meetings with various agencies were conducted to determine current conditions for utilities on Tinian and Pagan.

Potable water use data includes data from 2002 collected for a U.S. Army Corps of Engineers Study (Army Corps of Engineers 2003). More recent information was requested from the Commonwealth Utilities Corporation and potable water production and metered use from October 2011 through August 2014 have been received and analyzed (Commonwealth Utilities Corporation 2014). Average production and metered use values for the 2011-2014 time period were utilized to evaluate the capacity of the existing potable water system on Tinian.

### 3.14.4 Tinian

A Utilities Study has been prepared in support of this EIS/OEIS and is provided in Appendix P, *Utilities Study*. For more detailed information, refer to Appendix P, *Utilities Study*.

#### 3.14.4.1 Electrical Power

The Commonwealth Utilities Corporation is responsible for providing electrical power on Tinian. CNMI TeleSource, Inc. has been contracted by the Commonwealth Utilities Corporation to operate and maintain the entire electrical power infrastructure on Tinian. This contract currently extends up to year 2035 (Deposa 2014). The electrical power resource on Tinian includes generation units and distribution facilities that make up the existing island-wide power system. This includes above ground and underground transmission and distribution cables, manholes, transformers, substations, meters, and all other supporting facilities.

##### 3.14.4.1.1 Supply and Demand

The electrical power available from the Commonwealth Utilities Corporation power station totals 17.0 megawatts, as shown in Table 3.14-1. Current peak demand is approximately 4.5 megawatts which leaves 8 megawatts available (4.5 megawatts standby generator is kept in reserve). This peak demand can be met when one of the two largest units is down for maintenance.
Table 3.14-1. Power-Generating Facility on Tinian

<table>
<thead>
<tr>
<th>Unit</th>
<th>Design Megawatts</th>
<th>Available Megawatts</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinian Power Plant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel Engine No. 1</td>
<td>5.0</td>
<td>4.5</td>
<td>Operational</td>
</tr>
<tr>
<td>Diesel Engine No. 2</td>
<td>5.0</td>
<td>4.5</td>
<td>Standby</td>
</tr>
<tr>
<td>Diesel Engine No. 3</td>
<td>2.5</td>
<td>2.0</td>
<td>Standby</td>
</tr>
<tr>
<td>Diesel Engine No. 4</td>
<td>2.5</td>
<td>2.0</td>
<td>Standby</td>
</tr>
<tr>
<td>Diesel Engine No. 5</td>
<td>2.5</td>
<td>2.0</td>
<td>Standby</td>
</tr>
<tr>
<td>Diesel Engine No. 6</td>
<td>2.5</td>
<td>2.0</td>
<td>Standby</td>
</tr>
<tr>
<td>Totals</td>
<td>20.0</td>
<td>17.0</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: No. = number.

3.14.4.1.2 Generation

The power generation facility (Photo 3.14-1) consists of the following components: diesel generators, exhaust stacks, and an above ground fuel delivery pipeline from the Port of Tinian fuel storage tank to a storage tank adjacent to the power plant facility. The power generation facility is located near the coast outside of San Jose, at 25 feet (7.6 meters) above MSL. The power generation facility is 15 years old, and appears to be in very good condition and well maintained.

There are other private standby electrical power generators on Tinian that include the Tinian Dynasty Casino, the International Broadcasting Bureau facility, and personal-use standby generators.

3.14.4.1.3 Distribution

Figure 3.14-1 displays the existing distribution system on Tinian. The distribution lines are 13.8 kilovolts. A primary distribution line runs from the generation facility to the International Broadcasting Bureau via 8th Avenue. This line is above ground mounted on wooden poles except for a portion west of the airport that is underground to facilitate the clear zone for the runway. The maximum anticipated load from the International Broadcasting Bureau is 1.4 megawatts which is the peak load measured by the Commonwealth Utilities Corporation. The power facilities at the International Broadcasting Bureau transmitting station were designed for a peak demand load of approximately 7 megawatts. Although the highest recorded load is 4 megawatts, if the International Broadcasting Bureau determines it is necessary to operate all of the transmitters simultaneously at full power using normal amplitude modulation or dynamic carrier control modulation, the station’s peak loading on the Commonwealth Utilities Corporation power supply could approach that 7 megawatts peak design load and greatly exceed the 1.4 megawatts.
The overhead line that provides power to the International Broadcasting Bureau has capacity of up to 13.6 megawatts. However, the total additional load that can be added is limited by the drop in voltage caused by electrical losses in the transmission line. Voltage drop depends on the length of the transmission line from the power source to the electrical load and the amount of electrical load on the transmission line.

A separate 13.8-kilovolts distribution line runs from the generation facility to the airport. This line runs above ground along Broadway north to the airport access road, then runs west along this road to the airport.

Based on the characteristics of the existing distribution system and outage records from 2011, 2012, and part of 2013, the island-wide electrical power utility system is currently providing reliable service and is well positioned to keep providing an acceptable level of service into the future. The outage history from this 2.5 year period recorded 12 brief (average of 68 minutes) occurrences, only three of which were island-wide outages (see Appendix P, Utilities Study).

### 3.14.4.2 Potable Water

Tinian’s public water system is owned and operated by the Commonwealth Utilities Corporation. It services the southern third of Tinian, where the civilian population lives. This system consists of one functioning supply well (Maui Well #2), a chlorine injection system for water treatment, pumps, three storage tanks, distribution piping (typically underground), water meters, and other supporting facilities.

#### 3.14.4.2.1 Production

Currently, Maui Well #2 supplies all potable water to the Commonwealth Utilities Corporation Tinian water system, operating three of its four pumps almost constantly (Commonwealth Utilities Corporation 2013b). With the need to keep one pump on standby for maintenance purposes, Maui Well #2 is operating near full capacity.

Between October 2011 and August 2014, the water system produced an average of 1,056,553 gallons (3,999,488 liters) per day of potable water. The potential water production from Maui Well #2 has been estimated as at least 1 million gallons per day (3.8 million liters) of potable water in the dry season and 1.5 million gallons (5.7 million liters) per day in the wet season (Army Corps of Engineers 2003). The analysis of the potable water system assumed that a maximum average pump rate of 1,260,000 gallons (4,769,619 liters) per day was a sustainable level.

Recent water quality testing has shown chloride levels range from 172 to 217 milligrams per liter, with an average of 190 milligrams per liter. Chlorides may be associated with salt content, and the general acceptable limit of chlorides in drinking water is 250 milligrams per liter to avoid affecting the taste of drinking water. A chlorine injection system treats the water at Maui Well #2 (Photo 3.14-2). The injection system consists of two 150-pound (68-kilogram) chlorine cylinders, a vacuum regulator mounted to the
top of each cylinder, and a small pressurizing pump for the chlorination circuit. The Maui Well #2 pump house and equipment are shown in Photos 3.14-3 and 3.14-4.

### 3.14.4.2.2 Storage

The water system includes three water storage tanks: Marpo Tank, Carolinas Tank, and Tinian Airport Tank. The Marpo Tank (Photo 3.14-5) is a 250,000-gallon (950,000-liter) tank that serves the Marpo Valley agricultural area and Marpo Heights residential area. The largest storage tank, the Carolinas Tank (Photo 3.14-6) is a 500,000-gallon (1.9 million-liter) tank located above the Carolinas residential area. It serves the Carolinas Heights Subdivision, San Jose, Tinian Dynasty Casino, Carolinas Heights Agricultural Homesteads, and a portion of Marpo Valley. The Airport tank (Photo 3.14-7) is a 60,000-gallon (227,000-liter) tank located along the airport access road and serves only the airport facilities.

### 3.14.4.2.3 Distribution

*Figure 3.14-2* shows the existing potable water distribution system. All water transmission lines also serve as distribution lines. The waterlines between Maui Well #2 and the storage tanks also serve as distribution lines to residents. A 6-inch (150-millimeter) polyvinyl chloride water line transmits water to Marpo Tank, and an 8-inch (200-millimeter) polyvinyl chloride water line transmits water to Carolinas Tank.
Figure 3.14-2
Tinian Potable Water Distribution
The system has substantial leaks due to old galvanized and transite distribution piping, overflows at storage tanks due to lack of functioning telemetry controls, and leaks due to high pressures. The large water losses result in significantly more water being pumped from the well to make up for the losses in the system.

As of November 2013, the Commonwealth Utilities Corporation provides the potable water for a total of 833 metered accounts, which includes residential, commercial, and government customers (Commonwealth Utilities Corporation 2013b). Unaccounted for water is the result of leaks, unmetered uses, and unplanned overflows within the system. The typical unaccounted for water from efficient systems should be less than 25% of the water produced. The Commonwealth Utilities Corporation has indicated that unaccounted for water (water pumped from the supply well but not billed to customers) is estimated to be approximately 75% to 80% of the water produced (Commonwealth Utilities Corporation 2013a).

The average recorded water production in all of 2002 was 1,200,000 gallons (4,500,000 liters) per day. Over the first 7 months of 2002, a monthly average of 680,265 gallons (2,575,083 liters) per day of potable water was metered to users (Army Corps of Engineers 2003). This indicates that in 2002, approximately 641,781 gallons (2,429,405 liters) of potable water was lost within the distribution system on Tinian daily (an average unaccounted for water of 48%).

Between October 2011 and August 2014, the water system produced an average of 1,056,553 gallons (3,999,412 liters) per day of potable water (Commonwealth Utilities Corporation 2014). The monthly average of 320,384 gallons (1,212,785 liters) per day of potable water was metered to residential, commercial and government users. This means that between 2011 and 2014, daily potable water lost within the distribution system averaged 787,031 gallons (2,979,236 liters) per day, (an average unaccounted for water of 70%).

Although the Tinian International Airport relies on the Commonwealth Utilities Corporation system for its water source, it has its own local water distribution system. In addition, the International Broadcasting Bureau facilities are not connected to the Commonwealth Utilities Corporation Tinian municipal water supply system. Instead, they use non-potable rainwater collection, non-potable bulk water trucked in from the Commonwealth Utilities Corporation system, and bottled drinking water.

### 3.14.4.3 Wastewater

Figure 3.14-3 shows the existing wastewater systems on Tinian. There is no centralized municipal wastewater collection and treatment system on Tinian. Decentralized collection and treatment systems on Tinian serve some residential areas, such as the housing area in San Jose, and lead to a central septic and leaching field system. Most public and private buildings on Tinian use septic tanks with leaching fields or cesspools for treatment and disposal of wastewater. The Tinian Dynasty Hotel and Casino owns the largest private wastewater system on Tinian and the only treatment system that does not use a septic tank. The Dynasty Hotel and Casino uses a tertiary treatment plant that is permitted to discharge a maximum average monthly flow of 0.24 million gallons (0.91 million liters) per day. Discharge monitoring reports from April 2014 to May 2014 show that the average daily wastewater flow to the plant ranged from 0.14 to 0.15 million gallons (0.51 to 0.57 million liters) per day. The system discharges the treated effluent to leaching fields on the hotel’s property.
Figure 3.14-3
Tinian Wastewater Systems

Legend

- Existing IBB Fenceline
- Existing Roads
- Long/Short Term Leased Property
- Areas where individual sewage disposal systems may be used
- Military Lease Area
- International Broadcasting Bureau

Note: Location of existing wastewater systems are approximate.
A U.S. military septic tank and leaching field system was constructed on Tinian to support military training personnel. It was first made available during a military training exercise in March-April 1999. The system is located south of the International Broadcasting Bureau fence line adjacent to the west side of 8th Avenue. It was sized to support a population of 2,500 military training personnel and to an average daily flow of 6,640 gallons per day (25,000 liters per day). The system is currently not operational. There are plans for its rehabilitation.

3.14.4.4 Stormwater

As discussed in Section 3.3, Water Resources, Rainfall on Tinian averages 83 inches (212 centimeters) per year (Water and Environmental Research Institute 2003), 58% of which typically occurs from July to November while only 14% typically occurs during the dry season from January to April (DoN 2010). Stormwater management within the Military Lease Area is minimal, consisting primarily of shallow roadside swales for conveyance. Due to the high porosity of the soils and karst surface geology, the majority of stormwater collects in naturally occurring depressions and infiltrates into the ground. Outside of the Military Lease Area, such as in portions of San Jose, a few areas contain curb and gutter for stormwater conveyance. Most other areas allow stormwater to flow naturally away from the roadways.

3.14.4.5 Solid Waste

The existing solid waste facility consists of an unlined, open disposal site located about 0.5 mile (0.8 kilometer) north of San Jose and west of 8th Avenue (Photo 3.14-8 and Figure 3.14-4). This disposal site receives all of the municipal solid waste generated on Tinian. The CNMI Department of Public Works operates the facility, which does not comply with the CNMI Administrative Code Chapter 65-80 Solid Waste Management Regulations or the Resource Conservation and Recovery Act Subtitle D regulations applicable to municipal solid waste landfills (40 CFR Part 258) and were issued a Cease and Desist Administrative Order, CASE NO. DEQ SWM 2010-01 in 2010. The CNMI government has initiated contracting and construction for a solid waste transfer station that would handle the solid waste generated by the civilian population.
3.14.4.6 Information Technology/Communications

The information technology/communications resources on Tinian include all telephone, internet, cable, and satellite information technology/communications infrastructure. Tinian has commercial information technology/communications services provided by IT&E, which supplies phone and internet services through overhead distribution in the southern part of Tinian but not in the Military Lease Area. Cellular phone service is also provided by towers that serve the southern part of the island. Marianas Cable Vision Broadband provides cable television service on Tinian. There is no commercial or existing military information technology/communications infrastructure in the Military Lease Area. The International Broadcasting Bureau has significant broadcasting facilities on the northwest portion of Tinian but is not served by commercial services. It relies instead on wireless communications with infrastructure on Saipan.

An undersea fiber optic cable links Tinian and other islands in the CNMI to the Trans-Pacific Cable hub on Guam. In addition to the undersea fiber optic cable, a microwave system between Saipan, Tinian, and Rota provides alternative connectivity and provides diverse and redundant capability for IT&E commercial communications to Tinian in the event the undersea fiber optic cable is disabled (IT&E n.d.). The IT&E Cable Landing Facility is located on Tinian near Broadway and Canal Street in San Jose.

3.14.5 Pagan

3.14.5.1 Electrical Power

There is no public electrical generation or distribution infrastructure on Pagan. Visitors to Pagan may utilize personal-use generators or other power sources.

3.14.5.2 Potable Water

There is no potable water infrastructure or known freshwater source on Pagan. There are two large lakes in northern Pagan; Laguna Sanhiyon and Laguna Sanhalom. Knowledge of the groundwater resources of Pagan is limited to a 1957 study of the geology and hydrogeology of the island (Corwin et al. 1957), a 1978 planning study by the CNMI Office of Transition Studies and Planning; and limited water sampling conducted by the U.S. Geological Survey in 1983 and 2001 (U.S. Geological Survey 2014).

Figure 3.3-3 shows the location of the known groundwater wells on Pagan. Six relatively broadly-distributed groundwater samples were collected from accessible wells on Pagan by the U.S. Geological Survey in 1983 and two were collected in 2001 (U.S. Geological Survey 2014). Three of the wells Corwin et al. (1957) tested (Wells 1, 2, and 3) had total dissolved solids below the secondary drinking water maximum contaminant level. Two of these wells (Wells 2 and 3) had nitrate concentrations below the primary drinking water maximum contaminant level (i.e., mandatory drinking water quality standards under the Safe Drinking Water Act). Therefore these two wells might be considered potable; however both of these have water high in silica.

Visitors to Pagan utilize rainwater harvesting techniques to supply water for personal use. Additional information is provided in the Appendix P, Utilities Study (Volume III, Section 2.5.2 [DoN 2014]) and Section 3.3, Water Resources.
3.14.5.3 **Wastewater**

There is currently no publicly operated wastewater infrastructure on Pagan.

3.14.5.4 **Stormwater**

Average annual rainfall on Pagan is 70 to 80 inches (178 to 203 centimeters). There are no existing man made serviceable stormwater management features on Pagan. Existing culverts near Blue Beach are rusted, filled with holes, and partially crushed. The only related improvements include some grading around the airstrip performed decades ago.

3.14.5.5 **Solid Waste**

There is no publicly operated solid waste infrastructure on Pagan.

3.14.5.6 **Information Technology/Communications**

There is no existing information technology/communications infrastructure on Pagan.
3.15 **SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE**

Section 3.15 provides a summary of the general condition and character of CNMI socioeconomics and potential environmental justice issues. Because of the size and singular government of the CNMI, some of the anticipated socioeconomic impacts are expected to affect the Commonwealth as a whole but also at individual island level. Therefore, the region of influence includes the CNMI with particular emphasis on Tinian and Pagan (and in some cases Saipan).

### 3.15.1 Definition

Socioeconomics is generally defined as the study of the interrelation between social behavior and economics. Socioeconomic analyses typically address issues such as population, demographics, business activity, employment and income, and environmental justice. Impacts to these fundamental socioeconomic components can also influence other systemic issues such as housing, the provision of public services (e.g., emergency services, education, health services), and the general quality of life in a community.

The U.S. Environmental Protection Agency defines environmental justice as, “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies” (U.S. Environmental Protection Agency 2012). It goes on to clarify that “no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies.” The U.S. Environmental Protection Agency guidance states that “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of Northern Mariana Islands.”

Minority populations are “identified where either: (a) the minority population of the affected area exceeds 50% or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis” (Executive Order 12989). Minority populations include populations that report their ethnicity as something other than non-Hispanic White alone, including Native Hawaiian or other Pacific Islander, Asian, Black or African American, Hispanic or Latin, American Indian, or Alaska Native (U.S. Census Bureau 2011); specifically, for this EIS/OEIS, minority populations are primarily Pacific Islanders (Chamorro and Carolinian) and Asians.

Low-income populations “should be identified with the annual statistical poverty thresholds from the Bureau of the Census’ Current Population Reports, Series P-60 on Income and Poverty” (Executive Order 12989). The Bureau of Census further defines poverty areas as “census tracts or block numbering areas where at least 20% of residents were below the poverty level.”

Children are defined as those individuals under the age of 18 years old (Executive Order 13045).
3.15.2 Regulatory Framework

The Council on Environmental Quality regulations implementing NEPA state that when economic or social effects and natural or physical environmental effects are interrelated, the EIS would discuss these effects on the human environment (40 CFR § 1508.14). The Council on Environmental Quality regulations further state that the “human environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment.” In addition, 40 CFR § 1508.8 states that agencies need to assess not only direct effects, but also “aesthetic, historic, cultural, economic, social, or health” effects. Following from these regulations, the socioeconomic analysis in this EIS/OEIS evaluates how elements of the human environment such as population, employment, housing, and public services might be affected by the proposed action.

Two executive orders deal directly with the socioeconomic conditions and concerns of potentially affected communities. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations requires federal agencies to assess whether their actions could have disproportionately high and adverse environmental and health impacts on minority or low-income populations. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks requires a similar analysis for children.

3.15.3 Methodology

Information presented in this section is based on research, analysis, and personal interviews conducted for Appendix Q of this EIS/OEIS, the Socioeconomic Impact Analysis Study (DoN 2014). In order to gather data for the Socioeconomic Impact Assessment Study, a series of interviews with CNMI and Tinian government agencies, non-governmental organizations, and private organizations were conducted on Tinian and on Saipan during the final week of January and first week of February 2014 (see Appendix B of the Socioeconomic Impact Assessment Study (Appendix Q) for interview meeting records). Information from those interviews supplements data gathered from other sources, which include those published by the U.S. Census and other U.S. federal government agencies, CNMI government agencies, and academic institutions. This information gathered through personal interviews was noted as being a statement that was made by the interviewee, and the Socioeconomic Impact Assessment Study (Appendix Q) (DoN 2014) was provided as the citation. Interview meeting records are presented in complete form in Appendix Q, Socioeconomic Impact Assessment Study (see Appendix B of the study).

Information presented in this section includes some projections of future economic activity. The projections, collectively, comprise the expected future baseline to which effects of the proposed action were compared to determine the magnitude of impacts. These projections were developed using a methodology that is presented in Appendix A of the Socioeconomic Impact Assessment Study (Appendix Q), and more detailed information on these projections can also be found in Chapter 4 of the Socioeconomic Impact Assessment Study (Appendix Q). Some of the projections indicate whether certain economic development projects would be expected to occur absent the proposed action. Development of these expectations is consistent with methods described in reference to cumulative impact assessment (see Chapter 5, Cumulative Impacts, Section 5.3.1) but also take economic feasibility into consideration.
While the footprint of the proposed action would be limited to Tinian and Pagan, the entire population of the CNMI may be affected by the proposed action. As such, data on the population and economy of Saipan and Rota were included. The ways in which the proposed action may affect the CNMI (to include Tinian, Pagan, Saipan, and Rota) are through potential changes to the overall economic activity in the CNMI and changes to CNMI government revenues, which are distributed to each CNMI municipality.

Typically, an analysis of environmental justice is begun by determining the presence and proximity of low-income and minority populations relative to potential adverse impacts of a proposed action. In conjunction, a comparison of populations, that may be impacted, is made to determine the potential for disproportionate effects (i.e., the potential for disproportionate effects is established by looking at whether impacts would have greater effects on certain locations than other locations). However, in this case, environmental justice analysis is complicated by the CNMI’s unique capability to meet the purpose and need of the proposed action. As summarized in Chapter 1, the Department of Defense has identified the need for increased training capabilities in the Western Pacific with the greatest number of unfilled training requirements in the Mariana Islands, specifically the CNMI. As described in Chapter 2, of the 14 CNMI islands, only a combination of Tinian and Pagan meet unit level and combined level screening criteria, and could satisfy the unfilled training requirements. In this analysis, the populated islands in the CNMI (Saipan, Tinian, and Rota) were analyzed to determine the presence of low-income and minority populations.

3.15.4 Socioeconomic Context

3.15.4.1 Commonwealth of the Northern Mariana Islands

As described in Chapter 1, in June of 1975, with 78.8% of votes cast in favor, the people of the CNMI accepted the Covenant to Establish a Commonwealth of the Northern Mariana Islands in Political Union with the U.S. On November 4, 1986, the final provision of the 1976 Covenant came into effect and U.S. citizenship was conferred upon qualified CNMI residents.

The late 1980s and early 1990s were a boom period for the CNMI economy, in large part due to Japanese investments that were geared towards making the CNMI a tourist destination. Also contributing to the boom was growth in Chinese investments in the garment manufacturing industry. During the early part of the boom period, it became clear that the CNMI labor pool could not support the magnitude of its economy (DoN 2014). To meet labor demand, non-resident workers were brought in on CNMI-Only Transitional Worker visas. The visa allows CNMI business owners to apply for temporary permission to employ foreign (nonimmigrant) workers.

In 2005, the U.S. entered a global trade agreement that removed the quota system for garments made overseas allowing even cheaper textile imports from other parts of the world into the U.S., effectively closing down the CNMI garment manufacturing industry and ending the boom. In 2006, Japan Airlines withdrew from the CNMI due to a declining Japanese tourism market. These and other factors led to a prolonged contraction of the CNMI economy from 2002 to 2011 (DoN 2014).

Data show that from 2011 to 2012, the CNMI economy began to improve as gross domestic product increased for the first time in over a decade, by 7.7% (DoN 2014). The improvement was in large part due to increases in the number of Chinese visitors. Compared to traveling to the mainland U.S., travel to
the CNMI, for Chinese tourists, is relatively simple because of the allowance, referred to as “parole in place,” whereby the U.S. government permits visits of up to 45 days without requiring a visa.

### 3.15.4.2 Tinian

In January 1983, the U.S. and the CNMI governments finalized a lease agreement for military use of approximately two-thirds of northern Tinian (i.e., the Military Lease Area). In 1994, the U.S. military signed a lease back agreement for a portion of the land that it had leased; this Lease Back Area was made available to Tinian residents for subsistence agriculture and grazing. One-year agricultural permits were administered by the CNMI Department of Public Lands and limited to 12 acres (5 hectares). The 1994 lease back agreement has since expired but the CNMI and U.S. have continued the terms of the lease back agreement on a short-term, interim basis while negotiations continue on a long-term lease back agreement.

Since the 1990s, Tinian’s economy has been led by tourism and local government employment (U.S. Census Bureau 2010a, 2014). The Tinian Dynasty Hotel and Casino, which opened on April 25, 1998, currently draws visitors to Tinian, primarily from China. Tinian Dynasty management indicated that Chinese visitors purchase tour packages that typically include visits to Saipan for a couple of nights and Tinian for a couple of nights (DoN 2014). Tinian Dynasty Management and a Tinian tour operator also noted that visitors often take windshield tours of the island that stop at historical, scenic, and beach sites (DoN 2014).

### 3.15.4.3 Pagan

The first post-war economic development on Pagan took place in 1951 when the Northern Islands Development Company brought Chamorros to Pagan to collect and market copra (coconut meat) (Russell 1998). In 1976, about 75 tons (83 metric tons) of copra was produced on Pagan, generating sales of about $13,000 (CNMI Office of Transition Studies and Planning 1978). As of 1978, there were no stores on Pagan or evidence of cash exchanges among residents for goods or services. There was “limited potential for development” on Pagan due to lack of comparative advantage over other islands in the region, relative inaccessibility, and lack of modern infrastructure necessary to make potentially productive operations (e.g., basalt mining) feasible (CNMI Office of Transition Studies and Planning 1978).

Pagan is home to two active volcanoes, one of which (Mount Pagan) erupted in May 1981 forcing the evacuation of all residents to Saipan; the island remains unpopulated because of continued safety concerns. While no official homesteading has occurred on Pagan, there is anecdotal information indicating that people periodically visit the island and some may stay for extended periods. In 2010, the CNMI enacted Public Law 16-50, a homesteading law to establish the Northern Islands Village and Agricultural Homesteading program for current or former residents of the Northern Islands or any qualified person interested in residing on the Northern Islands. The law, however, requires extensive municipal planning and infrastructure development prior to homesteading deeds being issued, and to date, the CNMI has not deeded any land on Pagan (DoN 2014).
3.15.5 Population Characteristics

Figure 3.15-1 shows the population trend over time for the CNMI overall, Saipan, Tinian, Rota, the Northern Islands, and temporary residents. According to the 2010 Census, Saipan, Tinian, and Rota are the only three islands in the CNMI with permanent residents (U.S. Census Bureau 2010a). The CNMI population increased by 730% between 1958 and 2000 (from 8,290 to 69,221) but decreased from 2000 to 2010 by 22% (from 69,221 to 53,883).

The first major population influx was during the 1980s. During that decade, the CNMI population more than doubled from 16,780 to 43,345. The population increased substantially again during the 1990s, growing 60% from 43,345 to 69,221. The massive population influxes during the 1980s and 1990s were driven by the introduction and increasing numbers of temporary non-residents (Pacific Web 2013).

A range of projections indicates that during the time that the proposed action would be implemented, CNMI (including Tinian) population could range between 3% lower than counted in the 2010 Census and 18% higher than 2010 levels. See Appendix Q, Socioeconomic Impact Assessment Study (Section 4.1.1 of the study).

The racial composition of the CNMI is primarily Asian and Pacific Islander. As of 2010, 50% of the population was Asian (mostly Filipino) and 35% was Pacific Islander (mostly Chamorro) (U.S. Census Bureau 2010a). On Tinian in 2010, 47% of the population was Asian while 39% was Pacific Islander. Of the 1,222 Pacific Islanders on Tinian in 2010, 1,183 were Chamorro (97%) (U.S. Census Bureau 2010a). On average, CNMI households had 3.26 people and a median annual income of $19,958. Of the municipalities in the CNMI, Tinian had the fewest persons per household (3.21) and the highest median household income ($24,470); Saipan had the most people per household (3.27) and the lowest median household income ($19,607) (U.S. Census Bureau 2010a).
### 3.15.6 Economic Characteristics

#### 3.15.6.1 Employment and Income

According to the 2010 Census, the labor participation rate in the CNMI was 72%, and 11.2% of the labor force in the CNMI was unemployed (U.S. Census Bureau 2010a). In comparison to the CNMI as a whole, Tinian’s unemployment rate was low, at 6.7%. Table 3.15-1 lists the number and percent of the labor force, employed, and unemployed in the CNMI overall and broken down into Tinian, Saipan, and Rota.

<table>
<thead>
<tr>
<th>Labor Force</th>
<th>CNMI Overall</th>
<th>CNMI % of Employment</th>
<th>Tinian</th>
<th>Tinian % of Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population 16 Years and Over</td>
<td>38,679</td>
<td></td>
<td>2,311</td>
<td></td>
</tr>
<tr>
<td>Not in Labor Force</td>
<td>10,711</td>
<td></td>
<td>433</td>
<td>81%</td>
</tr>
<tr>
<td>Labor Force Participation Rate</td>
<td>72%</td>
<td></td>
<td>81%</td>
<td></td>
</tr>
<tr>
<td>In Civilian Labor Force</td>
<td>27,949</td>
<td></td>
<td>1,878</td>
<td>71%</td>
</tr>
<tr>
<td>Employed</td>
<td>24,826</td>
<td></td>
<td>1,752</td>
<td>76%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>3,123</td>
<td>12%</td>
<td>126</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2010a.

Table 3.15-2 shows 2010 employment by industry for the CNMI and Tinian. In 2010, the industry with the highest number employed both in the CNMI and on Tinian was the arts, entertainment, recreation, accommodation and food services industry; this tourism-related industry employed 672 people on Tinian (38% of employment) and 5,519 people in the CNMI (22% of employment).

<table>
<thead>
<tr>
<th>Industry</th>
<th>CNMI Overall</th>
<th>CNMI % of Employment</th>
<th>Tinian</th>
<th>Tinian % of Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts, entertainment, recreation, accommodation, and food services</td>
<td>5,519</td>
<td>22%</td>
<td>672</td>
<td>38%</td>
</tr>
<tr>
<td>Educational services, health care, and social assistance</td>
<td>3,085</td>
<td>12%</td>
<td>178</td>
<td>10%</td>
</tr>
<tr>
<td>Retail trade</td>
<td>2,645</td>
<td>11%</td>
<td>76</td>
<td>4%</td>
</tr>
<tr>
<td>Other services, except public administration</td>
<td>2,553</td>
<td>10%</td>
<td>131</td>
<td>7%</td>
</tr>
<tr>
<td>Public administration</td>
<td>2,414</td>
<td>10%</td>
<td>320</td>
<td>18%</td>
</tr>
<tr>
<td>Professional, scientific, management, administrative, and waste management services</td>
<td>1,974</td>
<td>8%</td>
<td>53</td>
<td>3%</td>
</tr>
<tr>
<td>Construction</td>
<td>1,786</td>
<td>7%</td>
<td>79</td>
<td>5%</td>
</tr>
<tr>
<td>Transportation and warehousing, and utilities</td>
<td>1,429</td>
<td>6%</td>
<td>127</td>
<td>7%</td>
</tr>
<tr>
<td>Finance, insurance, real estate, rental, and leasing</td>
<td>1,064</td>
<td>4%</td>
<td>31</td>
<td>2%</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>700</td>
<td>3%</td>
<td>10</td>
<td>1%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>689</td>
<td>3%</td>
<td>5</td>
<td>0%</td>
</tr>
<tr>
<td>Information</td>
<td>496</td>
<td>2%</td>
<td>29</td>
<td>2%</td>
</tr>
<tr>
<td>Agriculture, forestry, fishing, hunting, and mining</td>
<td>472</td>
<td>2%</td>
<td>41</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2010a.

Projections indicate that during the timeframe that the proposed action would be implemented, CNMI (including Tinian) employment could range between 8.4% and 35% higher than 2010 Census levels. See Appendix Q, *Socioeconomic Impact Assessment Study* (Section 4.2.3 of the study).
In the CNMI, the average hourly wage was $9.67, in 2011, and the median hourly wage was $6.00. This is lower than the U.S. minimum wage of $7.25 per hour because the CNMI does not fall under U.S. minimum wage regulations. Average annual pay was $20,114 and the median annual pay was $12,480. The highest paying jobs were legal (average annual pay of $59,467) and healthcare practitioner (average annual pay of $48,693). The lowest paying was food preparation and service-related occupations (average annual pay of $11,606). Table 3.15-3 presents 2011 CNMI income by occupation (CNMI Department of Commerce 2012a).

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Hourly Wage</th>
<th>Annual Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Median</td>
</tr>
<tr>
<td>Weighted Average¹</td>
<td>$9.67</td>
<td>$6.00</td>
</tr>
<tr>
<td>Management</td>
<td>$15.55</td>
<td>$13.07</td>
</tr>
<tr>
<td>Business and Financial Operations</td>
<td>$11.56</td>
<td>$9.30</td>
</tr>
<tr>
<td>Computer and Mathematical</td>
<td>$16.11</td>
<td>$14.18</td>
</tr>
<tr>
<td>Architecture and Engineering</td>
<td>$14.48</td>
<td>$10.13</td>
</tr>
<tr>
<td>Life, Physics, and Social Science</td>
<td>$12.58</td>
<td>$10.50</td>
</tr>
<tr>
<td>Community and Social Services</td>
<td>$9.12</td>
<td>$8.40</td>
</tr>
<tr>
<td>Legal</td>
<td>$28.59</td>
<td>$27.31</td>
</tr>
<tr>
<td>Education, Training, and Library</td>
<td>$16.18</td>
<td>$16.43</td>
</tr>
<tr>
<td>Arts, Design, Entertainment, Sports, and Media</td>
<td>$8.36</td>
<td>$6.09</td>
</tr>
<tr>
<td>Healthcare (Practitioners and Technical)</td>
<td>$23.41</td>
<td>$16.68</td>
</tr>
<tr>
<td>Healthcare Support</td>
<td>$7.52</td>
<td>$5.94</td>
</tr>
<tr>
<td>Protective Service</td>
<td>$8.27</td>
<td>$7.56</td>
</tr>
<tr>
<td>Food Preparation and Serving Related</td>
<td>$5.58</td>
<td>$5.05</td>
</tr>
<tr>
<td>Building and Grounds Cleaning and Maintenance</td>
<td>$5.79</td>
<td>$5.05</td>
</tr>
<tr>
<td>Personal Care and Service</td>
<td>$6.42</td>
<td>$5.09</td>
</tr>
<tr>
<td>Sales and Related</td>
<td>$5.80</td>
<td>$5.05</td>
</tr>
<tr>
<td>Office and Administrative Support</td>
<td>$8.45</td>
<td>$5.82</td>
</tr>
<tr>
<td>Farming, Fishing, and Forestry</td>
<td>$6.58</td>
<td>$5.05</td>
</tr>
<tr>
<td>Construction and Extraction</td>
<td>$6.21</td>
<td>$5.05</td>
</tr>
<tr>
<td>Installation, Maintenance, and Repair</td>
<td>$7.38</td>
<td>$5.67</td>
</tr>
<tr>
<td>Production</td>
<td>$7.27</td>
<td>$5.15</td>
</tr>
<tr>
<td>Transportation and Material Moving</td>
<td>$7.11</td>
<td>$5.25</td>
</tr>
</tbody>
</table>

Note: ¹Weighting based on number of employees in each occupation.
Source: CNMI Department of Commerce 2012a.

Figure 3.15-2 shows the trend for CNMI total employee compensation and gross domestic product over the years of 2002-2012. Over that period, total employee compensation was greatest in 2004 ($752 million), a year before the garment manufacturing industry experienced losses. After 2004, total compensation declined every year up to 2012, reaching a low of $482 million (U.S. Bureau of Economic Analysis 2012, 2013).

Projections indicate that during the timeframe that the proposed action would be implemented, due to anticipated expansion in the tourism industry and expected increases in the minimum wage, CNMI total compensation could range between 21% and 51% higher than 2012 levels shown in Figure 3.15-2. See Appendix Q, Socioeconomic Impact Assessment Study (Section 4.2.3 of the study).
3.15.6.2 Gross Domestic Product

Gross domestic product is a measure of overall economic activity in a region. It typically is the market value of all officially recognized final goods and services produced within an area in a given year. The CNMI’s gross domestic product declined every year from 2002 to 2009 (see Figure 3.15-2), decreasing from $1.22 billion in 2002 to $651 million in 2011 (a 47% decline). From 2011 to 2012, the gross domestic product of the CNMI increased for the first time since 2002, to $701 million, up 7.7% from 2011 levels (U.S. Bureau of Economic Analysis 2012, 2013).

Projections indicate that during the timeframe that the proposed action would be implemented, due to anticipated expansion in the tourism industry, CNMI gross domestic product could range between 25% and 56% higher (unadjusted for price changes) than 2012 Census levels. See Section 4.2.2 of the Socioeconomic Impact Assessment Study.

3.15.6.3 Commonwealth Government Finances

CNMI government revenues, by source, are presented in Table 3.15-4. Revenues increased from 2002 to 2004, but declined from 2004 to 2009. Data from the first two quarters of 2010 indicate that government revenues increased from 2009 to 2010 (CNMI Department of Commerce 2013).
Table 3.15-4. CNMI Government Revenues by Source, 2002-2009 (Millions of $’s)

<table>
<thead>
<tr>
<th>Revenue Type</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Gross Receipt Tax</td>
<td>$48.6</td>
<td>$50.6</td>
<td>$54.5</td>
<td>$58.3</td>
<td>$54.1</td>
<td>$49.0</td>
<td>$51.8</td>
<td>$44.8</td>
</tr>
<tr>
<td>Wage and Salary Tax</td>
<td>$31.2</td>
<td>$31.1</td>
<td>$35.0</td>
<td>$32.7</td>
<td>$28.6</td>
<td>$26.2</td>
<td>$25.1</td>
<td>$24.4</td>
</tr>
<tr>
<td>Personal/Corporate Income Tax†</td>
<td>$12.8</td>
<td>$17.0</td>
<td>$11.2</td>
<td>$10.0</td>
<td>$15.1</td>
<td>$ 8.3</td>
<td>$12.9</td>
<td>$15.5</td>
</tr>
<tr>
<td>Garment Certification Fee</td>
<td>$30.9</td>
<td>$29.3</td>
<td>$30.6</td>
<td>$24.1</td>
<td>$18.1</td>
<td>$11.4</td>
<td>$ 3.6</td>
<td>$ 0.1</td>
</tr>
<tr>
<td>Excise Tax</td>
<td>$18.7</td>
<td>$22.3</td>
<td>$24.4</td>
<td>$23.9</td>
<td>$24.4</td>
<td>$20.6</td>
<td>$19.7</td>
<td>$18.0</td>
</tr>
<tr>
<td>Hotel Occupancy Tax</td>
<td>$ 4.9</td>
<td>$ 5.4</td>
<td>$ 6.0</td>
<td>$ 6.5</td>
<td>$ 5.5</td>
<td>$ 4.9</td>
<td>$ 5.6</td>
<td>$ 5.1</td>
</tr>
<tr>
<td>Fuel/Container/Bar tax</td>
<td>$ 6.8</td>
<td>$ 8.2</td>
<td>$ 9.9</td>
<td>$10.2</td>
<td>$ 7.3</td>
<td>$ 6.8</td>
<td>$ 7.3</td>
<td>$ 6.4</td>
</tr>
<tr>
<td>Fees, Charges, and Other Revenues</td>
<td>$34.2</td>
<td>$45.8</td>
<td>$46.4</td>
<td>$44.6</td>
<td>$33.8</td>
<td>$39.3</td>
<td>$33.2</td>
<td>$30.0</td>
</tr>
<tr>
<td>Transfers from Other Funds</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$ 7.3</td>
</tr>
<tr>
<td>Revenue Transfer to Other Funds</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>$-3.5</td>
<td>$-3.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$187.9</strong></td>
<td><strong>$209.8</strong></td>
<td><strong>$217.9</strong></td>
<td><strong>$210.3</strong></td>
<td><strong>$192.0</strong></td>
<td><strong>$163.0</strong></td>
<td><strong>$162.8</strong></td>
<td><strong>$154.7</strong></td>
</tr>
</tbody>
</table>

Note: † Northern Marianas Territorial Income Taxes.

Projections indicate that during the timeframe that the proposed action would be implemented, due to anticipated increases overall economic activity spurred by expansion in the tourism industry, CNMI government revenues could range between 14% and 42% higher than 2009 levels. See Section 4.2.4 of the Socioeconomic Impact Assessment Study (Appendix Q).

### 3.15.6.4 Housing

In 2010, there were 20,850 housing units in the CNMI, most of which were in Saipan (18,683). Vacancy rates in the CNMI as a whole were 23%. Tinian was at 22%, twice the U.S. average (U.S. Census Bureau 2010b). The least expensive housing units in the CNMI were on Rota (valued at $109,900) and the most expensive were on Saipan (valued at $127,600) (U.S. Census Bureau 2010a). There were 1,118 housing units on Tinian in 2010, 874 were occupied, 244 were vacant, and 101 were for rent (U.S. Census Bureau 2010a).

The West San Jose Village Homestead, located in northwest San Jose and south of the airport, broke ground on February 5, 2014 and 170 families received homestead permits to build homes. Five other homestead sites are expected to be developed on Tinian that would house an additional 345 families (Eugenio 2014).

### 3.15.6.5 Tourism

#### 3.15.6.5.1 CNMI Overall

From 1999 to 2011, there has been a general decline in the number of tourism visitors. Figure 3.15-3 presents the number of tourists and Figure 3.15-4 illustrates the percent change over the same years (CNMI Department of Commerce 2006, 2008, 2012b). There are a variety of reasons for this decline, including the exit of Japan Airlines from the CNMI market, the March 2011 Japan natural disaster, and confusion over visas for Russian and Chinese visitors (Mariana Visitors Authority 2012). From 2011 to 2013, however, the number of visitors increased, rising from 340,957 in 2011 to 438,978 in 2013.
Projections indicate that during the timeframe that the proposed action would be implemented, the number of CNMI tourism visitors could be between 25% and 56% higher than 2012 levels, due to continued growth from Chinese and Korean markets. See Section 4.2.1 of the Socioeconomic Impact Assessment Study (Appendix Q).

### 3.15.6.5.2 Tinian

According to Tinian Dynasty management, over 90% of all Tinian visitors stay overnight at the Tinian Dynasty Hotel and Casino (the remaining 10% may not stay overnight or may stay at other accommodations). In 2013, 54,814 visitors from off-island stayed at the Tinian Dynasty. About 80% of visitors were from China and about 10% were from Korea. Tinian Dynasty management indicated that
visitors tend to participate in multiple activities while on Tinian that included island tours and nature activities such as scenic viewing and diving (DoN 2014).

3.15.6.5.3 Pagan

Scientific research draws some visitors to Pagan, as does camping and hunting activities (see Section 3.8, Recreation); however, there has been little direct economic activity related to tourism on Pagan since the 1981 evacuation. The Silver Explorer, a cruise ship operated by Silversea Expeditions, stopped at Pagan on its way from Otaru, Japan to Apra, Guam on September 28, 2014 bringing tourists to the island for an afternoon.

3.15.6.6 Commercial Agriculture

Data presented in this section were derived from the 2007 Agricultural Census (U.S. Department of Agriculture 2009) and relate to places with agricultural operations qualifying as farms according to the census definition. This included all places from which $1,000 or more of agricultural products were produced and sold during the 2007 calendar year. Data from the 2007 Agricultural Census is the most recent available as the U.S. Department of Agriculture has not conducted, and does not intend on publishing, an updated agricultural census for the CNMI (U.S. Department of Agriculture 2014).

Research provides no indication that any commercial agricultural activity occurs on Pagan (DoN 2014) and therefore, the topic is not discussed further with relation to Pagan.

3.15.6.6.1 CNMI Overall

Farms are found on all of the populated islands in the CNMI. In 2007, Saipan had the most farms (128), Rota the second most (97), and Tinian had the fewest (31) (U.S. Department of Agriculture 2009). Fruits and nuts (45%), vegetables and melons (43%), and root crops (41%) made up nearly all of the $1.85 million in agricultural product sales in the CNMI in 2007 (U.S. Department of Agriculture 2009). Additionally, CNMI farms had sales of livestock and poultry.

3.15.6.6.2 Tinian

3.15.6.6.2.1 Farms

As of 2014, 29 lots in the Military Lease Area were permitted for noncommercial, subsistence agriculture and grazing; these lots constituted 2,375 acres (961 hectares) (DoN 2014). Based on the Census definition, a person is engaged in subsistence activities if he or she mainly produces goods for his or her own or family’s use and needs, and not solely for commercial purposes (U.S. Census Bureau 2014). While it is not possible to discern with any certainty, Agricultural Census data suggest that some lots in the Military Lease Area sold more than $1,000 worth of agricultural products and therefore are considered farms (U.S. Department of Agriculture 2009); however, other lots, that had less than $1,000 in sales, would not be considered farms.

Table 3.15-5 provides information on the number of Tinian farms and the amount of land in those farms. In 2007, there were 31 farms on Tinian, an increase of 8 farms from 2002. Farms with sales over $1,000 used 2,071 acres (838 hectares) of Tinian land in 2007 (U.S. Department of Agriculture 2009).
Table 3.15-5. Farms, Land in Farms, and Land Use by Municipality, 2002 and 2007

<table>
<thead>
<tr>
<th>Municipalities</th>
<th>2002</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Farms</td>
<td>23</td>
<td>31</td>
</tr>
<tr>
<td>Land in Farms (acres)</td>
<td>672/272</td>
<td>2,071/838</td>
</tr>
</tbody>
</table>


Of the 31 farms on Tinian in 2007, 74% were owned by individuals, 15% by a partnership, and 6% by corporations; 29% of farms were on owned land and 71% were on rented land from others; 29 of the 31 farms used unpaid labor (indicating family workers); 77% of farms were operated by Chamorros and 19% were operated by Asians; 13% of farm operators were not a U.S. citizen (U.S. Department of Agriculture 2009).

3.15.6.6.2.2 Agricultural Products

In 2007, the market value of all agricultural products sold on Tinian (including root crops, vegetables, melons, fruits, and nuts) totaled $152,537. Fruits and nuts, and vegetables and melon sales were $72,339 and $77,188, respectively (U.S. Department of Agriculture 2009).

3.15.6.6.2.3 Gathering

Multiple Tinian government agencies and other anecdotal reports indicated that hot peppers named “Donni Sali” are sometimes gathered, processed, and sold. According to the Tinian Department of Labor, pepper gathering for sale is a common source of income for community members that are not working and is a supplement to income for those who need extra money (DoN 2014).

3.15.6.6.2.4 Livestock

As of 2014, the Lease Back Area (i.e., southern portion of the Military Lease Area) supported approximately 2,375 acres (961 hectares) of agricultural grazing permits. However, not all of that land was utilized. Data and research of cattle grazing on Tinian have been published in the Beef Cattle Herd Survey, 2013, by the Northern Marianas College Cooperative Research, Extension, and Education Service (NMC-CREES) (2013). Table 3.15-6 provides information on the Tinian herd as presented in that report. According to the Cattle Herd Survey, in 2013, there were 37 ranching operations that covered 1,834 acres (742.5 hectares) (NMC-CREES 2013). Of these 37 ranching operations, the Tinian Cattlemen’s Association estimates that 32 are located in the Military Lease Area (DoN 2014). Of the 1,834 acres on Tinian being used for cattle grazing, an estimated 1,010 is in the Military Lease area.

<table>
<thead>
<tr>
<th>Ranching Operations</th>
<th>Cattle and Calves</th>
<th>Acres in Production</th>
<th>Cattle/Calves per Acre</th>
<th>Estimated Value of Tinian Herd (2012 $s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>1,043</td>
<td>1,834</td>
<td>0.6</td>
<td>$547,850</td>
</tr>
</tbody>
</table>

Note: Liveweight value as determined in the cattle survey. Based on average live weight Tinian market values for 2012.

Source: NMC-CREES 2013. Data collected over a period of three months (December 2012 through February 2013) via personal interviews.

In 2012, 177 cattle were sold (with a permit) for a total of $97,350. In 2013, the herd numbered 1,043 and the live weight value, calculated based on sales in 2012, was about $547,850 (NMC-CREES 2013). According to the survey, there were about 0.6 cattle per acre (1.4 per hectare) on Tinian around the
start of 2013. The Tinian Cattlemen’s Association indicated that there was no crowding of cattle, that there was more than enough space for the number of cows in the herd, and that ideally there could be more cows per acre (1 per acre or 2.5 per hectare were noted to be ideal) (NMC-CREES 2013).

### 3.15.6.7 Commercial Fishing

Commercial fishing occurs throughout the CNMI, mostly around Saipan and Tinian. Interviews conducted with groups that have knowledge of fishing in waters off of Pagan indicated that Pagan waters are good for fishing but costs associated with fishing there are very high due to Pagan’s remoteness, and therefore only a small amount of fishing is conducted there (DoN 2014). Therefore, the topic is not discussed further with relation to Pagan.

#### 3.15.6.7.1 CNMI Overall

An estimated $503,822 worth of fish were landed in the CNMI in 2010 (217,099 pounds (98,474 kilograms) at an average price of $2.32 per pound), over 90% of which were landed on Saipan (National Oceanic and Atmospheric Administration 2013a).

#### 3.15.6.7.2 Tinian

As of 2011, the number of fishing boats on Tinian was between 15 and 20, with the majority of those boats less than 25 feet (8 meters) in length (National Oceanic and Atmospheric Administration 2013b). While the waters to the northwest of Tinian are used for fishing by the Saipan commercial fishing fleet, there is no evidence of a commercial fishing industry based out of Tinian. According to the Tinian Department of Land and Natural Resources and the Western Pacific Fishery Management Council, fishing boats on Tinian are not used for commercial fishing; when fish are sold, it is to cover the expenditures of fishing excursions (DoN 2014).

Table 3.15-7 and Figure 3.15-5 identify fishing areas around Tinian and the type of fishing that takes place at each area. While the CNMI has a moratorium on gill nets, the Department of Land and Natural Resources reports gill net fishing so it is included here. The water is notably calmer on the western side of Tinian, which makes it more attractive for fishing than the eastern side. Types of fishing that require boats are almost exclusively limited to the western side of the island. According to the Tinian Department of Land and Natural Resources, waters on the eastern side are rougher and, for the most part, only good for land-based cliff-fishing (DoN 2014).

<table>
<thead>
<tr>
<th>Location</th>
<th>From</th>
<th>To</th>
<th>Type of Fishing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest</td>
<td>Puntan Tahgong</td>
<td>Puntan Diapblo</td>
<td>Spearfishing, rod and reel (casting from boat), and cliff fishing</td>
</tr>
<tr>
<td>Southwest</td>
<td>Puntan Diapblo</td>
<td>Puntan Carolinas</td>
<td>Trolling and bottom fishing</td>
</tr>
<tr>
<td>Southeast</td>
<td>Puntan Carolinas</td>
<td>Puntan Baranga</td>
<td>Spearfishing and cliff fishing</td>
</tr>
<tr>
<td>East</td>
<td>Puntan Baranga</td>
<td>Puntan Chiget</td>
<td>Cliff fishing</td>
</tr>
<tr>
<td>Northeast</td>
<td>Puntan Chiget</td>
<td>Puntan Tahgong</td>
<td>Sea crab, throw net, cast net, gill net, and spearfishing</td>
</tr>
</tbody>
</table>

Source: DoN 2014.
Figure 3.15-5
Tinian Fishing Areas and Type of Fishing

Legend
- Military Lease Area
- International Broadcasting Bureau

Type of Fishing
- Trolling/Bottom
- Spear
- Net (throw, cast, gill)
- Prime Sea Crab
- Rod & Reel (casting from boat)
- Cliff

Puntan Tahgong
- Ush "Cross" Point

Puntan Chiget
- Unai Chulu
- Unai Babui
- Unai Lam Lam

Puntan Barangka
- Marpo Point
- Tinian Harbor

Puntan Carolinas
- Puntan Diapblo
- Puntan Chiget
- Lamanibot Bay

Puntan Barangka
- Mount Lasso
- Lake Hagol
- International Broadcasting Bureau

Streets:
- State Street
- Grand Avenue
- Masalok Beach Road
- Broadway
- 86th Street
- 96th Street
- 123rd Street
- 8th Avenue
- 124th Street

Scales:
- 0 0.5 1 2 Miles
- 0 0.5 1 2 Kilometers

NORTH
3.15.6.7.3 Saipan

Saipan residents surveyed in 2005 (Van Beukering et al. 2006), who said they were active and/or commercial fishermen, were asked to answer questions to better understand the cultural importance of fishing on Saipan and the social and economic role it plays among households and individuals (Van Beukering et al. 2006). Saipan anglers reported that about 90% of their catch was consumed by themselves, family, and friends while about 8% of their catch was sold. The survey showed that the cost of fishing exceeded fish sales for almost every income group except those fishermen earning over $501 a month and those earning less than $26 (National Oceanic and Atmospheric Administration 2013b). The survey authors concluded that even those fishermen that do sell fish, do not sell to earn a profit but rather, sell fish to recover some of the costs of fishing (Van Beukering et al. 2006). This condition is thought to be the same for anglers throughout the CNMI (DoN 2014).

3.15.6.8 Aquaculture

Aquaculture in the CNMI is primarily land-based with major products that include tilapia and shrimp. Production in 2009 was estimated at 10 metric tons (11 tons) with a value of $56,000. Fish are sold live or fresh, usually at a size of 7-9 ounces (200-250 grams), for a price of $2-$3 per pound ($5-$6 per kilogram). As of 2011, there were eight tilapia farmers in the CNMI (five on Saipan, two on Rota, and one on Tinian) (NMC-CREES 2011). A local source with expertise in aquaculture indicated that the two farms on Rota were government-sponsored demonstration farms, four of the five Saipan farms were for subsistence, and the continued operation of the farm on Tinian was uncertain since the passing of its operator (Michael Ogo, personal communication, May 2014).

3.15.6.9 Commercial Hunting

Research indicated that no commercial hunting takes place in the CNMI; rather, hunting is limited to subsistence purposes only (DoN 2014).

3.15.6.10 Minerals

3.15.6.10.1 Tinian

Through ownership in FPA Pacific Corp., Hawaiian Rock has operated a quarry and ready mix concrete plant on Tinian since 1993.

3.15.6.10.2 Pagan

Mineral resources have been identified on Pagan and include basalt and pozzolan (a substance used as an additive for producing cement). The 1978 Pagan Physical Development Master Plan (CNMI Office of Transition Studies and Planning 1978) noted that one possibility for economic development on Pagan might be the exploitation of the island's basalt deposits (basalt is sometimes used in construction as an aggregate mixed into concrete). The Master Plan noted that investigation by the Government of Guam Department of Public Works suggested that although the basalt resource on Pagan was extensive, the cost of infrastructure improvements necessary to mine, process, and transport the basalt would make mining it too expensive to earn a profit. To make it feasible, “joint development funding including capital improvement program development funds from the Northern Mariana Islands Capital Improvement Program, Economic Development Authority Funds, Federal Aviation Administration, Airport
Development Aid Program funds, and finally a long term contract for supplying basalt to Guam would appear to be necessary to make such a program successful” (CNMI Office of Transition Studies and Planning 1978).

Pozzolan is the result of the 1981 eruption of Mount Pagan and is defined as any substance that, if in small enough particles, reacts chemically to form compounds that contain cement-like properties. Economic use of pozzolan is to mix it with Portland cement to create blended cement. On Pagan, the pozzolan material is primarily volcanic ash and glass (pumice and pumicite).

In 2007, a field program drilled samples from 32 sites on Pagan and conducted analysis of the pozzolan material that was extracted. The study indicated there was an estimated 13.1 million tons (11.9 million metric tons) of pozzolan that could be extracted and that the pozzolan was suitable for industrial use (DoN 2014).

The price of pozzolan in 2012 was $35 per metric ton (U.S. Geological Survey 2013), which is lower than the cost would be to ship pozzolan to market (Saipan Shipping Company 2014), indicating that, while a permit to mine pozzolan was provided by the CNMI Department of Public Lands to a private mining company, a pozzolan mine on Pagan may not be economically feasible (see Appendix Q, Socioeconomic Impact Assessment Study, Section 4.2.10 for more information). One of the permit conditions is to provide an economic feasibility study within 1 year of permit issuance.

3.15.6.11 Airports and Sea Ports

The Commonwealth Ports Authority operates, maintains, and is responsible for improvements of all airports and sea ports in the CNMI. Airports and sea ports are located on Tinian, Saipan, and Rota and facilitate economic activity in the CNMI. Airports facilitate the movement of tourists and goods between islands and sea ports facilitate the transportation of goods between islands. As of September 30, 2012, the Commonwealth Ports Authority had 122 employees on Saipan, 25 on Tinian, and 21 on Rota (Commonwealth Ports Authority 2013).

3.15.6.11.1 Airports

There are three major airports in the CNMI: Saipan International Airport, Tinian International Airport, and Rota International Airport. Air taxi operations (i.e., aircraft designed to carry 60 or fewer passengers or carry up to 18,000 pounds of cargo) constituted 76% of operations at Saipan International Airport and 94% of operations at Tinian International Airport. Military operations constituted 4.1% of operations at Rota International Airport, 1% of operations at Tinian International Airport, and 0.3% of operations at Saipan International Airport. The Pagan airfield is partially covered by lava from the 1981 volcanic eruption, is unattended, and has not received a Federal Aviation Administration inspection since 1980 (Federal Aviation Administration 2014).

3.15.6.11.2 Sea Ports

In fiscal year 2012, a total of 395,070 inbound revenue tons and 14,244 outbound revenue tons were brought in and out of CNMI ports. The Port of Tinian is located on the southwest side of the island and is currently used for fuel supply and other commodities such as food. Fuel is brought in by tanker that makes deliveries on a monthly basis (Commonwealth Ports Authority 2014). The fuel tanker docks at the port and fuel is piped to storage tanks located about 300 feet (91 meters) inland. A tug and barge are
used to bring shipping containers over from Saipan. According to the Saipan Shipping Company and Tinian Marine Stevedores Incorporated, the barge only transits about once every other month (DoN 2014). Recently completed improvements at the Port of Tinian include new fenders and bollards and repairs to the concrete cap (Commonwealth Ports Authority 2014). There are no port facilities on Pagan.

### 3.15.6.12 Power Utility Rates

The CNMI’s electric system is owned by the Commonwealth Utilities Corporation, which is a public corporation that is part of the CNMI government. All CNMI electricity customers pay a fuel surcharge that varies with the world price of diesel fuel; this surcharge is known as the Levelized Energy Adjustment Clause rate. Large commercial electricity consumers on Tinian include the Tinian Dynasty and the International Broadcasting Bureau, which, combined, consume an average daily load of 0.75 megawatts (see Appendix P, Utilities Study). There are no electric utility systems on Pagan.

### 3.15.7 Public Services

#### 3.15.7.1 Education

**3.15.7.1.1 CNMI**

The CNMI Public School System, created in 1988, is a state education agency for preschool, elementary, and secondary education. It also includes the Early Intervention Program for infants up to 3 years old, and Head Start for children aged 3 to 4. Public education services are funded through a mixture of CNMI and federal funds. During fiscal year 2011, the CNMI Public School System received $58,374,747 in overall federal grants (Deloitte 2013a), though much of that ($28 million) was awarded under the American Recovery and Restoration Act, which is a temporary source of funding.

The CNMI Public School System comprises 12 elementary schools, 4 junior high schools, and 5 high schools. Kindergarten is offered at every elementary school, and there are 10 Head Start centers (CNMI Public School System 2013). Enrollment in elementary schools was 5,412 students, and in secondary schools it was 5,093 students (DoN 2014).

**3.15.7.1.2 Tinian**

There are two accredited public schools on Tinian, an elementary school (grades kindergarten through grade 6) and a junior/senior high school (grades 7 through 12). Both schools are located in the village of San Jose. According to 2011 to 2012 school year data, published by the CNMI Public School System, Tinian elementary had 14 teachers and 260 students (student to teacher ratio of 19:1), and Tinian Junior/Senior High School had 15 teachers and 229 students (student to teacher ratio of 15:1). The overall student to teacher ratio on Tinian during the 2011 to 2012 school year was 17:1. There is one Head Start center on Tinian, and as of 2011, there were 34 children enrolled and one staff member (CNMI Public School System 2013).

Representatives of the CNMI Public School System indicated that due to Tinian’s declining population, Tinian schools are using less of their capacity than during previous years. The total of 489 students for the 2011 to 2012 school year is below the highest number of students that recent data show for Tinian, which was 615 students during the 2007 to 2008 school year (CNMI Public School System 2011).
3.15.7.1.3 Pagan

Research indicated that no education services are currently provided on Pagan (DoN 2014).

3.15.7.2 Emergency Services

3.15.7.2.1 CNMI

The Department of Public Safety provides emergency services including police, fire, and emergency medical services in the CNMI. The Department consists of four major divisions, including the Commonwealth State Police Division, the Fire Division, the Bureau of Motor Vehicles, and the Commissioner. Emergency services are funded through a mixture of CNMI and federal funds. In fiscal year 2011, the CNMI received over $2 million in grants from the U.S. Department of Justice (Deloitte 2013b).

In 2013, the CNMI Department of Public Safety handled 4,604 Emergency Medical Services incidents, 3,521 fire related incidents, and there were a total of 3,105 criminal offenses (including 1,129 burglaries/robberies/thefts, 699 disturbances, 569 violent crimes, and 316 property crimes) (CNMI Department of Public Safety 2013a).

3.15.7.2.2 Tinian

The Tinian Department of Public Safety indicated that, as of February 2014, they were staffed by 17 police officers (a ratio of 6 officers for every 1,000 residents) and 11 firefighters (a ratio of 3.8 firefighters per 1,000 residents) (CNMI Department of Public Safety 2013a). While Tinian police officers are often responsible for a variety of tasks (for example, the same officer may be trained in boating safety and 911 call reception), the 6 officers per 1,000 residents is double the average for the U.S. as a whole, which is less than 3 officers per 1,000 residents (Bureau of Justice Statistics 2003). In addition, the ratio of 3.8 firefighters per 1,000 residents greatly exceeds the historical U.S. ratio of about 1.7. Since ratios of both officer and firefighter per 1,000 residents on Tinian are more than double of those in the U.S., Tinian emergency safety services are generally considered to have the capacity to meet the needs of the public.

The condition of the Department of Public Safety’s building was noted as fair and able to accommodate current personnel and operations (DoN 2014). Additionally, the Department indicated that it has a refurbished fire engine and ambulance, and that a boating safety facility will be operational sometime in 2014 (DoN 2014). The Commonwealth Ports Authority maintains firefighting capability at Tinian International Airport as a requirement for airport operations. This capability is available to the Tinian Department of Public Safety in the event of an emergency. According to the Commonwealth Ports Authority, Tinian International Airport has two fire-fighting vehicles (DoN 2014).

In 2013, 86 criminal offenses were recorded in San Jose; the most common offenses included 30 thefts or burglaries, 15 incidences of disturbing the peace, and 15 assaults (CNMI Department of Public Safety 2013b). It was noted that burglary is often drug-related and domestic violence is often alcohol-related and that these crimes are also related to weak economic conditions (DoN 2014).
3.15.7.2.3 Pagan

The Department of Public Safety indicated that it maintains no personnel or facilities on Pagan and if a visitor on Pagan were to require emergency assistance, the CNMI government would likely contract a charter helicopter or airplane to fly to Pagan and bring the individual to Saipan for treatment (DoN 2014). The CNMI Homeland Security and Emergency Management Office requires travelers to the Northern Islands, which includes Pagan, to provide notification if they plan to visit so that the agency can better respond to requests for emergency assistance.

3.15.7.3 Health

3.15.7.3.1 CNMI

Public health services are funded through a mixture of patient fees and CNMI and U.S. federal government funds. The Commonwealth Healthcare Corporation is an autonomous public corporation of the CNMI government. It provides hospital, primary care, and public health services to Saipan, Tinian, and Rota. There is no major trauma center in the CNMI; the closest major trauma center is on Guam.

3.15.7.3.2 Tinian

The Tinian Health Center is the island’s primary health care facility. Part of the Commonwealth Healthcare Corporation, the Health Center facility was built in 1987, currently has five holding beds, and in 2013, the Health Center accommodated 8,000 outpatient visits and 1,600 urgent care visits (DoN 2014). Information provided by staff indicates that there is one full-time physician, one nurse practitioner, four registered nurses, five licensed practical nurses, one nursing aide, and a dentist that visits periodically (DoN 2014). Medical staff explained that non-communicable diseases such as diabetes and hypertension are a major concern on Tinian, much like the rest of the CNMI (DoN 2014).

Despite clearly apparent limitations necessitated by operational efficiencies in areas with small populations such as Tinian (e.g., major emergency and specialty medical cannot be provided here but in Saipan), Health Center staff did not indicate that the facility was overburdened in any way. Some concerns were expressed about available space for treatment, but expansions are underway that should alleviate those concerns (DoN 2014).

3.15.7.3.3 Saipan

The largest hospital in the CNMI, the Commonwealth Health Center, is located on Saipan. Recent information indicates that the hospital offers inpatient and outpatient medical and surgical services, emergency care, public and mental health services, dental services, hemodialysis, electrocardiography, ultrasound, radiology, as well as other ancillary and diagnostic services (Air Force 2012). According to Health Center staff, as of 2014, there were 32 physicians employed (DoN 2014). Commonwealth Health Center management further indicated that it treats approximately 60,000 outpatient visitors (including those from Tinian) per year (DoN 2014). The Health Center indicated that the hospital is of sufficient size to accommodate existing staff and patients and has 86 beds, 76 of which are functioning (DoN 2014). In addition to the Commonwealth Health Center, there are private health, dental, and optical clinics on Saipan (Air Force 2012).
3.15.7.3.4 Pagan

No health services are provided on Pagan. Research indicated that emergency care requires evacuation by plane or helicopter to Saipan for treatment (DoN 2014).

3.15.8 Social and Community Topics

Community and social topics are a collection of activities or goals that are important to a social group or community. Changes to community and social topics are measured in terms of changes in community character and community cohesion.

Community character is the distinctive identity of a particular place that results from the interaction of many factors that give it unique or special characteristics—built form, landscape, history, people, and activities within the place as a whole (American Planning Association 2011). The topic areas of homesteads, agriculture, fishing, and hunting in particular contribute to community character in the CNMI and are detailed in the sections below.

Community or social cohesion measures the levels of “relationship between individuals, groups, and organizations within a community” (Holdsworth 2009). In a community with strong community cohesion, high levels of characteristics such as social ties, interdependence, trust, and reciprocity exist and bind people within that community together. A lack of community cohesion occurs when there are “divisions between groups, individuals, and systems” (Stone and Hughes 2002). Again, the topic areas of homesteads, agriculture, fishing, and hunting are the characteristics within the region that allow the building of relationships between individuals, groups, and organizations within the community and are thus covered in the sections below.

3.15.8.1 CNMI

3.15.8.1.1 Homesteads

The Northern Islands Village and Agricultural Homesteading Act of 2008 was passed by the CNMI legislature to:

a) Establish the Northern Islands Village and Agricultural Homesteading program for current or former residents of the Northern Islands or any qualified person interested to reside on the Northern Islands.

b) Enable residents of the Northern Islands who hold a homestead permit to borrow money to build a safe and sanitary home.

c) Initiate and promote economic development on the Northern Islands through long-term commercial leases and permanent settlements.

d) Provide the Department of Public Lands sufficient authority and flexibility to administer this act.

e) Allow the Department of Public Lands to review homestead claims on their merits.

In addition, per Article 11 Section 5 of the CNMI constitution, some portions of public lands are to be set aside for a homestead program. In concept, one gains ownership of an unowned natural resource by performing an act of original appropriation under the program. Appropriation could be enacted by putting an unowned resource to active use (as with using it to produce a product), joining it with
Eligibility requirements to receive a homestead permit, set forth in Title 2 Section 4303 of the Commonwealth Code, provide that an applicant must be of Northern Marianas descent and an applicant is eligible for a homestead permit on only one lot. Once a permit is granted, the recipient of the permit may begin to make improvements on the homestead lot. A deed of ownership of the homestead lot may be granted after a period of time if certain conditions are met, such as subdivision conditions consistent with modern planning standards (i.e., power and water utilities are present) and that a home has been built on the lot, or a minimum $10,000 investment has been made on the land.

### 3.15.8.2 Tinian

The early history of Tinian is covered in Section 3.11, *Cultural Resources*. The modern Tinian community is small and quiet with only a few stores and restaurants. Families often go to the beaches on weekends and attend barbeques. People also engage in agriculture, fishing, and hunting activities for both traditional and subsistence purposes. These agriculture, gathering, hunting, fishing, and grazing activities, when mainly conducted for a person’s own or family’s use and needs and not primarily for commercial purposes, are considered subsistence activities (U.S. Census Bureau 2014). The 2010 Census identified 103 Tinian residents over the age of 16 that participated in subsistence activities (U.S. Census Bureau 2010a). Of the 103 people that engaged in subsistence activity, 91 were elsewhere employed (part-time), 44 were unemployed, and 8 were not in the labor force.

#### 3.15.8.2.1 Agriculture

The CNMI Department of Community and Cultural Affairs indicated that agricultural products grown in the Military Lease Area include taro, sweet potatoes, and melons (DoN 2014). Other agricultural products harvested in the Military Lease Area include hot peppers, yams, and beef (DoN 2014).

*Farming.* According to Tinian and CNMI government agencies, farming is done for subsistence on Tinian; as of 2014, 29 lots in the Military Lease Area were permitted for subsistence agriculture (DoN 2014). According to staff at the Tinian Health Center, Tinian is traditionally an agricultural community, but has become less so over the past several years. The trend has been away from foods that are produced locally and towards processed food that are purchased at stores (DoN 2014).

*Ranching.* Cattle grazing has occurred on Tinian since cattle were first introduced by the Spanish in the 16th century (NMC-CREES 2013). After the Spanish-Chamorro War, for a few hundred years, feral cattle roamed across Tinian. When Tinian was transferred from Spanish to German control, the Germans preserved the herd for food and the monetary value. The Japanese administration later oversaw a decrease in the size of the herd as sugarcane fields took over the Tinian landscape. After World War II, much of Tinian was leased to Ken Jones, a businessman who expanded the herd to include 7,000 beef cows and 1,000 milk cows; during this time the Tinian herd was the primary source of beef and milk products consumed by residents of Tinian, Saipan, Guam, and other nearby islands. The modern herd provides local residents with fresh beef for regular consumption and for traditional cultural events (NMC-CREES 2013). Tinian beef cannot be sold commercially because slaughtering facilities do not meet U.S. federal standards (21 CFR §§ 601).
Gathering. According to multiple Tinian government agencies, people gather yams and hot peppers as a cultural tradition. It is often something that mothers and daughters do together (DoN 2014). The hot pepper is also the basis for the island’s largest community event—the Pika Festival. This festival has been ongoing for more than 10 years and features song and dance performances, including performances by school groups, and events such as a crab race, a hot pepper eating contest, and a pika burger eating contest (Camacho 2014). While the peppers have more of a cultural value than for subsistence purposes, Tinian government agency sources indicated that yams are consumed by gatherers and their families (DoN 2014).

3.15.8.2.2 Fishing

On April 19, 1999, the National Marine Fisheries Service officially identified the CNMI as a fishing community. The legal concept of a fishing community means “a community which is substantially dependent on, or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs” (National Oceanic and Atmospheric Administration 2012). According to multiple Tinian government agencies, fishing is a cultural and traditional activity that is passed down from father to son at an early age (DoN 2014).

According to the Tinian Department of Land and Natural Resources and the Western Pacific Fishery Management Council, Tinian fishermen typically do not sell fish to earn a profit, they do so to obtain food for themselves and their family (DoN 2014). The frequency and value of subsistence fishing on Tinian is not known, but on Saipan data indicate that 90% of the catch was consumed by fishermen, family, and friends, while about 8% was sold.

3.15.8.2.3 Hunting

According to Tinian government agencies, hunting is a cultural and traditional activity that is passed down from father to son (DoN 2014). The Tinian Department of Land and Natural Resources indicated that wildlife that are hunted include turtledoves, coconut crabs, sea crabs, as well as feral goats and chickens (DoN 2014). While the entire island could be considered a hunting ground, the majority of hunting resources are located in the unpopulated northern two-thirds of the island, in the Military Lease Area. The reason for this in part is because there are laws against firing weapons in populated, residential areas found in the south (DoN 2014). Agencies noted that the mid-west to east part of the island is prime coconut crab area, but during the coconut crab season they can be hunted anywhere on the island, and that a prime area for sea crabs is on the northeast coast within the Military Lease Area (DoN 2014).

3.15.8.3 Pagan

Throughout the early history of Pagan there has been a pattern of settlement and relocation and a continuous desire to settle the island. The early history of Pagan is discussed in Section 3.11, Cultural Resources.

There are no official residents of Pagan, though research indicates that about 100 families claim that they have personal or ancestral ties (DoN 2014). Some people that grew up on Pagan currently live on Saipan because of the 1981 eruption of Mount Pagan; others have ancestors that lived on the island or are buried there (DoN 2014). People with personal or ancestral ties consider Pagan as part of their
language and culture and they have expressed a desire to go back permanently (DoN 2014); others have indicated they want to visit their former home sites.

Since the passage of the Northern Islands Village and Agricultural Homesteading Act of 2008, no Northern Islands homesteads have been permitted or deeded (a permit would allow home construction on a homestead lot while a deed would imply actual ownership of the homestead lot). In 2013, CNMI House Bill 18-109 was enacted to simplify the homestead permit process by waiving certain eligibility requirements. Eligibility requirements notwithstanding, the Department of Public Lands indicates that while homestead permits may be issued, they cannot legally provide homestead deeds until the homestead lands have the infrastructure (i.e., water, electricity) necessary to ensure safe and sanitary living (DoN 2014).

CNMI government agencies indicate that they would need to make provisions to provide public services for any villages that would be developed on Pagan (DoN 2014). Because physical and public services infrastructure would need to be developed on the distant island, homesteading on Pagan would be very costly to the CNMI government (DoN 2014). Those who wish to re-settle Pagan indicate that they do not require publicly provided infrastructure; they can live in housing that uses sustainable techniques that make large-scale public infrastructure unnecessary (DoN 2014). However, development without public services may violate certain public safety and child protective statutes of the CNMI.

### 3.15.9 Environmental Justice and the Protection of Children

Tinian is a small island of approximately 39 square miles (101 square kilometers) in size with a little over 3,000 residents. Local residents occupy the southern one-third of the island and live generally in the villages of San Jose, Marpo, and Carolinas, with the majority in San Jose. The population is predominately of Pacific Islander and Asian decent with low numbers of other races. Approximately 30% of the Tinian population is made up of children less than 18 years of age.

Pagan does not support any permanent residents or schools (U.S. Census Bureau 2010b) for whom environmental justice and the protection of children evaluations could be made.

### 3.15.9.1 Minority Population Areas

Table 3.15-8 shows the 2010 minority population proportions for the CNMI overall and Tinian. The CNMI minority population comprised 97.9% of the total population (2.1% of CNMI population was non-minority), while the Tinian population is 98.2% minority. As defined by Council on Environmental Quality guidelines and presented in Section 3.15.1, Definition, any area where 50% or more of the population is minority, then it is considered a minority population area. Therefore, all of Tinian is considered a minority population area.
Table 3.15-8. Minority Population Areas (> 50%) by Census Tract

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Population</th>
<th>Minority Population</th>
<th>% Minority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Census Tract 9501, Rota</td>
<td>2,527</td>
<td>2,488</td>
<td>98.5%</td>
</tr>
<tr>
<td>Census Tract 1, Saipan</td>
<td>1,527</td>
<td>1,455</td>
<td>95.3%</td>
</tr>
<tr>
<td>Census Tract 2, Saipan</td>
<td>1,457</td>
<td>1,419</td>
<td>97.4%</td>
</tr>
<tr>
<td>Census Tract 3, Saipan</td>
<td>1,705</td>
<td>1,598</td>
<td>93.7%</td>
</tr>
<tr>
<td>Census Tract 4, Saipan</td>
<td>3,983</td>
<td>3,953</td>
<td>99.2%</td>
</tr>
<tr>
<td>Census Tract 5, Saipan</td>
<td>2,820</td>
<td>2,776</td>
<td>98.4%</td>
</tr>
<tr>
<td>Census Tract 6, Saipan</td>
<td>2,577</td>
<td>2,504</td>
<td>97.2%</td>
</tr>
<tr>
<td>Census Tract 7, Saipan</td>
<td>3,369</td>
<td>3,334</td>
<td>99.0%</td>
</tr>
<tr>
<td>Census Tract 8, Saipan</td>
<td>2,078</td>
<td>2,051</td>
<td>98.7%</td>
</tr>
<tr>
<td>Census Tract 9, Saipan</td>
<td>3,650</td>
<td>3,634</td>
<td>99.6%</td>
</tr>
<tr>
<td>Census Tract 10, Saipan</td>
<td>2,451</td>
<td>2,420</td>
<td>98.7%</td>
</tr>
<tr>
<td>Census Tract 11, Saipan</td>
<td>1,520</td>
<td>1,503</td>
<td>98.9%</td>
</tr>
<tr>
<td>Census Tract 12, Saipan</td>
<td>2,635</td>
<td>2,590</td>
<td>98.3%</td>
</tr>
<tr>
<td>Census Tract 13, Saipan</td>
<td>3,272</td>
<td>3,252</td>
<td>99.4%</td>
</tr>
<tr>
<td>Census Tract 14, Saipan</td>
<td>4,980</td>
<td>4,916</td>
<td>98.7%</td>
</tr>
<tr>
<td>Census Tract 15, Saipan</td>
<td>3,853</td>
<td>3,687</td>
<td>95.7%</td>
</tr>
<tr>
<td>Census Tract 16, Saipan</td>
<td>4,226</td>
<td>4,204</td>
<td>99.5%</td>
</tr>
<tr>
<td>Census Tract 17, Saipan</td>
<td>2,117</td>
<td>1,903</td>
<td>89.9%</td>
</tr>
<tr>
<td>Census Tract 9501.01, Tinian</td>
<td>1,939</td>
<td>1,904</td>
<td>98.2%</td>
</tr>
<tr>
<td>Census Tract 9502, Tinian</td>
<td>1,197</td>
<td>1,175</td>
<td>98.2%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2010a.

The Tinian population is further defined in the 2010 Census as 47% Asian, 39% Pacific Islander (of which 97% was Chamorro), and 12% two or more races.

### 3.15.9.2 Low-income Population Areas

The 2010 low-income population proportions for the CNMI overall and Tinian are presented by Census Tract on Figure 3.15-6 and in Table 3.15-9. For the CNMI overall, 52% of the population was below the poverty line in 2010. On Tinian, 43.6% of the population was below the poverty line as defined by the Bureau of Census. Therefore, the island is low income and from the perspective of Executive Order 12898, the majority of the residents of Tinian are both minority and low income.
Figure 3.15-6
Minority and Low-income Population Areas

Legend
- 2010 Census Tract Boundary
- Minority and Low-income Population Area

Source: United States Census 2010
Table 3.15-9. Low-income Population Areas (>20%) by Census Tract

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Population</th>
<th>Population Below the Poverty Line</th>
<th>% Below Poverty Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Census Tract 9501, Rota</td>
<td>2,520</td>
<td>1,118</td>
<td>44%</td>
</tr>
<tr>
<td>Census Tract 1, Saipan</td>
<td>1,522</td>
<td>712</td>
<td>47%</td>
</tr>
<tr>
<td>Census Tract 2, Saipan</td>
<td>1,456</td>
<td>770</td>
<td>53%</td>
</tr>
<tr>
<td>Census Tract 3, Saipan</td>
<td>1,696</td>
<td>696</td>
<td>41%</td>
</tr>
<tr>
<td>Census Tract 4, Saipan</td>
<td>3,967</td>
<td>2,476</td>
<td>62%</td>
</tr>
<tr>
<td>Census Tract 5, Saipan</td>
<td>2,806</td>
<td>1,535</td>
<td>55%</td>
</tr>
<tr>
<td>Census Tract 6, Saipan</td>
<td>2,416</td>
<td>1,149</td>
<td>48%</td>
</tr>
<tr>
<td>Census Tract 7, Saipan</td>
<td>3,348</td>
<td>1,901</td>
<td>57%</td>
</tr>
<tr>
<td>Census Tract 8, Saipan</td>
<td>1,944</td>
<td>1,214</td>
<td>62%</td>
</tr>
<tr>
<td>Census Tract 9, Saipan</td>
<td>3,629</td>
<td>2,313</td>
<td>64%</td>
</tr>
<tr>
<td>Census Tract 10, Saipan</td>
<td>2,440</td>
<td>1,339</td>
<td>55%</td>
</tr>
<tr>
<td>Census Tract 11, Saipan</td>
<td>1,509</td>
<td>940</td>
<td>62%</td>
</tr>
<tr>
<td>Census Tract 12, Saipan</td>
<td>2,627</td>
<td>1,784</td>
<td>68%</td>
</tr>
<tr>
<td>Census Tract 13, Saipan</td>
<td>3,254</td>
<td>1,819</td>
<td>56%</td>
</tr>
<tr>
<td>Census Tract 14, Saipan</td>
<td>4,964</td>
<td>2,398</td>
<td>48%</td>
</tr>
<tr>
<td>Census Tract 15, Saipan</td>
<td>3,815</td>
<td>1,697</td>
<td>44%</td>
</tr>
<tr>
<td>Census Tract 16, Saipan</td>
<td>4,216</td>
<td>2,013</td>
<td>48%</td>
</tr>
<tr>
<td>Census Tract 17, Saipan</td>
<td>2,111</td>
<td>683</td>
<td>32%</td>
</tr>
<tr>
<td>Census Tract 9501.01, Tinian</td>
<td>1,937</td>
<td>916</td>
<td>47%</td>
</tr>
<tr>
<td>Census Tract 9502, Tinian</td>
<td>1,189</td>
<td>448</td>
<td>38%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2010a.

3.15.9.3 Areas with High Concentration of Children

The presence of children follows closely with the overall population concentrations. Within these populated areas, certain locations such as schools, parks, and playgrounds have higher concentrations of children. Table 3.15-10 shows the percentage of children living on Tinian and the CNMI overall.

Table 3.15-10. Children in the CNMI and Tinian, 2010

<table>
<thead>
<tr>
<th>Age</th>
<th>CNMI</th>
<th>% of CNMI Population</th>
<th>Tinian</th>
<th>% of Tinian Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 5 years</td>
<td>4,827</td>
<td>9.0%</td>
<td>275</td>
<td>8.8%</td>
</tr>
<tr>
<td>5 to 9 years</td>
<td>4,613</td>
<td>8.6%</td>
<td>247</td>
<td>7.9%</td>
</tr>
<tr>
<td>10 to 14 years</td>
<td>4,921</td>
<td>9.1%</td>
<td>257</td>
<td>8.2%</td>
</tr>
<tr>
<td>15 to 17 years</td>
<td>2,788</td>
<td>5.2%</td>
<td>158</td>
<td>5.0%</td>
</tr>
<tr>
<td>Total</td>
<td>17,149</td>
<td>31.8%</td>
<td>937</td>
<td>29.9%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2010a.
Table 3.15-11 shows the percentage of children living under the poverty line on Tinian and in the CNMI overall.

<table>
<thead>
<tr>
<th>Age</th>
<th>CNMI</th>
<th>Tinian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 5 years</td>
<td>59%</td>
<td>49%</td>
</tr>
<tr>
<td>5 years</td>
<td>58%</td>
<td>48%</td>
</tr>
<tr>
<td>6 to 11 years</td>
<td>56%</td>
<td>45%</td>
</tr>
<tr>
<td>12 to 17 years</td>
<td>50%</td>
<td>36%</td>
</tr>
<tr>
<td>All Children</td>
<td>55%</td>
<td>43%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2010a.

Figure 3.15-7 shows populated areas and school locations on Tinian, as well as on Saipan and Rota for comparison purposes. The greatest concentration of schools on Tinian is located in the village of San Jose, to the southeast of the Military Lease Area and in the southwest end of Saipan.
Figure 3.15-7
Schools and Highly Populated Areas

Legend
- School Location
- Populated Area

Source: Pacific Disaster Center 2013
3.16  **HAZARDOUS MATERIALS AND WASTE**

Section 3.16 provides a summary of the general condition and character of hazardous materials, toxic substances, hazardous waste, and sites impacted by these materials (i.e., contaminated sites) within the region of influence for the proposed action and alternatives. The region of influence for hazardous materials and waste on Tinian includes the Military Lease Area, the Tinian International Airport, and areas to the north and the vicinity of Port of Tinian where the activities related to the proposed action alternatives would occur. The region of influence for hazardous materials and waste on Pagan comprises the entire island. Live-fire maneuvers would be limited to the northern portion of the island and non-live-fire maneuvers would occur on the southern portion of the island.

### 3.16.1 Definitions

The phrase “hazardous substance” is used in this document to describe any item or agent (i.e., biological, chemical, or physical) that has the potential to cause harm to humans, animals, or the environment and may include “hazardous materials,” “toxic substances,” and/or “hazardous wastes.” Additionally, sites that are environmentally affected by releases of hazardous substances are referred to as “contaminated sites.” These terms are briefly summarized below and more fully defined in Appendix R, *Hazardous Materials and Waste Technical Memo*.

#### 3.16.1.1 Hazardous Materials

The term “hazardous materials” is defined under Section 1802 of the Hazardous Materials Transportation Act as “a substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property when transported in commerce” (49 U.S. Code §§ 5101-5127).

When discussed in this document, hazardous materials currently present or that may be used as part of the proposed action include petroleum, oils, and lubricants; cleaning agents; adhesives; paints; pesticides; and other products necessary to perform essential functions. Fueling operations to support aircraft, watercraft, vehicle operations, and power generation on Tinian require the storage of bulk quantities of petroleum, oils, and lubricants. As such, these hazardous materials are stored in aboveground and underground storage tanks and distributed with pumps and pipelines. The storage areas for petroleum, oils, and lubricants represent potential sources of leaks, releases, or spills. Other types of hazardous materials (e.g., paints, pesticides, adhesives, cleaning agents) are distributed in smaller quantities in authorized containers such as drums, 5-gallon containers, and bottles.

#### 3.16.1.2 Toxic Substances

The U.S. Environmental Protection Agency defines a toxic substance as “any chemical or mixture that may be harmful to the environment and to human health if inhaled, swallowed, or absorbed through the skin.” The Toxic Substances Control Act of 1976 provides the U.S. Environmental Protection Agency with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures as well as the production, importation, use, and disposal of specific chemicals including asbestos, lead-based paint, polychlorinated biphenyls, and radon.
Descriptions of these substances are provided in Appendix R, *Hazardous Materials and Waste Technical Memo*.

### 3.16.1.3 Hazardous Waste

Hazardous wastes are defined and regulated under the under the federal Resource Conservation and Recovery Act (U.S. Environmental Protection Agency 2014). Before a material can be classified as a hazardous waste, it must first be defined as a solid waste, which can include discarded materials such as solids, liquids, and gases. Hazardous wastes may take the form of a solid, liquid, contained gas, or semi-solid. In general, any combination of wastes that poses a substantial present or potential hazard to human health or the environment that has been discarded or abandoned may be a hazardous waste. The U.S. Environmental Protection Agency defines several hazardous waste types: (1) listed wastes (wastes that the agency has determined are hazardous); (2) characteristic wastes (e.g., corrosive, ignitable, reactive, toxic wastes); (3) universal wastes (e.g., batteries, pesticides, mercury-containing equipment); and (4) mixed wastes (contains both radioactive and hazardous wastes) (U.S. Environmental Protection Agency 2014).

### 3.16.1.4 Contaminated Sites

Contaminated sites discussed as part of this EIS/OEIS are described below and include those addressed under the Defense Environmental Restoration Program and the CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality, Site Assessment and Remediation Branch. These areas were identified to have historical or current use of materials and wastes that have been recognized as hazardous. While they have not all been evaluated and confirmed to be contaminated, they are collectively referred to as contaminated sites.

#### 3.16.1.4.1 Defense Environmental Restoration Program

The Department of Defense primarily conducts environmental restoration activities in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act. The Department of Defense began cleaning up contamination in 1975. For the purposes of this EIS/OEIS, applicable environmental restoration activities include those conducted under the Installation Restoration Program, the Military Munitions Response Program, and Formerly Used Defense Sites described in the following paragraphs.

##### 3.16.1.4.1.1 Installation Restoration Program

The Installation Restoration Program focuses on cleaning up releases of hazardous substances that pose risks to the public and/or the environment at properties actively owned or used by the U.S. military.

##### 3.16.1.4.1.2 Military Munitions Response Program

The Military Munitions Response Program addresses non-operational range lands with suspected or known hazards from munitions and explosives of concern that occurred prior to September 2002, but are not already included within an Installation Response Program site cleanup activity.

The Military Munitions Rule was published as a final rule in 1997 and identifies when conventional and chemical military munitions become Resource Conservation and Recovery Act hazardous waste. Military munitions include, but are not limited to: confined gases, liquids, or solid propellants; explosives;
pyrotechnics; chemical and riot agents; and smoke canisters (U.S. Environmental Protection Agency 2008b). Under the Military Munitions Rule, wholly inert items and non-munitions training materials are not defined as military munitions (U.S. Environmental Protection Agency 1997).

The Department of Defense has historically conducted live-firing, ordnance testing, and training exercises to ensure military readiness. Decades of these munitions-related activities have resulted in the presence of unexploded ordnance, discarded military munitions, and munitions constituents. Unexploded ordnance, discarded military munitions, and munitions constituents all present potential explosive hazards and are collectively referred to as munitions and explosives of concern. In 1997, the Final Military Munitions Rule (40 CFR 266, Subpart M) was published defining munitions and explosives of concern handling requirements.

Military munitions that are used for their “intended purposes” are not considered waste per the Military Munitions Rule (40 CFR 266.202). In general, military munitions become subject to Resource Conservation and Recovery Act transportation, storage, and disposal requirements (i.e., judged not to have been used for their “intended purposes”) when:

- Transported off-range for storage,
- Reclaimed and/or treated for disposal,
- Buried or land filled on or off range, or
- Munitions land off range and are not immediately rendered safe or retrieved.

Munitions and explosives of concern are found on active, inactive, and closed military training ranges. Active ranges include areas being used on a periodic, ongoing basis for training purposes. Inactive ranges are: (1) not currently being used, (2) still are under military control and therefore may be used in the future as a military range, and (3) have not been put to a new use that is “incompatible” with range activities. Closed ranges are areas that have been taken out of service and put to a new use “incompatible” with range activities.

According to U.S. Environmental Protection Agency interpretation, the Military Munitions Rule “...applies only to the recovery, collection, and on range destruction of unexploded ordnance and munitions fragments during range clearance activities at active or inactive ranges. With regard to closed ranges, U.S. Environmental Protection Agency did not generally intend to include these range clearance activities to be within the scope...of the intended use...exception to Subtitle C of Resource Conservation and Recovery Act granted by the Military Munitions Rule...” munitions and explosives of concern located on closed ranges therefore “...would at some point become a solid waste potentially subject to the Resource Conservation and Recovery Act and also may include hazardous substances, pollutants or contaminants subject to the Comprehensive Environmental Response Conservation and Liability Act...”

In summary, munitions and explosives of concern at closed ranges are classified as solid waste and would likely be subject to Resource Conservation and Recovery Act Subtitle C hazardous waste handling and disposal requirements as well and therefore subject to regulatory oversight (U.S. Environmental Protection Agency 2005).
3.16.1.4.1.3 Formerly Used Defense Sites

This program manages environmental cleanup on eligible properties formerly owned, leased, possessed, or used by the U.S. military. The program only applies to properties that transferred from the U.S. military before 1986 (U.S. Army Corps of Engineers 2014).

3.16.2 Regulatory Framework

Hazardous substances are controlled in the U.S. primarily by laws and regulations administered by the U.S. Environmental Protection Agency, the U.S. Occupational Safety and Health Administration, and the U.S. Department of Transportation. Each agency incorporates hazardous substance controls and safeguards according to its unique Congressional mandate. U.S. Environmental Protection Agency regulations focus on the protection of human health and the environment. U.S. Occupational Safety and Health Administration regulations primarily protect employee and workplace health and safety. U.S. Department of Transportation regulations promote the safe transportation of hazardous substances used in commerce.

The CNMI oversees and administers federal environmental regulations through the CNMI Bureau of Environmental and Coastal Quality. The CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality, Hazardous and Solid Waste Management Branch regulates hazardous waste generated within the CNMI. In 1984, the CNMI Bureau of Environmental and Coastal Quality adopted the federal hazardous waste regulations under the Resource Conservation and Recovery Act and the hazardous and solid waste amendments (CNMI Bureau of Environmental and Coastal Quality 2008). The CNMI does not have hazardous waste regulations that are more stringent than U.S. Environmental Protection Agency regulations.

The CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality, Toxic Waste Management Branch protects human health and the environment through the enforcement and ongoing inspections of hazardous waste and emergency response. The CNMI Bureau of Environmental and Coastal Quality regulates hazardous and toxic materials through Title 65: Bureau of Environmental and Coastal Quality, Division of Environmental Quality, Chapter 65-50, Hazardous Waste Management Regulations.

All Department of Defense operations on Tinian are required to comply with the CNMI, as well as applicable federal and Department of Defense laws and regulations. The following federal and CNMI laws, rules, and regulations would be followed. Refer to Appendix R, Hazardous Materials and Waste Technical Memo, for a detailed description and information about hazardous materials, hazardous wastes, and toxic substances. Appendix E, Applicable Federal and Local Regulations, provides a complete listing of applicable regulations.

3.16.2.1 Federal Regulations

- Comprehensive Environmental Response, Compensation, and Liability Act
- Resource Conservation and Recovery Act
- Military Munitions Rule
- Emergency Planning and Community Right-to-Know Act
- Toxic Substances Control Act
- Oil Pollution Act
- Pollution Prevention Act
- Occupational Safety and Health Administration laws and regulations
- Department of Transportation laws and regulations, including the Transportation Safety Act
- Federal Insecticide, Fungicide, and Rodenticide Act
- Federal Environmental Pesticide Control Act
- Federal Facilities Compliance Act
- Underground Storage Tank regulations
- Ship-Borne Hazardous Substance regulations
- Executive Order 12088, Federal Compliance with Pollution Control Standards

3.16.2.2 CNMI Regulations

- Commonwealth Environmental Protection Act
- Harmful Substance Clean Up Regulations
- Hazardous Waste Management Regulations
- Used Oil Management Rules and Regulations

3.16.3 Methodology

The following sections summarize the baseline hazardous materials and waste environment as it relates to those areas on Tinian and Pagan that would be affected by the proposed action or alternatives. As the first step, historical, topographical, and geological conditions of Tinian and Pagan were reviewed to establish a baseline of conditions present at each location. For Tinian, the 1997 Environmental Baseline Survey (GMP Associates, Inc. 1997) provided the best currently available data for Tinian; however, information was updated where more recent data was available. For Pagan, a 2013 historical ordnance assessment (DoN 2013a) provided the best currently available data. As was done for Tinian, information regarding the potential presence of hazardous materials and waste on Pagan was updated where more recent data was available.

As the second step, to determine the potential impacts, individual “areas of disturbance” under the proposed action or alternatives were examined to determine whether current or historic hazardous materials conditions may have affected or have the potential to affect these areas. Factors that are considered when making these determinations include the severity and probability of the potential for the release of hazardous materials within the area of disturbance, as well as conditions that may have affected the migration of hazardous materials. The discussion is organized as follows: (1) hazardous materials, (2) toxic substances, (3) hazardous waste, and (4) contaminated sites.

3.16.4 Tinian

The following provides a historical context of activities on Tinian that potentially could contribute to the use of hazardous materials, toxic substances, hazardous wastes, and/or creation of contaminated sites. Appendix R, Hazardous Materials and Waste Technical Memo, provides greater detail on land use as it pertains to the historical use of these types of substances on Tinian.

Tinian was sparsely populated prior to Spanish missionaries coming to the Northern Mariana Islands in 1668 (see Section 3.11, Cultural Resources). The island was largely depopulated from approximately
1700 until the early 1920s. Large-scale sugar cane cultivation began on Tinian beginning around 1922 and continued until the U.S. takeover of the island in 1944. Military use of the island by the Japanese occurred during the early 1940s, ending with the Battle of Tinian in August 1944. The U.S. military continued operations on the island during the war with a peak population of approximately 150,000 service personnel in 1944. Following World War II, small-scale U.S. military activity continued through to the present time. Meanwhile, civilian agriculture, cattle ranching, and eventually tourist activities began to take place on the island and continue today.

3.16.4.1 Hazardous Materials

3.16.4.1.1 Military Lease Area

Activities in the Military Lease Area that use hazardous materials include military training activities and use of the International Broadcasting Bureau; agricultural activities associated with cattle grazing and food production; and general public use.

3.16.4.1.1.1 Military Training Activities

As part of current military training exercises, portable, aboveground 60,000-gallon (200,000-liter) bulk diesel storage containers have been temporarily staged and used at North Field. These containers are called fuel bladders and assist in offloading fuel from aircraft (DoN 2014a). To prevent accidental releases, the fuel bladders are staged on existing pavement within temporary berms with impervious liners or secondary containment (DoN 2010). Military training activities include the use of vehicles and heavy equipment which could require refueling within the Military Lease Area.

Military training activities are conducted in compliance with standard operating procedures as described in an unpublished military training manual (M. Cruz, Joint Region Marianas, personal communication, December 2014). This includes proper storage and handling of hazardous materials inside an impervious barrier and away from catch basins, storm drains, and waterways; implementing a Spill Control Plan; and having trained spill response teams. Approved cleanup equipment is used in the event of an accidental release during military fueling activities (DoN 2010). Oily waste and bilge water from amphibious vehicles are disposed at disposal facilities on Guam and/or Saipan (DoN 2010). Plans are updated and implemented as part of continuous review for ongoing training.

3.16.4.1.1.2 International Broadcasting Bureau

The International Broadcasting Bureau is located within a compound on the west side of the Military Lease Area. The facility compound has a standby power plant consisting of three diesel-fired generators, two free-standing 30,000-gallon (100,000-liter) aboveground storage tanks, and a fuel pump house. The aboveground storage tanks are surrounded by an earthen containment berm connected to an oil/water separator for the drainage from the containment berm. In fiscal year 2012, the International Broadcasting Bureau used approximately 12,000 gallons (45,000 liters) of diesel fuel to operate the standby power plant (DoN 2013b). Fuel is delivered to the aboveground storage tanks via tanker truck. No petroleum releases related to the fuel storage activities at the International Broadcasting Bureau have been reported.
3.16.4.1.1.3 Agricultural Activities

Within the Military Lease Area, there are an estimated 32 cattle ranching operations. According to the Tinian Cattlemen Association, cattle ranching activities on Tinian are organic (i.e., do not use pesticides, herbicides, or insecticides) (L. Duponcheel, Tinian Cattlemen Association, personal communication, December 6, 2013). No permanent structures (e.g., buildings, storage facilities, aboveground or underground storage tanks) are allowed as part of the lease agreements with the ranchers. Visual observations from a windshield survey of accessible portions of the cattle ranch lands did not reveal any obvious areas of hazardous material storage or releases (i.e., soil staining, dead or stressed vegetation). However, within several of the ranch lots, observations of old appliances (e.g., washing machines) and plastic or metal drums were made. These appliances and containers are reportedly used by ranchers for water catchment and as barricades. It is unknown if these items were properly decommissioned or if they contain any potential hazardous materials.

3.16.4.1.1.4 Public Use

Access to the Military Lease Area is largely unrestricted; therefore, there is the potential for unpermitted disposal of hazardous materials and unreported releases of petroleum products from vehicles using the area in association with tourism or simply passing through. Visual observations from a windshield survey of accessible portions of the Military Lease Area did not reveal any unpermitted disposal sites or obvious areas of chemical storage or releases.

3.16.4.1.2 Tinian International Airport

The existing runways and the area north of the existing runways at Tinian International Airport that would be part of the action alternatives comprises parts of the active runway, World War II-era pavement, and otherwise undeveloped land. The Tinian International Airport uses, handles, and stores hazardous materials for daily airport operations; however, due to the limited aircraft maintenance and repair capabilities available at Tinian International Airport, the amounts of these hazardous materials are limited. Common hazardous materials at Tinian International Airport include pesticides and herbicides; industrial and household cleaning products; hydraulic fluids; paints; solvents; and petroleum, oils and lubricants (Air Force 2012). Hazardous materials are stored and managed by Tinian International Airport personnel in accordance with applicable federal and CNMI regulations.

The Tinian International Airport has two aboveground diesel storage tanks: 2,000-gallons (7,600-liter) and 1,500-gallons (5,700 liters) (CNMI Bureau of Environmental and Coastal Quality, personal communication, January 30, 2014). Fueling operations at Tinian International Airport are limited to small containers (55-gallon drums) of aviation fuel brought to the island for emergency fuel needs by commuter airlines (Commonwealth Ports Authority, personal communication, December 2013). Military training also includes fueling expeditionary vehicles at Tinian International Airport on the west end of the taxi ramp, similar to the fueling operations described for North Field.

The Micronesian Development Company holds a lease for cattle grazing south of the airport (R-12). For the past 2 years Micronesian Development Company has been applying Effective Microorganism-1 as a pesticide/fertilizer. This product contains lactic acid, photosynthetic organisms, and yeast and is mixed with (drinking) alcohol. It is undetermined whether any other pesticides and herbicides are applied in this location.
3.16.4.1.3 Port of Tinian

The area in the vicinity of the Port of Tinian where the proposed action alternatives would occur includes the storage, use, and/or management of hazardous materials. A bulk fuel storage facility owned and operated by Mobil Oil is located at the port but not within the proposed footprint of the action alternatives. The plant provides Tinian with gasoline and diesel fuel, including fuel for the Commonwealth Utility Corporation power plant. Other aboveground storage tanks at the Mobil bulk fuel storage facility include a 63,000-gallon (240,000-liter) diesel tank and an approximately 30,000-gallon (100,000-liter) gasoline tank (CNMI Division of Environmental Quality, personal communication, January 30, 2014). A fuel tanker vessel delivers fuel to the tanks on a monthly basis (DoN 2014a). There is also a truck fueling facility for gasoline distribution at this facility.

An 1,167-foot (356-meter) long, single-walled, steel, aboveground pipeline delivers fuel from the Mobil bulk fuel plant to a 500,000-gallon (1,900,000-liter) aboveground diesel storage tank at the Commonwealth Utility Corporation power plant located to the northwest of the port at the corner of West Street and 6th Avenue (Figure 3.16-1). The pipeline is approximately 3 inches (8 centimeters) in diameter and has no secondary containment. No releases have been reported in association with the pipeline. The Commonwealth Utility Corporation has two 15,000-gallon (57,000-liter), two 7,000-gallon (26,500-liter), and one 2,000-gallon (7,600-liter) aboveground diesel fuel storage tanks (CNMI Division of Environmental Quality, personal communication, January 30, 2014). All tanks at this site are provided with secondary containment using concrete or concrete lined earthen berms. No releases have been reported at the power plant.

3.16.4.2 Toxic Substances

The 1997 Environmental Baseline Survey examined the environmental condition of the Military Lease Area including the presence and management toxic substances (GMP Associates, Inc. 1997). The results are summarized in the following subsections.

3.16.4.2.1 Island-wide Hazards

No radon testing has occurred on Tinian. However, radon testing on Guam resulted in a definite correlation between the type of surficial geology and radon concentrations. In almost all cases, elevated radon concentrations were found in buildings located above Barrigada and Mariana limestones but not in those located above alluvial clay deposits, beach deposits, and volcanic rocks (Burkhart et al. 1993). A large portion of the geology of Tinian consists of Mariana limestone, and therefore there is the potential for radon intrusion into structures constructed on Tinian.

3.16.4.2.2 Military Lease Area

3.16.4.2.2.1 Asbestos

The 1997 Environmental Baseline Survey noted the presence of asbestos-containing materials at Site L-5, the former Micronesian Development Company slaughterhouse (Figure 3.16-1) (GMP Associates, Inc. 1997). No other asbestos-containing materials were noted within the Military Lease Area.
Figure 3.16-1 Tinian Areas of Potential Environmental Concern And Military Munitions Response Program Sites

Sources: GMP Associates, Inc. 1997; DoN 2010d; CNMI Department of Environmental Quality 2014
The International Broadcasting Bureau facilities were constructed in four phases from 1999 through 2003 (International Broadcasting Bureau 2009). No changes that would require the use of asbestos-containing materials are known have been made to this facility since its completion in 2003. Asbestos-containing materials are not known to be present in the International Broadcasting Bureau facilities (D. Gifford, International Broadcasting Bureau, personal communication, 2013).

3.16.4.2.2.2 Lead

No evidence of lead-based paint was found in the Military Lease Area in the 1997 Environmental Baseline Survey (GMP Associates, Inc. 1997). Additionally, lead-based paint is not known to be present in the International Broadcasting Bureau facilities (D. Gifford, International Broadcasting Bureau, personal communication, 2013). The use of lead-based paint was banned in 1978; therefore, no lead-based paint has been introduced to the site since the 1997 Environmental Baseline Survey or the construction of the International Broadcasting Bureau, and the results of the survey remain valid.

3.16.4.2.2.3 Polychlorinated Biphenyls

No evidence of historical use of polychlorinated biphenyls was found in the Military Lease Area (GMP Associates, Inc. 1997). However, existing electrical power lines were documented along Broadway and extending to the Micronesian Development Company Slaughterhouse (L-5). The presence/absence of polychlorinated biphenyls in the electrical transformers was not confirmed.

The International Broadcasting Bureau obtains its electricity from the Commonwealth Utility Corporation via off-site, overhead power distribution lines connect to a ground-mounted electrical transformer located within the facility compound. The electrical transformer and other the electrical equipment in the International Broadcasting Bureau facilities are reported to be free of polychlorinated biphenyls (D. Gifford, International Broadcasting Bureau, personal communication, 2013).

3.16.4.2.3 Tinian International Airport

The existing runways and the area north of the existing runways at Tinian International Airport that would be part of the action alternatives comprises parts of the active runway, World War II-era pavement, and otherwise undeveloped land. There are no existing structures in that portion of the airport that would potentially contain asbestos-containing materials, lead-based paint, or polychlorinated biphenyls.

3.16.4.2.4 Port of Tinian

The areas of the port that would be part of the action alternatives are comprised of concrete ramps, fenced areas, and open land. There are no structures in these areas that could potentially contain asbestos-containing materials, lead-based paint, or polychlorinated biphenyls.

3.16.4.3 Hazardous Waste

3.16.4.3.1 Military Lease Area

3.16.4.3.1.1 Military Training Activities

There are no active live-fire ranges on Tinian. However, live-fire training with small arms into bullet traps that are temporarily set up occurs at various locations within the Military Lease Area. Each temporary
range is cleared of expended hazardous materials, such as lead bullet fragments, in accordance with the Mariana Islands Range Complex Management Plan (U.S. Pacific Fleet 2007). Expended materials are removed after an exercise is completed (DoN 2010) and range byproducts expended in range firing lines, stationary defensive positions, and bullet traps are collected for removal from training areas, taken back aboard ship (as appropriate), or to Guam for proper disposal. Other range byproducts, such as brass cartridges and links, would be collected from training area roadways and recycled or managed as solid waste.

Under the Military Munitions Response Program, fired munitions are considered a solid waste when they are removed from their landing spot and then managed off-range (i.e., when transported off-range and stored, reclaimed, treated, or disposed of).

3.16.4.3.1.2 International Broadcasting Bureau

The International Broadcasting Bureau generates hazardous waste mainly in the form of used oil, fluorescent light bulbs, and batteries. These wastes are stored temporarily in the facility’s hazardous waste storage area and periodically removed for proper disposal/recycling off-site (DoN 2013b).

3.16.4.3.1.3 Public Use

Access to the Military Lease Area is largely unrestricted; therefore, there is the potential for unpermitted disposal of hazardous wastes by the general public. Visual observations from a windshield survey of accessible portions of the Military Lease Area did not reveal any unpermitted waste sites or obvious areas of chemical releases.

3.16.4.3.2 Tinian International Airport

The existing runways and the area north of the existing runways at Tinian International Airport that would be part of the action alternatives comprises parts of the active runway, World War II-era pavement, and otherwise undeveloped land. There are no existing facilities or operations in this area that potentially generate hazardous waste. Access to the Tinian International Airport is restricted; therefore, disposal of hazardous wastes does not occur.

3.16.4.3.3 Port of Tinian

The areas of the port that would be part of the action alternatives are comprised of concrete ramps, fenced areas, and open land. These areas are either undeveloped or do not have activities that would generate hazardous waste.

3.16.4.4 Potential and Confirmed Contaminated Sites

Historic military activities on Tinian have resulted in adverse impacts on the area with regards to hazardous materials and wastes. An Environmental Baseline Survey conducted in 1997 identified several U.S. military sites of environmental concern on Tinian (see Figure 3.16-1). These areas were identified to have historical use of materials and wastes that have been recognized as hazardous. However, they have not all been evaluated and confirmed to be contaminated. The sites identified consisted of fuel drum sites, hazardous materials sites, and concentrated ordnance sites. While an Environmental Baseline Survey is not a comprehensive assessment of contamination, in response, the U.S. military, the U.S. Environmental Protection Agency, and the CNMI have established mitigation and cleanup activities.
under a variety of programs. These programs are summarized in Section 3.16.1.4, Contaminated Sites, and Appendix R, Hazardous Materials and Waste Technical Memo. Activities conducted at Tinian through these programs are addressed in this section.

### 3.16.4.4.1 Island-wide Sites

Activities on Tinian during World War II resulted in the potential for contaminants to be present throughout the island. According to a 1997 Environmental Baseline Survey, numerous areas of concern were identified that were the result of wartime activities and are described in detail in the following sections (GMP Associates, Inc. 1997). Island-wide hazards were also identified, including isolated ordnance, pesticide residues (i.e., dichlorodiphenyltrichloroethane or DDT), and sodium arsenate. Isolated ordnance may be encountered across Tinian as a result of historic wartime and training activities. According to the 1997 Environmental Baseline Survey, the archeological consultant documented the location of approximately 137 pieces of isolated ordnance (GMP Associates, Inc. 1997).

The 1997 Environmental Baseline Survey also documented the historical application of DDT as having occurred regularly at various locations on the island (GMP Associates, Inc. 1997). DDT was sprayed at least twice a month, but the duration of the spraying activity was not determined. Documents indicated that pesticide applications occurred at galleys, mess halls, and restroom facilities, however, the exact locations were also not determined. Subsequent testing for DDT and its byproducts in groundwater in the Marpo Municipal Well indicated that groundwater at that location had not been contaminated with DDT or its byproducts. However, further testing of soil was recommended due to the persistence of DDT in the environment.

Finally, pit latrines were used during World War II for the disposal of human waste where/when restroom facilities were not present. The holes were backfilled when capacity was reached and new holes were dug. While in use, the holes were sprayed daily with oil and sodium arsenite for sanitation purposes. Sodium arsenite is water soluble and highly toxic. The actual locations of the pit latrines were not determined; therefore, sodium arsenite is considered an island wide hazard both in soil and groundwater. Testing conducted and the Marpo Municipal Well has indicated that this substance has not contaminated the aquifer near the well site.

### 3.16.4.4.2 Military Lease Area

#### 3.16.4.4.2.1 Military Training Activities

Site E-13 (the Tinian Mortar Range; also known as the Chiget Mortar Range) identified in the 1997 Environmental Baseline Survey is being investigated under the Navy’s Military Munitions Response Program (see Figure 3.16-1) (DoN 2014b; GMP Associates, Inc. 1997). Chiget Mortar Range is located next to the Blow Hole attraction on Tinian. It occupies approximately 97.5 acres (39.5 hectares) of land.

The Tinian Mortar Range was part of the World War II battlefield and was used for military live-fire training from 1945 through 1994. During training exercises, small arms caliber munitions (i.e., up to .50 caliber), 40 millimeter rifle grenades, 60 millimeter mortars, and 81 millimeter mortars were used on the range. The range was closed in 1994. The Tinian Mortar Range is currently unused by the military and is being investigated to address hazards associated with munitions and explosives of concern and munitions constituents.
A Preliminary Assessment was completed in 2006 and noted the observation of mortar fragments, cartridge casings, unexpended grenades, and various expended munitions and munitions debris. Based on the findings of the Preliminary Assessment report, a Site Inspection to address Munitions and Explosives of Concern and Munitions Constituents at the Tinian Mortar Range was recommended and conducted from May to October 2014.

The Site Inspection confirmed the presence of metal constituents at levels exceeding 2008 Guam Environmental Protection Agency Pacific Basin Environmental Screening Levels for unrestricted land use where groundwater is a current or potential source of drinking water (DoN 2014b). Chromium and iron were the most common metals to exceed project action levels. The Site Inspection determined that munitions constituents concentrations did not exceed project action levels (DoN 2014b).

Utilizing the Munitions and Explosives of Concern and Munitions Constituents findings acquired during the Site Inspection, an explosive, chemical and health hazard evaluation was documented, and a Munitions Response Site Priority of 4 was determined based on application of the Munitions Response Site Prioritization Protocol. Munitions Response Site priorities range from 1 (highest priority) to 8 (lowest priority). A further investigation to delineate the extent and magnitude of metals contamination and to assess the potential human health and environmental risks associated with past operational practices was recommended.

### 3.16.4.4.2.2 International Broadcasting Bureau

According to the 1997 Environmental Baseline Survey, a lessee using the southwestern portion of the International Broadcasting Bureau site for cattle grazing reported finding glass bottles in the 1950s that he buried onsite (GMP Associates, Inc. 1997). The lessee stated that the bottles had a unique but unidentifiable odor. The location of the bottles was not ascertained and the bottles are assumed to still be present on the site.

### 3.16.4.4.2.3 Agricultural Activities

Historic agricultural activities on Tinian have resulted in the potential for contaminated sites within the proposed action area. An Environmental Baseline Survey conducted in 1997 identified eight sites of environmental concern within or just south of the Military Lease Area (see Figure 3.16-1) that are summarized in Table 3.16-1 and described in the following paragraphs.
Table 3.16-1. Sites of Potential Environmental Concern Associated with Agricultural Activities within the Tinian Military Lease Area

<table>
<thead>
<tr>
<th>Site</th>
<th>Description/Materials and Location</th>
<th>Activities/Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-17</td>
<td>Bio Pacific Agricultural Area/possible pesticide use west of 8th Avenue, surrounding International Broadcasting Bureau inside Military Lease Area</td>
<td>The Bio Pacific Company stored fertilizers and pesticides at a warehouse outside the Military Lease Area. The amount of fertilizers and pesticides from the warehouse that may have been applied to the agricultural land are not known; this site is considered Category 6*</td>
</tr>
<tr>
<td>E-18**</td>
<td>Micronesian Development Company Cattle Grazing Land/possible pesticide use south of North Field and west of Broadway</td>
<td>Land was used primarily for grazing cattle from 1965 through 1994. However, several chemicals including pesticides were inventoried at the Micronesian Development Company in 1990 and it is unknown whether the pesticides were used on the grazing land; therefore, this site is considered Category 6*</td>
</tr>
<tr>
<td>L-13</td>
<td>Micronesian Development Company slaughterhouse disposal site</td>
<td>Disposal of waste products from slaughterhouse. Presence of stressed vegetation documented Category 7*</td>
</tr>
<tr>
<td>R-8</td>
<td>Micronesian Development Company Dairy Plant</td>
<td>Former location of “dipping wells” for bathing cattle in a tick repellent/pesticide</td>
</tr>
<tr>
<td>R-12</td>
<td>Micronesian Development Company Cattle Grazing Land/possible pesticide use</td>
<td>Land was used primarily for grazing cattle and several chemicals including pesticides may have been used on the grazing land; therefore, this site is considered Category 7*</td>
</tr>
<tr>
<td>R-13</td>
<td>Micronesian Development Corporation pesticide disposal site, 590 feet east of Broadway and 1800 feet South of the ranch office</td>
<td>Pesticide burial took place in 1989 in an excavated trench approximately 30 feet in length and 3 feet deep. In 1994 Environmental Engineering, Inc. removed contaminated soil and treated remaining contaminated soil. This site is considered a Category 4* because all removal and remedial actions have been taken</td>
</tr>
<tr>
<td>R-14</td>
<td>Micronesian Development Company contaminated soil</td>
<td>Storage of drums containing contaminated soil excavated from site R-13 remediation activities. Category 7*</td>
</tr>
<tr>
<td>S-11**</td>
<td>Micronesian Development Company Agricultural Parcels/pesticides, southeastern portion of island</td>
<td>Most of this land is used for cattle grazing. However, it is unknown whether pesticides were used on these lands; therefore, the site is considered Category 7*</td>
</tr>
</tbody>
</table>

Legend: *Category 1: Areas where no storage or disposal of hazardous substances or petroleum has occurred.
Category 2: Areas where only storage of hazardous substances has occurred, but no release or disposal has occurred.
Category 3: Areas where storage or release of hazardous substances has occurred but at concentrations that do not require a removal or remedial response.
Category 4: Areas where storage or release of hazardous substances has occurred and all removal or remedial actions to protect human health and the environment have been taken.
Category 5: Area where storage or release of hazardous substance has occurred, and removal actions are underway, but all required remedial actions have not yet been taken.
Category 6: Area where storage or release of hazardous substances has occurred, but required actions have not yet been implemented.
Category 7: Area not evaluated or that requires additional evaluation.
The 1997 Environmental Baseline Survey identified three areas within the Military Lease Area that supported agricultural uses (GMP Associates, Inc. 1997). The first was located near the current site of the International Broadcasting Bureau and was leased by the Bio Pacific Company for approximately 10 years in the 1980s (E-17). The site was used for the experimental production of fruit trees. Numerous fertilizers, pesticides, fungicides, herbicides, and reagents were left behind when Bio Pacific Company vacated the site. The Tinian Department of Public Works removed the chemicals from the site. Because many of the chemicals are classified as hazardous materials and no application data was available, soil sampling was recommended to determine whether remedial actions are warranted. The second site was located in the eastern half of the Military Lease Area and may have been used by the Micronesian Development Company for cattle grazing under a 30-year lease between 1965 and 1994 (E-18). Several pesticides and herbicides were inventoried in association with this site but it is unknown whether any were applied. The Micronesian Development Company also held a lease just south of the Military Lease Area on the western coast of Tinian (S-11) that also may have been subject to pesticide/herbicide application. The third site is the Micronesian Development Company disposed of waste from their slaughterhouse at a site located east of Broadway at the end of 96th Street just south of the Military Lease Area. This site was also used for aircraft disposal during World War II (see L-13 depicted in Figure 3.16-1).

A dairy plant operated from 1973 through 1982 or 1983, near the current Micronesian Development Corporation ranch office along Broadway (R-8) just south of the Military Lease Area boundary. Near the dairy were “dipping wells” for bathing cattle in a tick repellent/pesticide. This site is considered a Category 7 (see description of Categories under Table 3.16-1) because it was not surveyed during the 1997 Environmental Baseline Survey and more information is needed about the dairy operation.

The Micronesian Development Corporation leased an area just south of the Military Lease Area for cattle grazing (R-12). Pesticide and fertilizer applications are suspected to have occurred in this area. Additionally, the Micronesian Development Corporation established a pesticide disposal site, 590 feet (180 meters) east of Broadway and 1,800 feet (550 meters) south of the ranch office (R-13) near the Military Lease Area boundary. Pesticide burial took place in 1989 in an excavated trench approximately 30 feet (9 meters) in length and 3 feet (1 meter) deep. In 1994 Environmental Engineering, Inc. removed contaminated soil and treated remaining contaminated soil. The CNMI Bureau of Environmental and Coastal Quality indicates that five barrels of contaminated materials from site R-13 are stored at the Micronesian Development Corporation ranch office warehouse, East of Broadway and just North of the pesticide disposal site (R-14) and are awaiting approval from U.S. Environmental Protection Agency to ship the barrels off-island (GMP Associates, Inc. 1997).

### 3.16.4.4.2.4 World War II Activities

Former activities by both the United States and Japanese militaries during World War II have the potential to affect site conditions in the Military Lease Area. These sites were identified in the 1997 Environmental Baseline Survey (GMP Associates, Inc. 1997). Twenty-three fuel storage facilities, ordnance sites, and disposal sites used during World War II are located on in the Military Lease Area and have the potential to have affected site conditions. These sites are summarized in Table 3.16-2 and depicted in Figure 3.16-1.
<table>
<thead>
<tr>
<th>Site</th>
<th>Description/Materials and Location</th>
<th>Activities/Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-1</td>
<td>12 World War II Aviation Fuel Storage Tanks/ordnance east of 8&lt;sup&gt;th&lt;/sup&gt; Avenue, south of the traffic circle at the intersection of 8&lt;sup&gt;th&lt;/sup&gt; Avenue and 125&lt;sup&gt;th&lt;/sup&gt; Street</td>
<td>Some, but not all of the fuel tanks were removed as scrap metal following World War II. Small munitions may also remain at this site; this site is considered Category 5*</td>
</tr>
<tr>
<td>E-2</td>
<td>19 World War II Aviation Fuel Storage Tanks/ordnance east side of Broadway, south of the traffic circle at the intersection of Broadway and 116&lt;sup&gt;th&lt;/sup&gt; Street</td>
<td>Some, but not all of the fuel tanks were removed as scrap metal following World War II. Small munitions may also remain at this site; this site is considered Category 5*</td>
</tr>
<tr>
<td>E-5</td>
<td>World War II Japanese Fuel Bunker/petroleum products, end of a shallow gorge in the northwestern corner of North Field</td>
<td>The fuel bunker was bombed or burned during the war and unburned fuel likely leaked from containers. No subsequent cleanup took place; this site is considered Category 6*</td>
</tr>
<tr>
<td>E-6</td>
<td>World War II Asphalt Plant/asphalt east of 8&lt;sup&gt;th&lt;/sup&gt; Avenue, between 110&lt;sup&gt;th&lt;/sup&gt; and 125&lt;sup&gt;th&lt;/sup&gt; Streets</td>
<td>Due to asphalt on the ground and metal equipment at the site, this site is considered Category 6*</td>
</tr>
<tr>
<td>E-8</td>
<td>World War II Mine Assembly Buildings/ordnance east of Broadway</td>
<td>Historical maps showed a cluster of mine assembly buildings that were not found during the 1997 Environmental Baseline Survey; this site is considered Category 7*</td>
</tr>
<tr>
<td>E-11</td>
<td>World War II Lube Oil Storage and Dumping Unit/petroleum products west of the traffic circle at northern end of Broadway</td>
<td>A historical map showed a lube oil storage and dumping unit at the location indicated. No further information was available and the site was not surveyed during the 1997 Environmental Baseline Survey; this site is considered Category 7*</td>
</tr>
<tr>
<td>E-12</td>
<td>World War II Central Bomb Dump/ordnance south of North Field</td>
<td>Historical records show that this facility had storage capacity for 10,000 tons of high explosive bombs and 15,000 tons of incendiary bombs. However, it is reported that there are no areas on Tinian with concentrated munitions, so most of the munitions may have been removed from this location. Because complete removal cannot be confirmed, this site is considered Category 5*</td>
</tr>
<tr>
<td>E-14</td>
<td>Caves Below Mount Lasso/ordnance caves along the cliffs below the east side of Mount Lasso used as Japanese defensive positions in World War II</td>
<td>According to archeological records, multiple munitions were found at Japanese positions along cliffs. However, no munitions were found in the Mount Lasso cliff caves during the 1997 Environmental Baseline Survey. A more thorough survey is needed to be sure that no munitions are present; this site is considered Category 7*</td>
</tr>
<tr>
<td>E-15</td>
<td>World War II Army Hospital/unknown, 110&lt;sup&gt;th&lt;/sup&gt; Street east of 8&lt;sup&gt;th&lt;/sup&gt; Avenue</td>
<td>A historical map indicated the presence of an Army Hospital at this location. No further information was found, and the site was not analyzed under the 1997 Environmental Baseline Survey; the site is considered Category 7*</td>
</tr>
<tr>
<td>E-20</td>
<td>Coke Dump Site</td>
<td>This is an ocean dump site located between Earle Point and Hilo Point. The site was used for the wholesale dumping of vehicles, tools, equipment and trash at the end of World War II</td>
</tr>
</tbody>
</table>
Table 3.16-2. Sites of Potential Environmental Concern Associated with World War II Activities within the Tinian Military Lease Area

<table>
<thead>
<tr>
<th>Site</th>
<th>Description/Materials and Location</th>
<th>Activities/Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-21</td>
<td>Trash Dump Site</td>
<td>This World War II trash dumping site is located along the coast between Unai Chulus and Unai Babui. The trash dump consisted of a ramp that was used to dump small garbage into the ocean. No information regarding the exact type of trash was obtained.</td>
</tr>
<tr>
<td>E-22***</td>
<td>World War II Trash Dump Site/garbage east of 8th Avenue and International Broadcasting Bureau</td>
<td>A historical map identified a World War II trash dump. The site is considered Category 7* because it was not assessed during the 1997 Environmental Baseline Survey.</td>
</tr>
<tr>
<td>E-23</td>
<td>World War II Scrap Metal Dump Site/ordnance on northeastern coast, south of Asiga Point</td>
<td>Scrap metal, bullets, and other evidence of ammunition were found during the 1997 Environmental Baseline Survey. This site is considered Category 6*.</td>
</tr>
<tr>
<td>E-25**</td>
<td>World War II Scrap Metal Dump Site/ordnance west of 8th Avenue, within Site E-17 described above</td>
<td>This site was identified from a historical map that indicated it contained scrap metal and possibly bombs. The site was not viewed during the 1997 Environmental Baseline Survey; therefore, the site is considered Category 7*.</td>
</tr>
<tr>
<td>E-26</td>
<td>World War II Scrap Metal Dump Site/ordnance and petroleum products east of 8th Avenue and International Broadcasting Bureau south of Site E-22</td>
<td>Fuel containers, bombs, and bomb casings possibly remain at this site after partial removal; therefore, the site is considered Category 5*.</td>
</tr>
<tr>
<td>E-29</td>
<td>World War II Japanese Air Traffic Control Building/unidentified stain on floor, northern boundary of North Field</td>
<td>Stain on floor was not investigated during the 1997 Environmental Baseline Survey. Therefore, the site is considered Category 7*.</td>
</tr>
<tr>
<td>L-1</td>
<td>World War II Fuel Storage Tanks/ordnance, east of Broadway and northeast of the eastern end of the Tinian International Airport Runway</td>
<td>Rusted fuel tanks were noted during the 1997 Environmental Baseline Survey and historical evidence suggests munitions may remain; this site is considered Category 5*.</td>
</tr>
<tr>
<td>L-2</td>
<td>World War II Fuel Storage Tanks/ordnance, west of Broadway across 96th Street</td>
<td>Fuel tanks were removed after World War II, but historical evidence suggests munitions may remain; this site is considered Category 5*.</td>
</tr>
<tr>
<td>L-5</td>
<td>Former World War II Japanese Communication Building now Micronesian Development Company Slaughterhouse/potential asbestos and petroleum, northeastern corner of Broadway and 96th Street</td>
<td>Due to broken, suspected friable asbestos corrugated sheeting, World War II aboveground storage tanks, and a 55-gallon container with unknown contents, the site is considered Category 7*.</td>
</tr>
<tr>
<td>L-8</td>
<td>Masalog Bomb Dump/ordnance, eastern portion of the island, inland from Unai Masalok</td>
<td>This site historically had 469 compartments for bomb storage and could accommodate 18,800 tons of high explosive bombs. All of the historic munitions may not have been removed, so this site is considered Category 5*.</td>
</tr>
<tr>
<td>L-12</td>
<td>World War II Scrap Metal Dump Site/petroleum products and ordnance, west of 8th Avenue between 96th and 86th Streets</td>
<td>Historical records indicated that scrap metal, bombs, fuel, and grease from World War II may not all have been removed. The site was not viewed during the 1997 Environmental Baseline Survey; therefore, the site is considered to be Category 5*.</td>
</tr>
</tbody>
</table>
Table 3.16-2. Sites of Potential Environmental Concern Associated with World War II Activities within the Tinian Military Lease Area

<table>
<thead>
<tr>
<th>Site</th>
<th>Description/Materials and Location</th>
<th>Activities/Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-13***</td>
<td>West Field “Boneyard”</td>
<td>World War II aircraft junkyard. The site is assigned Category 7*</td>
</tr>
<tr>
<td>R-1</td>
<td>World War II Fuel Tank Farm located east of 8th Avenue south of the airport. Possible presence of ordnance</td>
<td>Undetermined whether all fuel tanks were removed after World War II. Historical evidence suggests munitions may remain; this site is considered Category 5*</td>
</tr>
</tbody>
</table>

Legend: *Category 1: Areas where no storage or disposal of hazardous substances or petroleum has occurred.<br>Category 2: Areas where only storage of hazardous substances has occurred, but no release or disposal has occurred.<br>Category 3: Areas where storage or release of hazardous substances has occurred but at concentrations that do not require a removal or remedial response.<br>Category 4: Areas where storage or release of hazardous substances has occurred and all removal or remedial actions to protect human health and the environment have been taken.<br>Category 5: Area where storage or release of hazardous substance has occurred, and removal actions are underway, but all required remedial actions have not yet been taken.<br>Category 6: Area where storage or release of hazardous substances has occurred, but required actions have not yet been implemented.<br>Category 7: Area not evaluated or that requires additional evaluation.


3.16.4.4.2.5 Masalog Ridge Area Site

The Masalog Ridge Area Site encompasses approximately 292 acres (118 hectares) and is part of an ordnance storage depot located in what is known as the Masalog Ridge Area. The site is located along Masalok Beach Road near Masalog Point along the eastern coast of Tinian and is partially within the Military Lease Area. The U.S. military used the site immediately following the capture of the Mariana Islands in World War II to stage ordnance for aircraft, especially B-29 Bombers for the invasion of Japan. The ordnance storage area was extensive, consisting of over a hundred open revetments with unknown quantity of ordnance stored over a large area.

The unexploded ordnance contamination occurred after World War II, during the Trust Territory of the Pacific Islands government (which was administered by the U.S. government), prior to the CNMI acquiring the property. The property was returned from the Trust Territory government when the CNMI government was created in 1976. The property is currently owned by the Department of Public Lands, which is in charge of managing public properties in the CNMI and is under the Executive Branch of the CNMI government.

Unexploded ordnance and the potential for other explosive components currently present a significant health hazard to general public at this site. The site has remained idled and undeveloped since after its use as an ordnance storage depot (CNMI Division of Environmental Quality 2014).

The CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality, Site Assessment and Remediation branch had completed and submitted U.S. Environmental Protection Agency Eligibility Determination Checklist on July 28, 2013, which was approved by U.S. Environmental Protection Agency on August 16, 2013, as a Brownfields site. A Phase 1 Environmental Site Assessment was scheduled to occur in 2014 and a Phase II Environmental Site Assessment is scheduled to occur in 2015 (CNMI Division of Environmental Quality 2014).
3.16.4.4.3 Tinian International Airport

The existing runways and the area north of the existing runways at Tinian International Airport that would be part of the action alternatives comprises parts of the active runway, World War II-era pavement, and otherwise undeveloped land. A World War II-era asphalt plant located at end of Riverside Drive was identified in the vicinity of the Tinian International Airport by the 1997 Environmental Baseline Survey (see L-6 depicted in Figure 3.16-1). Due to containers of asphalt, spilled asphalt at the plant site and on Riverside Drive, plant equipment, and scrap metal, this site is considered Category 6 (see description of Categories under Table 3.16-3) and is being addressed under the Defense Environmental Restoration Program for Formerly Used Defense Sites (GMP Associates, Inc. 1997).

3.16.4.4.3.1 Tinian Asphalt Drum Dump Site

A Defense Environmental Restoration Program for Formerly Used Defense Sites site, known as the “Tinian Asphalt Drum Dump Site” at Puntan Diaplo, has been identified at the western end of the runway at Tinian International Airport. Few details regarding the extent of possible contamination at this dump site are available; however, this site is believed to have resulted from military activities during the World War II era (Air Force 2012). This site is also identified as site L-6 in the 1997 Environmental Baseline Survey Report and shown in Figure 3.16-1. The 1997 report documented remnants of asphalt plant equipment, drums, and scrap metal at the site (GMP Associates, Inc. 1997).

3.16.4.4.3.2 Surplus Area – West Field

According to the U.S. Army Corps of Engineers, the Surplus Area-West Field site is suspected to contain containerized and non-containerized hazardous or toxic waste (U.S. Army Corps of Engineers 2012) and a soil removal action is recommended. Few details regarding the possible contamination at this site are available; however, this site is believed to be located in the vicinity of the Tinian International Airport and was deemed ineligible for remediation under the Formerly Used Defense Sites program (U.S. Army Corps of Engineers, personal communication, December 5, 2014).

3.16.4.4.4 Port of Tinian

In 1992, approximately 10,000 gallons (38,000 liters) of unleaded fuel were released at the Mobil bulk fuel storage facility (located in the vicinity of the proposed port improvements) as a result of tank bottom failure. Contamination of soils and groundwater was confirmed and remediation using a combination of in situ air sparging, free product recovery, and air stripping was implemented with quarterly groundwater monitoring.

3.16.4.4.5 Supply Route

Table 3.16-3 lists sites of environmental concerns that were identified by the 1997 Environmental Baseline Survey in the vicinity of the proposed supply route on Tinian (see Figure 3.16-1).
Table 3.16.3. Sites of Potential Environmental Concern within the Tinian Military Lease Area

<table>
<thead>
<tr>
<th>Site</th>
<th>Description/Materials and Location</th>
<th>Activities/Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-1</td>
<td>World War II Fuel Tank Farm (located east of 8th Avenue south of the airport. Possible presence of ordinance)</td>
<td>Undetermined whether all fuel tanks were removed after World War II. Historical evidence suggests munitions may remain; this site is considered Category 5*</td>
</tr>
<tr>
<td>R-6</td>
<td>Tinian Solid Waste Facility</td>
<td>Unrestricted dumping of municipal, hospital and military waste in unlined disposal site. No monitoring daily cover, compaction or established boundaries. Category 6*</td>
</tr>
<tr>
<td>R-15</td>
<td>Bio Pacific Lease Area</td>
<td>Area was used during the 1980s for the experimental cultivation of sugar cane. Several chemicals including pesticides may have been used on the grazing land; therefore, this site is considered Category 6*</td>
</tr>
<tr>
<td>L-4</td>
<td>Tinian International Airport/post- World War II-era petroleum, oil, and lubricant products</td>
<td>The airport has a 1,500-gallon (5,700 liters) aboveground diesel storage tank inside a concrete containment berm and a 2,000-gallon (7,600-liter) aboveground diesel storage tank. Minor leaks of hydraulic fluid were probable, but at concentrations that do not require a removal or remedial response. Therefore, this site is considered Category 3*</td>
</tr>
<tr>
<td>L-6</td>
<td>World War II Asphalt Plant/asphalt, end of Riverside Drive</td>
<td>Due to containers of asphalt, spilled asphalt at the plant site and on Riverside Drive, plant equipment, and scrap metal, this site is considered Category 6*</td>
</tr>
<tr>
<td>L-7</td>
<td>World War II-era Service Aprons and Engineering Areas/petroleum, oil, and lubricant products, north of Tinian International Airport</td>
<td>Occasional small spills of petroleum products were likely, but at concentrations that do not require a removal or remedial response. Therefore, this site is considered Category 3*</td>
</tr>
</tbody>
</table>

Legend: *Category 1: Areas where no storage or disposal of hazardous substances or petroleum has occurred. Category 2: Areas where only storage of hazardous substances has occurred, but no release or disposal has occurred. Category 3: Areas where storage or release of hazardous substances has occurred but at concentrations that do not require a removal or remedial response. Category 4: Areas where storage or release of hazardous substances has occurred and all removal or remedial actions to protect human health and the environment have been taken. Category 5: Area where storage or release of hazardous substance has occurred, and removal actions are underway, but all required remedial actions have not yet been taken. Category 6: Area where storage or release of hazardous substances has occurred, but required actions have not yet been implemented. Category 7: Area not evaluated or that requires additional evaluation.


3.16.4.4.5.1 Tinian Solid Waste Facility

Solid waste on Tinian is currently transported by residents and business entities to an open disposal site west of 8th Avenue and south of the Tinian International Airport. This site is unlined and does not comply with Resource Conservation and Recovery Act Subtitle D regulations governing landfills. The CNMI Department of Public Works is required to maintain the existing Tinian Solid Waste Facility in accordance with an Administrative Order issued by the CNMI Division of Environmental Quality, which requires the application of daily cover material and prohibits burning wastes, among other operational requirements. The Administrative Order was issued in 2010 as a cease-and-desist action serving to document the findings of violations of the CNMI solid waste regulations (DoN 2014).
3.16.5  Pagan

Land uses on Pagan have varied historically from being largely uninhabited until the early 1920s, to predominant agricultural use throughout the 1920s and 1930s, and then to predominant military use during World War II. Following World War II, small-scale U.S. military activity remained until the 1950s at which point small scale agricultural use resumed. The remaining 53 residents were evacuated from Pagan due to the large-scale eruption of Mount Pagan in 1981. This eruption covered half of the runway and destroyed much of Shomushon. Many of the structures were covered by ash (over 3 feet [1 meter] thickness) and lava (over 30 feet [9 meters] thickness). Any existing hazardous materials, hazardous wastes or expended military munitions may have been covered/destroyed. Since that time the island has not been resettled or used for industrial or agricultural purposes. This type of information provides a historical context from which to evaluate the use of hazardous substances over time on the island. A detailed summary of the land uses on Pagan as it pertains to the historical use of hazardous substances can be found in Appendix R, Hazardous Materials and Waste Technical Memo.

3.16.5.1  Hazardous Materials

Currently, Pagan is uninhabited, and therefore no hazardous materials are used on the island. Ongoing land uses on Pagan are limited to visitor encampments and ecotourism trips. Hazardous materials associated with these uses would be limited to small volumes of fuel for vehicles and cooking. These materials would likely be consumed or brought back to their point of origin and would not be stored or disposed of on Pagan.

3.16.5.2  Toxic Substances

Historic land uses have left remnants of equipment, structures, and buildings on Pagan that have the potential to contain toxic substances such as asbestos-containing materials, lead-based paint, and polychlorinated biphenyls.

All units and surficial deposits of Mount Pagan, where known, are composed of either basalt or basaltic andesite or a combination of the two (U.S. Geological Survey 2006). Basalt has relatively little uranium and is unlikely to generate high radon levels (Brill et. al. 1994).

3.16.5.3  Hazardous Waste

Currently, Pagan is uninhabited and, therefore, no hazardous wastes are generated on the island. Ongoing land uses on Pagan are limited to visitor encampments and ecotourism trips. These uses are not likely to result in the generation of hazardous wastes.

3.16.5.4  Potentially and Confirmed Contaminated Sites

United States and Japanese military activities during World War II potentially resulted in the presence of hazardous substance contamination and/or munitions and explosives of concern on Pagan. Based on review of historical documentation, the Final Historical Ordnance Assessment Study, Pagan, Commonwealth of the Northern Mariana Islands (DoN 2013a) estimated a determination of areas on Pagan with moderate to high or low probability of munitions and explosives of concern and munitions potentially presenting an explosive hazard presence based on the historical locations of Japanese
defense positions. See Figure 3.16-2 for a map showing the probability of munitions and unexploded ordnance of concern on Pagan.

Historic uses on the island include residential, agricultural, and military operations that may have utilized hazardous materials. The storage and disposal of hazardous materials on Pagan was not determined, therefore, traces of these materials may still be present on the island.

Other potentially contaminated sites include the historical Japanese Imperial Army infrastructure at the former Japanese airfield and in the foothills of Mount Pagan, including an aircraft hangar, bunkers, gun placements, fuel dumps, a mining camp, and a pier on Shomshon Bay.

Table 3.16-4 lists potential historical hazardous waste sites and munitions and explosives of concern areas at on Pagan (DoN 2013a).

<table>
<thead>
<tr>
<th>Site</th>
<th>Description/Materials and Location</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Former Japanese Airfield and Surrounding Area</td>
<td>Potential unexploded ordnance and potential munitions constituents in soils from World War II munitions storage and aerial bombardment of primary military targets on and surrounding the airfield. World War II activities could also include potential storage and use of petroleum, oils, and lubricants, and petroleum residues that may be present in soils.</td>
<td>According to the Final Historical Ordnance Assessment Study Pagan, Commonwealth of the Northern Mariana Islands (DoN 2013a) the area around the airfield and support facilities is considered to have a moderate to high level of probability of munitions and explosives of concern presence, requiring “On-call” unexploded ordnance contractor support.</td>
</tr>
<tr>
<td>Foothills of Mount Pagan</td>
<td>Potential unexploded ordnance and potential munitions constituents in soils from World War II aerial bombardment of non-military targets during air raids.</td>
<td>According to the Final Historical Ordnance Assessment Study Pagan, Commonwealth of the Northern Mariana Islands (DoN 2013a) non-military positions were also bombed and are considered to have a moderate to high level of probability of munitions and explosives of concern presence, requiring “On-call” unexploded ordnance contractor support.</td>
</tr>
</tbody>
</table>

Source: DoN 2013a.
Figure 3.16-2
Probable Munitions Presence Locations

Legend
- Japanese Defensive Positions (1944)

Determination of the Probability of Munitions Presence
- Moderate to High
- Low

Note: The 1981 eruption may have significantly reduced potential munitions locations due to lava and ash deposition.

Source: DoN 2013c
3.17 PUBLIC HEALTH AND SAFETY

Section 3.17 describes the existing public health and safety issues on Tinian and Pagan. Public health and safety refers to the health and well-being of the general public living on or visiting the region of influence. The region of influence includes the airspace, land areas, and marine waters (sea space) of Tinian and Pagan. The evaluation of health and safety in this EIS/OEIS addresses issues related to the capacity of emergency response organizations (i.e., police, fire, medical) to respond to emergency as needed in the region of influence is provided in Section 3.15, Socioeconomics and Environmental Justice.

3.17.1 Definition

Health and safety issues addressed in this EIS/OEIS include: risks of public exposure to military operations, and local/regional emergency response matters. Risks related to military operations may be related to flight safety, ground training munitions-related hazards, energy hazards, and marine safety. Flight safety issues may include potential accidents resulting from mid-air collisions, collisions with manmade structures or terrain, weather-related accidents, mechanical failure, pilot error, or wildlife-aircraft collisions. Ground safety issues may be related to vehicle and maneuvers, munitions use, range maintenance activities, traffic safety, and other military activities. Energy hazards may include human exposure to electromagnetic frequencies and lasers as well as hazards that electromagnetic radiation may present to storage and use of munitions. Marine safety issues may include potential accidents resulting from vessel collisions with other vessels or wildlife, vessels running aground, munitions danger zones over the water, and other military activities.

3.17.2 Regulatory Framework

The information presented in this section focuses on the health and safety of the general public. The health and safety of military personnel is not addressed in this EIS/OEIS. Military personnel would follow health and safety requirements as outlined by Department of Defense regulations in order to minimize the risk to their health and safety.

The Marine Corps Safety Program (DoN 2011a) governs Marine Corps policies, responsibilities, and procedures to protect and preserve Marine Corps personnel and property against accidental injury or loss of life. Other U.S. military services (i.e., the Navy, Army, and Air Force) have similar safety programs that apply to their operations and would be followed when undertaking their operations. Federal and CNMI laws, rules, and regulations that are applicable to protecting public health and safety are detailed in Appendix E, Applicable Federal and Local Regulations. Marine Corps policies include:

- The Marine Corps practices Operational Risk Management as specified in Office of the Chief of Naval Operations Instruction 3500.39C (DoN 2010a)
- Marine Corps Order 3500.27B (DoN 2011b)
Safety risks to construction personnel are addressed under 29 CFR 1910 et seq., *Occupational Health and Safety Standards*. Due to adherence to these regulations, health and safety of construction personnel is not addressed further in this EIS/OEIS.

### 3.17.3 Methodology

Existing procedures for ensuring public health and safety associated with military training activities were derived from U.S. military standard operating procedures related to the use of specific training areas, ranges, and facilities within the region (Guam and the CNMI). These standard operating procedures are applicable to military units of all Services (personal communication with Mark Cruz, Joint Region Marianas). Historical ordnance assessments conducted provide a general assessment for the probability of encountering unexploded ordnance and historically discarded munitions on Tinian and Pagan (DoN 2010b, 2013a).

### 3.17.4 Tinian

As summarized in Chapter 1, *Introduction*, Section 1.4, since 1983, the U.S. government has leased approximately two-thirds of the island (i.e., the Military Lease Area) *(Figure 3.17-1)*. There are no homes within the Military Lease Area. The Military Lease Area is unfenced except for a formerly used unexploded ordnance area known as the Tinian Mortar Range (described in *Section 3.17.4.2.3, Unexploded Ordnance and Historically Discarded Military Munitions*), fences associated with cattle ranging operations, and perimeter fencing around the International Broadcasting Bureau.

#### 3.17.4.1 Aircraft Operations

Civilian and military airspace and air transportation facilities are described in Section 3.6, *Airspace*, and 3.13, *Transportation*, respectively.

##### 3.17.4.1.1 Civilian Activities

There are no control towers for aircraft on Tinian. Coordination of flight and ground taxi is accomplished through the Saipan control tower and via a common traffic advisory frequency. Aircrews use the common frequency to deconflict their arrivals and departures, providing location and intent to other aircraft in the vicinity. This procedure is applicable to both civilian and military air traffic. Airport lighting and aircraft rescue and firefighting capabilities are available at Tinian International Airport during field operating hours. Aircraft refueling services are not normally available at Tinian International Airport (Federal Aviation Administration 2014).
Figure 3.17-1
Tinian Military Lease Area
Tinian International Airport has two Runway Protection Zones, one at either end of the runway, which are to be kept clear of all above-ground objects and all facilities supporting incompatible activities. Runway Protection Zones are established to enhance the protection of people and property on the ground under the flight approach zones. This is best achieved through airport owner control over Runway Protection Zones. Control is preferably exercised through the acquisition of sufficient property interest in the Runway Protection Zones and includes clearing Runway Protection Zones areas (and maintaining them clear) of incompatible objects and activities. The Tinian Runway Protection Zones are trapezoidal in shape and centered about the extended runway centerline, at both ends. At 2,700 feet (820 meters) from the runway edge, the Runway Protection Zones width is 1,750 feet (530 meters), and then narrows toward the runway edge (Federal Aviation Administration 1999, 2012).

3.17.4.1.2 Military Activities

Military aircrews currently use both the Tinian International Airport and Tinian’s North Field for training. Recent exercises have centered on fixed-wing aircraft arrested landings and refueling at the Tinian International Airport and expeditionary landing and take-off operations by cargo aircraft at North Field. Other military activities include humanitarian assistance/disaster relief practice, off-loading of cargo, and helicopter night vision landings using North Field as a landing zone. Aircraft-delivery of munitions does not occur.

At its aviation facilities, the Department of Defense normally establishes Accident Potential Zones, which depict areas with a significant or measurable potential (not the probability) for accidents. Tinian International Airport does not have any associated Accident Potential Zone.

Military air operations within the local Tinian airspace are conducted under Federal Aviation Administration visual flight rules, which specify certain flight altitudes based on direction of flight. Military and civilian activities are deconflicted based primarily on a see-and-avoid concept, and the use of a common frequency for local situational awareness. Air traffic control personnel at the Saipan tower provide additional information as requested. The U.S. military standard operating procedures specify aircraft training flight restrictions over certain areas within the Military Lease Area associated with bird habitat. There is currently no Special Use Airspace for Tinian.

3.17.4.1.3 Aircraft-related Accidents

The Federal Aviation Administration has recorded three safety-related incidents at Tinian International Airport over the past 10 years (Federal Aviation Administration n.d.-a). All involved small, single engine air taxi/commuter aircraft and were related to taxi or take-off from the airport. In July 2004, an aircraft experienced a landing gear bolt failure on landing, with minor aircraft damage. The flight incident report indicates no personal injury. In May 2012, an aircraft lost power on initial take-off and sustained minor damage. The flight incident report indicates no personal injury. Personal accounts from passengers on this flight indicate they sustained various injuries (De Guzman 2012). In October 2013, an aircraft sustained substantial damage when it struck a raised concrete berm after failing to maintain its position on the taxiway. The flight incident report indicates no personal injury.

Recent aircraft incidents occurring on Tinian (but not at Tinian International Airport) include a fatal crash near Mount Lasso on the northern portion of Tinian, at night. In October 2013, an air taxi aircraft that had departed from Tinian International Airport en route to Saipan International Airport crashed, there
were three survivors and four fatalities (Guerrero 2013). In November 2012, an air taxi aircraft departing Saipan International Airport bound for Tinian International Airport was substantially damaged when it crashed at the Saipan Airport. There was one fatality, five individuals seriously injured, and one sustaining minor injury (National Transportation Safety Board 2012; Flight Safety Foundation 2012).

There have been two reported bird strike incidents, occurring during take-off and climb-out from Tinian International Airport. Both were air taxi aircraft and neither sustained serious damage (Federal Aviation Administration n.d.-b). A Wildlife Hazard Assessment was completed for Tinian International Airport (U.S. Department of Agriculture 2008) that recommended a Wildlife Hazard Management Plan be developed. A Bird Aircraft Strike Hazard Plan, implemented on Department of Defense installations used to help prevent or reduce bird strikes by aircraft) does not exist for Tinian International Airport.

3.17.4.2 Ground Operations

3.17.4.2.1 Civilian Activities

As described in Section 3.15, Socioeconomics and Environmental Justice, the Tinian Department of Public Safety indicated that, as of February 2014, they were staffed by 17 police officers (a ratio of 6 officers for every 1,000 residents) and 11 firefighters (a ratio of 3.8 firefighters per 1,000 residents) (CNMI Department of Public Safety 2013a). The condition of the Department of Public Safety’s building was noted as fair and able to accommodate current personnel and operations (DoN 2014). In 2013, 86 criminal offenses were recorded in San Jose; there were 30 thefts or burglaries, 15 incidences of disturbing the peace, and 15 assaults (CNMI Department of Public Safety 2013b). Descriptions of the police divisions, fire divisions, and health services are presented in Section 3.15, Socioeconomics and Environmental Justice.

As described in Section 3.13, Transportation, ground transportation facilities on Tinian include the existing road network (primarily developed in 1944 to accommodate the U.S. military), with limited designated bicycle paths, and isolated sidewalks along roads within San Jose. Many of the existing roads throughout Tinian are in poor condition.

The Commonwealth Department of Public Safety, Highways Safety Office develops, coordinates, and promotes safety programs and provides policy and public awareness on highway safety. Highway safety, in general terms, includes the following initiatives: reduction of traffic crashes, impaired driving traffic-related injuries and fatalities, and property damages as a result of a traffic collision; and improving pedestrian and motorcycle safety, community outreach, occupant protection, child restraint, and emergency medical services. Under CNMI Public Law 3-61, §1 (§ 101), the Department of Public Safety, Police Traffic Services is the enforcement authority of all laws relating to traffic matters on the islands of Saipan, Tinian, and Rota.

The Department of Public Services division on Tinian is required to submit a monthly traffic report. The report includes motor vehicle crashes, seat-belt usage, impaired driving, speeding, pedestrian, and traffic fatalities/injuries, and other data related to traffic safety. One of the five fatal collisions reported within the CNMI in 2010 occurred on Tinian. No other fatal collisions occurred on Tinian during the 5-year period from 2008 through 2012. Of the 7,332 collisions that occurred during the 5-year period, 94% resulted in property damage, 5% resulted in injury, and 1% resulted in fatality. Alcohol was a factor in 63% of the 27 fatal collisions. None of the collisions reported during the 5-year period resulted in a
bicyclist or motorcyclist death. The 5 year (2008-2012) collision summary for the CNMI is summarized in Table 3.17-1.

![Table 3.17-1. CNMI Five Year (2008-2012) Collision Summary](image)

The Military Lease Area is open to the public at the discretion of the military, generally during times when U.S. military training is not occurring. Activities occurring in the Military Lease Area include daily use of the International Broadcasting Bureau, cattle grazing lots, all-terrain vehicle off-roading, and visitation to other locations (e.g., historic sites, beaches) by visitors and residents.

Potential public exposure to electromagnetic radiation hazards (as defined by American National Standards Institute) associated with the radio transmission activities of the International Broadcast Bureau is a public health and safety concern. The area of potential exposure is largely contained within the International Broadcasting Bureau’s fenced boundaries. The risk of exposure is minimized through public exclusion from the fenced boundaries.

### 3.17.4.2.2 Military Activities

Military operations and training have occurred in the Military Lease Area, (i.e., northern two-thirds of the island) since the 1940s. Public safety is a concern within the Military Lease Area because the public visits numerous historic and scenic sites within the Military Lease Area. This includes North Field National Historic Landmark, beaches, scenic viewpoints, and other points of interest. The public also uses the Military Lease Area for hunting, fishing, and plant gathering when the military is not conducting training. Additional details on civilian use of the Military Lease Area are provided in Section 3.7, Land Use, Section 3.8, Recreation, and Section 3.15, Socioeconomics and Environmental Justice.

The military notifies the CNMI Government and the Tinian Mayor’s office 45 days in advance of scheduled training in the Military Lease Area. To ensure public safety, the area is cleared of unauthorized civilian personnel and cordoned off prior to the start of potentially hazardous training operations. Traffic control points are located on 8th Avenue and Broadway Avenue to prevent unauthorized access (DoN 2013b).

Training maneuvers and limited live-fire training activities follow range, aviation, and munitions safety standard operating procedures. During hazardous training activities such as maneuvers and small arms fire involving live and inert munitions, a qualified range safety officer is always on duty. Range safety officers ensure that these hazardous areas are clear of personnel during training activities. After a live-
fire event, the participating unit ensures that all weapons are safe and that the training area is clear of live rounds.

3.17.4.2.3 Unexploded Ordnance and Historically Discarded Military Munitions

Due to the historic use of Tinian during World War II, unexploded and historically discarded military munitions are known to exist within the Military Lease Area and may exist in the Tinian Harbor and other civilian locations. There are confirmed reports of the use of artillery, mortars, and tanks, in addition to naval gunfire and aircraft bombs, along with common infantry weapons in the historical record of the battle fought on the island by advancing U.S. military forces against defending Japanese forces in World War II (i.e., the Battle of Tinian). In response, the U.S. military, the U.S. Environmental Protection Agency, and the CNMI have established ordnance and munitions mitigation and cleanup activities under a variety of programs. These programs are summarized in Appendix R, Hazardous Materials and Waste Technical Memo. In addition, the community is routinely advised not to handle or step on any suspicious items, and to report such findings immediately. Unexploded ordnance and historically discarded military munitions have been discovered periodically since the end of World War II. There have been no reported incidents of serious injury or death related to unexploded ordnance and historically discarded military munitions on Tinian in the past 50 years. Clearances for unexploded military munitions have been conducted. Unexploded ordnance and historically discarded military munitions are identified to determine disposal requirements. Normally, an unexploded ordnance and historically discarded military munitions item may be removed offsite for disposal. If unstable, it may need to be blown in place. This determination is made by qualified military explosive ordnance disposal technicians.

Although portions of the island have been developed, unexploded military munitions may still be present. A historical ordnance assessment (DoN 2010b) was completed in 2010 and categorized areas of Tinian based on the probability (low, medium, and high) of such ordnance and munitions being present. The assessment was limited to current U.S. military properties where military construction may occur, which included the Military Lease Area (see Figure 3.16-1, Section 3.16, Hazardous Materials and Waste).

Medium and high probabilities of unexploded ordnance and the presence of historically discarded military munitions are the general risk assessment categories assigned to the Military Lease Area on Tinian (DoN 2010b). Light ordnance (e.g., hand grenades, projected grenades, and light mortars) likely comprise a large majority of unexploded ordnance that could be found within 4 feet (1.2 meters) of the ground surface. Heavier munitions (e.g., artillery projectiles, naval projectiles, and aerial bombs) can likely be found at greater depths since their force of impact tends to bury them deeper below the ground surface if they fail to detonate. In addition, there is a possibility of encountering historically discarded military munitions from either individual losses of ammunition or abandoned munitions. The northern portion of the Military Lease Area is considered a high-probability area due to the intensive pre-invasion bombardment and the intensive combat associated with the amphibious training that occurred during World War II. The southern portion of the area is assessed as medium probability because movement through this area was relatively rapid after the capture of Mount Lasso (DoN 2010b). Section 3.16, Hazardous Materials and Waste (Table 3.16.1) provides a description and location of known sites containing either unexploded ordnance and/or historically discarded military munitions.
A portion of the Battle of Tinian site was used as a military training range (Tinian Mortar Range) from 1945 to 1994. The former training range is located along the road north of Unai Chiget and south of Blow Hole, which is fenced off and marked as containing unexploded ordnance.

The Historical Ordnance Assessment (DoN 2010b) did not take into account that the majority of the Military Lease Area was bulldozed during World War II to develop airfields and supporting infrastructure. Despite prior development activities on the island, there is no record of unexploded ordnance surface or subsurface clearance having been performed. Unexploded ordnance and historically discarded munitions could be present in undeveloped areas and at depths below previous earth disturbing activities.

### 3.17.4.3 Marine Operations

#### 3.17.4.3.1 Civilian Activities

The Port of Tinian is used by the public, commercial and supply barges, as well as U.S. Coast Guard vessels. The current port docking facilities consist of a main wharf that is approximately 2,000 feet (610 meters) long with a usable length of 1,600 feet (488 meters). The harbor has no fixed shore-side cranes or lighting. West of the main wharf are two finger piers, both are in complete disrepair and unusable.

As described in Section 3.8, Recreation and Section 3.15 Socioeconomics and Environmental Justice, waters to the northwest of Tinian are used for fishing by the Saipan commercial fishing fleet. The water is notably calmer on the western side of Tinian, which makes it more attractive for fishing than the eastern side. Additionally, shorelines are used for recreational fishing, primarily located south of Dump Coke South and north of the Two Coral (Turtle Cove) diving sites on the west side of Tinian.

#### 3.17.4.3.2 Military Activities

North of the main wharf and adjacent to the current public dock and ramps is an old concrete boat ramp that has been used by military Amphibious Assault Vehicles. This ramp has an adjacent grassy staging area suitable for storing vehicles brought ashore, or for staging, cleaning, and reloading (U.S. Commander Pacific Fleet 1999). There are no recurrent military operations within waters surrounding Tinian. There is currently no marine danger zones associated with Tinian.

#### 3.17.4.3.3 Marine Vessel Accidents

The Lloyd’s Maritime Information Service Casualty Register collects data on and reports vessel casualties. Vessel casualties consist of accidental groundings and shipwrecks. In 1997 the South Pacific Regional Environment Programme published a research paper which included a list of all casualties in the South Pacific between 1976 and 1996. During this 20-year period there were seven documented wrecks or groundings in the vicinity of the Northern Marianas. Four of the seven documented events involved heavy weather of typhoons. Only one vessel casualty was recorded in the waters surrounding Tinian. In August 1986, a refrigerated cargo ship carrying frozen fish stranded while entering the Tinian Harbor. The hold and engine room of the ship flooded (Preston et al. 1997). Based on a review of National Transportation Safety Board, Marine Accident Reports issued since 1996, there have been no accidents reported in the waters surrounding Tinian, during the past 18 years (National Transportation Safety Board 2014).
3.17.5  Pagan

3.17.5.1  Aircraft Operations

The population of Pagan was evacuated to Saipan in May 1981 due to the eruption of Mount Pagan and has not been formally re-inhabited since. The active volcano located on Northern Pagan is monitored by the U.S. Geological Survey via satellite. Procedures and support during natural disasters and area advisories to inform travelers of safety risks is provided by the CNMI Homeland Security and Emergency Management Office. Temporary visitors to Pagan on approved visits generally travel by private or chartered boats or aircraft (i.e., helicopters) and are required to have the ability to contact the CNMI Homeland Security and Emergency Management Office.

3.17.5.1.1  Civilian Activities

As described in Section 3.6, Airspace and Section 3.13, Transportation, Pagan airfield is an unattended/uncontrolled World War II-era, grass field, truncated at one end by a 30-foot-thick lava flow. It has no airport control tower, communications or other airport facilities. There are no scheduled flights. These conditions limit the type of aircraft that can land there, generally small aircraft and helicopters. It is used as an evacuation airfield for medical emergencies in the Northern Islands, coordinated via satellite phone. There are no recorded wildlife strike events at or near the Pagan airfield and no published Runway Protection Zones.

3.17.5.1.2  Military Activities

Limited military training has occurred in recent years on Pagan as part of the Forager Fury and Forager Fury II training exercises. The training consisted of 1-day combat search and rescue training missions in the northern section of Pagan. A rotary-wing aircraft (MV-22 Osprey) was utilized to extract personnel from a simulated downed aircraft. No live-fire training has occurred as part of these activities. There is currently no Special Use Airspace for Pagan.

3.17.5.2  Ground Operations

3.17.5.2.1  Civilian Activities

There is no resident population on Pagan but people visit Pagan for recreation and resource gathering. Visitors have been observed using temporary encampments to over-night on the island. Abandoned livestock have become feral and roam the entire island. The Department of Public Safety maintains no personnel or facilities on Pagan. There is no information available to suggest that accidents and safety are a current issue.

3.17.5.2.2  Military Activities

No military ranges exist on Pagan, with military operations confined to recent, 1-day, non-live-fire, aviation events described in Section 3.17.5.1.2, Military Activities.

3.17.5.2.3  Unexploded Ordnance and Historically Discarded Military Munitions

As described in Section 3.16, Hazardous Materials and Wastes, Pagan was a Japanese Imperial Army stronghold that was continuously bombed from June 1944 through September 1945. There is the
possibility that unexploded ordnance and/or historically discarded military munitions could be encountered throughout the island. The historic ordnance study conducted in support of this EIS/OEIS (DoN 2013a) summarized the probability of the presence of unexploded ordnance (i.e., unexploded munitions and explosive hazards) on Pagan. In this study, the island is described in terms of moderate-to-high-potential and low-potential hazard areas. Areas with moderate-to-high-potential were identified by historical records indicating locations of military importance based on the level of historic military use of the area. Low-potential areas include areas where there is no evidence or documentation of military use and areas that lacked structures during World War II (i.e., the entire southern portion of Pagan) (see Figure 3.16-2, Section 3.16, Hazardous Materials and Waste).

3.17.5.3 Marine Operations

3.17.5.3.1 Civilian Activities

There is no operable pier or port facilities on Pagan and there are no regularly scheduled marine operations. Ships that have travelled to Pagan have anchored off the northwestern shore, and personnel have used small boats to come ashore. However, as described in Section 3.8, Recreation, there are currently two tour options being offered for Pagan: Pagan ecotour adventure and the Silver Explorer cruise ship. In September 2014, the Silver Explorer cruise ship anchored and shuttled people between the ship and Pagan for a day trip nature excursion before sailing on to Saipan and Tinian.

3.17.5.3.2 Military Activities

There is no operable pier or port facilities on Pagan and there are no regularly scheduled marine operations. Ships that have travelled to Pagan have anchored off the northwestern shore, and personnel have used small boats to come ashore. However, as described in Section 3.8, Recreation, there are currently two tour options being offered for Pagan: Pagan ecotour adventure and the Silver Explorer cruise ship. In September 2014, the Silver Explorer cruise ship anchored and shuttled people between the ship and Pagan for a day trip nature excursion before sailing on to Saipan and Tinian.

3.17.5.3.3 Marine Vessel Accidents

As reported by the South Pacific Regional Environment Programme from data compiled by the Lloyd’s Maritime Information Services Casualty Register, during the 20-year period from 1976 to 1996 there were no reported vessel casualties in the waters surrounding Pagan (Preston et al. 1997). Based on a review of National Transportation Safety Board, Marine Accident Reports issued since 1996, there have been no accidents reported in the waters surrounding Pagan, during the past 18 years (National Transportation Safety Board 2014).
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# CHAPTER 4

## ENVIRONMENTAL CONSEQUENCES

## TABLE OF CONTENTS

| CHAPTER 4 | ENVIRONMENTAL CONSEQUENCES | ................................................................. | 1 |
| ACRONYMS AND ABBREVIATIONS | ................................................................. | XI |
| 4.1 | INTRODUCTION | ................................................................. | 4-1 |
| 4.1.1 | ENVIRONMENTAL RESOURCE SECTIONS | ................................................................. | 4-1 |
| 4.1.2 | APPROACH TO ANALYSIS | ................................................................. | 4-1 |
| 4.1.3 | RESOURCE MANAGEMENT MEASURES | ................................................................. | 4-1 |
| 4.1.4 | ACTION ALTERNATIVES | ................................................................. | 4-2 |
| 4.1.5 | CONSTRUCTION AND OPERATION IMPACTS | ................................................................. | 4-2 |
| 4.1.6 | NO-ACTION ALTERNATIVE | ................................................................. | 4-3 |
| 4.1.7 | PROGRAMMATIC ANALYSIS | ................................................................. | 4-3 |
| 4.1.8 | SECTION 4(f) EVALUATION | ................................................................. | 4-3 |
| 4.1.9 | SUMMARY OF IMPACTS AND MITIGATIONS | ................................................................. | 4-3 |
| 4.2 | GEOLOGY AND SOILS | ................................................................. | 4-4 |
| 4.2.1 | APPROACH TO ANALYSIS | ................................................................. | 4-4 |
| 4.2.2 | RESOURCE MANAGEMENT MEASURES | ................................................................. | 4-5 |
| 4.2.3 | TINIAN | ................................................................. | 4-6 |
| 4.2.4 | PAGAN | ................................................................. | 4-27 |
| 4.3 | WATER RESOURCES | ................................................................. | 4-36 |
| 4.3.1 | APPROACH TO ANALYSIS | ................................................................. | 4-36 |
| 4.3.2 | RESOURCE MANAGEMENT MEASURES | ................................................................. | 4-37 |
| 4.3.3 | TINIAN | ................................................................. | 4-40 |
| 4.3.4 | PAGAN | ................................................................. | 4-56 |
| 4.4 | AIR QUALITY | ................................................................. | 4-65 |
| 4.4.1 | APPROACH TO ANALYSIS | ................................................................. | 4-65 |
| 4.4.2 | RESOURCE MANAGEMENT MEASURES | ................................................................. | 4-68 |
| 4.4.3 | TINIAN | ................................................................. | 4-69 |
| 4.4.4 | PAGAN | ................................................................. | 4-74 |
| 4.5 | NOISE | ................................................................. | 4-77 |
| 4.5.1 | APPROACH TO ANALYSIS | ................................................................. | 4-77 |
| 4.5.2 | RESOURCE MANAGEMENT MEASURES | ................................................................. | 4-80 |
| 4.5.3 | TINIAN | ................................................................. | 4-81 |
| 4.5.4 | PAGAN | ................................................................. | 4-117 |
### 4.6 AIRSPACE

- 4.6.1 APPROACH TO ANALYSIS ................................................................. 4-132
- 4.6.2 RESOURCE MANAGEMENT MEASURES ........................................... 4-135
- 4.6.3 TINIAN .......................................................................................... 4-136
- 4.6.4 PAGAN ......................................................................................... 4-150

### 4.7 LAND AND SUBMERGED LAND USE

- 4.7.1 APPROACH TO ANALYSIS ................................................................. 4-154
- 4.7.2 RESOURCE MANAGEMENT MEASURES ........................................... 4-155
- 4.7.3 TINIAN .......................................................................................... 4-155
- 4.7.4 PAGAN ......................................................................................... 4-168

### 4.8 RECREATION

- 4.8.1 APPROACH TO ANALYSIS ................................................................. 4-172
- 4.8.2 RESOURCE MANAGEMENT MEASURES ........................................... 4-173
- 4.8.3 TINIAN .......................................................................................... 4-174
- 4.8.4 PAGAN ......................................................................................... 4-185

### 4.9 TERRESTRIAL BIOLOGY

- 4.9.1 APPROACH TO ANALYSIS ................................................................. 4-187
- 4.9.2 RESOURCE MANAGEMENT MEASURES ........................................... 4-191
- 4.9.3 TINIAN .......................................................................................... 4-193
- 4.9.4 PAGAN ......................................................................................... 4-244

### 4.10 MARINE BIOLOGY

- 4.10.1 APPROACH TO ANALYSIS ................................................................. 4-264
- 4.10.2 RESOURCE MANAGEMENT MEASURES ........................................... 4-267
- 4.10.3 TINIAN .......................................................................................... 4-270
- 4.10.4 PAGAN ......................................................................................... 4-302

### 4.11 CULTURAL RESOURCES

- 4.11.1 APPROACH TO ANALYSIS ................................................................. 4-327
- 4.11.2 RESOURCE MANAGEMENT MEASURES ........................................... 4-328
- 4.11.3 TINIAN .......................................................................................... 4-329
- 4.11.4 PAGAN ......................................................................................... 4-353

### 4.12 VISUAL RESOURCES

- 4.12.1 APPROACH TO ANALYSIS ................................................................. 4-364
- 4.12.2 RESOURCE MANAGEMENT MEASURES ........................................... 4-365
- 4.12.3 TINIAN .......................................................................................... 4-366
- 4.12.4 PAGAN ......................................................................................... 4-380

### 4.13 TRANSPORTATION

- 4.13.1 APPROACH TO ANALYSIS ................................................................. 4-385
- 4.13.2 RESOURCE MANAGEMENT MEASURES ........................................... 4-387
- 4.13.3 TINIAN .......................................................................................... 4-388
Chapter 4, Environmental Consequences

4.13.4 PAGAN................................................................. 4-405

4.14 UTILITIES ........................................................... 4-410
  4.14.1 APPROACH TO ANALYSIS .................................. 4-410
  4.14.2 RESOURCE MANAGEMENT MEASURES .............. 4-411
  4.14.3 TINIAN.............................................................. 4-412
  4.14.4 PAGAN.............................................................. 4-430

4.15 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE .......... 4-433
  4.15.1 APPROACH TO ANALYSIS .................................. 4-433
  4.15.2 RESOURCE MANAGEMENT MEASURES .............. 4-439
  4.15.3 TINIAN.............................................................. 4-439
  4.15.4 PAGAN.............................................................. 4-454

4.16 HAZARDOUS MATERIALS AND WASTE ......................... 4-457
  4.16.1 APPROACH TO ANALYSIS .................................. 4-457
  4.16.2 RESOURCE MANAGEMENT MEASURES .............. 4-458
  4.16.3 TINIAN.............................................................. 4-460
  4.16.4 PAGAN.............................................................. 4-479

4.17 PUBLIC HEALTH AND SAFETY .................................. 4-489
  4.17.1 APPROACH TO ANALYSIS .................................. 4-490
  4.17.2 RESOURCE MANAGEMENT MEASURES .............. 4-490
  4.17.3 TINIAN.............................................................. 4-492
  4.17.4 PAGAN.............................................................. 4-499

4.18 PROGRAMMATIC ANALYSIS OF FUTURE POTENTIAL PROJECT COMPONENTS .......... 4-503
  4.18.1 INTERNATIONAL BROADCASTING BUREAU PROGRAMMATIC ANALYSIS ......... 4-504
  4.18.2 PAGAN DOCK AND BREAKWATER.......................... 4-521

4.19 SECTION 4(F) EVALUATION ....................................... 4-537
  4.19.1 INTRODUCTION.................................................. 4-537
  4.19.2 DESCRIPTION OF THE PROPOSED ACTION ............. 4-539
  4.19.3 DESCRIPTION OF SECTION 4(F) PROPERTIES ........... 4-540
  4.19.4 IMPACTS ON THE SECTION 4(F) PROPERTIES BY THE PROJECT ......... 4-542
  4.19.5 AVOIDANCE ALTERNATIVES.................................. 4-543
  4.19.6 MEASURES TO MINIMIZE OR MITIGATE HARM .......... 4-544
  4.19.7 COORDINATION.................................................. 4-545
  4.19.8 CONCLUDING STATEMENT................................. 4-545

4.20 SUMMARY OF IMPACTS AND POTENTIAL MITIGATIONS ........... 4-546
  4.20.1 SUMMARY OF IMPACTS FOR TINIAN ALTERNATIVES ......... 4-547
  4.20.2 SUMMARY OF IMPACTS FOR PAGAN ALTERNATIVES .......... 4-555
  4.20.3 SUMMARY OF POTENTIAL MITIGATION MEASURES........... 4-559
### List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2-1</td>
<td>Tinian Ground Disturbance and Geologic Map for Alternatives 1 and 2</td>
<td>4-12</td>
</tr>
<tr>
<td>4.2-2</td>
<td>Tinian Ground Disturbance and Geologic Map for Alternatives 1 and 3</td>
<td>4-24</td>
</tr>
<tr>
<td>4.3-1</td>
<td>Tinian Alternative 1 Surface Waters and Flood Zones</td>
<td>4-43</td>
</tr>
<tr>
<td>4.3-2</td>
<td>Tinian Alternative 1 Groundwater Wells, Elevation, and Flow Direction</td>
<td>4-45</td>
</tr>
<tr>
<td>4.3-3</td>
<td>Tinian Alternative 2 Surface Waters</td>
<td>4-52</td>
</tr>
<tr>
<td>4.3-4</td>
<td>Tinian Alternative 3 Surface Waters</td>
<td>4-54</td>
</tr>
<tr>
<td>4.3-5</td>
<td>Pagan Alternative 1 Surface Waters</td>
<td>4-58</td>
</tr>
<tr>
<td>4.3-6</td>
<td>Pagan Alternative 2 Surface Waters</td>
<td>4-63</td>
</tr>
<tr>
<td>4.5-1</td>
<td>All Tinian Alternatives Small-caliber Weapons Noise Levels (A-weighted)</td>
<td>4-85</td>
</tr>
<tr>
<td>4.5-2</td>
<td>All Tinian Alternatives Small-caliber Weapons Noise Levels (Peak)</td>
<td>4-87</td>
</tr>
<tr>
<td>4.5-3</td>
<td>All Tinian Alternatives Large-caliber Weapons Noise Levels (C-weighted)</td>
<td>4-91</td>
</tr>
<tr>
<td>4.5-4</td>
<td>All Tinian Alternatives Large-caliber Noise Levels under Neutral Weather Conditions (Peak)</td>
<td>4-93</td>
</tr>
<tr>
<td>4.5-5</td>
<td>All Tinian Alternatives Large-caliber Noise Levels under Unfavorable Weather Conditions (Peak)</td>
<td>4-95</td>
</tr>
<tr>
<td>4.5-6</td>
<td>Airfield and Airspace Noise Levels for All Tinian Alternatives (A-weighted)</td>
<td>4-103</td>
</tr>
<tr>
<td>4.5-7</td>
<td>All Pagan Alternatives Small-caliber Weapons Noise Levels (A-weighted)</td>
<td>4-118</td>
</tr>
<tr>
<td>4.5-8</td>
<td>All Pagan Alternatives Small-caliber Weapons Noise Levels (Peak)</td>
<td>4-119</td>
</tr>
<tr>
<td>4.5-9</td>
<td>All Pagan Alternatives Large-caliber Weapons Noise Levels (C-weighted)</td>
<td>4-122</td>
</tr>
<tr>
<td>4.5-10</td>
<td>All Pagan Alternatives Large-caliber Noise Levels under Neutral Weather Conditions (Peak)</td>
<td>4-123</td>
</tr>
<tr>
<td>4.5-11</td>
<td>All Pagan Alternatives Large-caliber Noise Levels under Unfavorable Weather Conditions (Peak)</td>
<td>4-124</td>
</tr>
<tr>
<td>4.5-12</td>
<td>All Pagan Alternatives Airfield and Airspace Noise Levels (A-weighted)</td>
<td>4-127</td>
</tr>
<tr>
<td>4.6-1</td>
<td>Airspace Region of Influence</td>
<td>4-133</td>
</tr>
<tr>
<td>4.6-2</td>
<td>Commuter Flight Routes</td>
<td>4-139</td>
</tr>
<tr>
<td>4.7-1</td>
<td>Tinian Proposed Land Acquisition</td>
<td>4-157</td>
</tr>
<tr>
<td>4.7-2</td>
<td>Tinian Potential Agricultural Use in the Military Lease Area</td>
<td>4-160</td>
</tr>
<tr>
<td>4.7-3</td>
<td>Tinian All Action Alternatives Areas of Particular Concern</td>
<td>4-163</td>
</tr>
<tr>
<td>4.7-4</td>
<td>Pagan All Action Alternatives Areas of Particular Concern</td>
<td>4-170</td>
</tr>
<tr>
<td>4.9-1a</td>
<td>Northern Military Lease Area – Tinian Alternative 1, Vegetation Communities</td>
<td>4-195</td>
</tr>
<tr>
<td>4.9-1b</td>
<td>Southern Military Lease Area – Tinian Alternative 1, Vegetation Communities</td>
<td>4-196</td>
</tr>
<tr>
<td>4.9-2</td>
<td>Potential Mitigation Areas with Implementation of Tinian Alternatives 1, 2 or 3</td>
<td>4-199</td>
</tr>
<tr>
<td>4.9-3a</td>
<td>Northern Military Lease Area – Tinian Alternative 1, Occurrence of Special-status Species</td>
<td>4-202</td>
</tr>
<tr>
<td>4.9-3b</td>
<td>Southern Military Lease Area – Tinian Alternative 1, Occurrence of Special-status Species</td>
<td>4-203</td>
</tr>
<tr>
<td>4.9-4a</td>
<td>Northern Military Lease Area – Tinian Alternative 2, Vegetation Communities</td>
<td>4-218</td>
</tr>
<tr>
<td>Section Code</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>4.9-4b</td>
<td>Southern Military Lease Area – Tinian Alternative 2, Vegetation Communities</td>
<td>4-219</td>
</tr>
<tr>
<td>4.9-5a</td>
<td>Northern Military Lease Area – Tinian Alternative 2, Occurrence of Special-status Species</td>
<td>4-223</td>
</tr>
<tr>
<td>4.9-5b</td>
<td>Southern Military Lease Area – Tinian Alternative 2, Occurrence of Special-status Species</td>
<td>4-224</td>
</tr>
<tr>
<td>4.9-6a</td>
<td>Northern Military Lease Area – Tinian Alternative 3, Vegetation Communities</td>
<td>4-228</td>
</tr>
<tr>
<td>4.9-6b</td>
<td>Southern Military Lease Area – Tinian Alternative 3, Vegetation Communities</td>
<td>4-229</td>
</tr>
<tr>
<td>4.9-7a</td>
<td>Northern Military Lease Area – Tinian Alternative 3, Occurrence of Special-status Species</td>
<td>4-233</td>
</tr>
<tr>
<td>4.9-7b</td>
<td>Southern Military Lease Area – Tinian Alternative 3, Occurrence of Special-status Species</td>
<td>4-234</td>
</tr>
<tr>
<td>4.9-8</td>
<td>Pagan Alternative 1, Vegetation Communities</td>
<td>4-245</td>
</tr>
<tr>
<td>4.9-9</td>
<td>Pagan Alternative 1, Occurrence of Special-status Species</td>
<td>4-247</td>
</tr>
<tr>
<td>4.9-10</td>
<td>Pagan Alternative 2, Vegetation Communities</td>
<td>4-256</td>
</tr>
<tr>
<td>4.9-11</td>
<td>Pagan Alternative 2, Occurrence of Special-status Species</td>
<td>4-258</td>
</tr>
<tr>
<td>4.10-1</td>
<td>Unai Chulu Training Impact Area- Depth</td>
<td>4-272</td>
</tr>
<tr>
<td>4.10-2</td>
<td>Unai Chulu Training Impact Area- Coral Cover</td>
<td>4-273</td>
</tr>
<tr>
<td>4.10-3</td>
<td>Unai Babui Training Impact Area-Depth</td>
<td>4-284</td>
</tr>
<tr>
<td>4.10-4</td>
<td>Unai Babui Training Impact Area-Coral Cover</td>
<td>4-285</td>
</tr>
<tr>
<td>4.10-5</td>
<td>Unai Lam Lam Training Impact Area- Depth</td>
<td>4-286</td>
</tr>
<tr>
<td>4.10-6</td>
<td>Unai Lam Lam Training Impact Area-Coral Cover</td>
<td>4-287</td>
</tr>
<tr>
<td>4.10-7</td>
<td>Unai Masalok Training Impact Area-Depth</td>
<td>4-288</td>
</tr>
<tr>
<td>4.10-8</td>
<td>Unai Masalok Training Impact Area-Coral Cover</td>
<td>4-289</td>
</tr>
<tr>
<td>4.10-9</td>
<td>Green Beach Training Impact Area-Depth</td>
<td>4-308</td>
</tr>
<tr>
<td>4.10-10</td>
<td>Green Beach Training Impact Area-Coral Cover</td>
<td>4-309</td>
</tr>
<tr>
<td>4.10-11</td>
<td>Red Beach Training Impact Area-Depth</td>
<td>4-310</td>
</tr>
<tr>
<td>4.10-12</td>
<td>Red Beach Training Impact Area-Coral Cover</td>
<td>4-311</td>
</tr>
<tr>
<td>4.10-13</td>
<td>Blue Beach Training Impact Area-Depth</td>
<td>4-312</td>
</tr>
<tr>
<td>4.10-14</td>
<td>Blue Beach Training Impact Area-Coral Cover</td>
<td>4-313</td>
</tr>
<tr>
<td>4.10-15</td>
<td>South Beach Training Impact Area Depth</td>
<td>4-314</td>
</tr>
<tr>
<td>4.10-16</td>
<td>South Beach Training Impact Area Coral Cover</td>
<td>4-315</td>
</tr>
<tr>
<td>4.10-17</td>
<td>North Beach Training Impact Area-Depth</td>
<td>4-316</td>
</tr>
<tr>
<td>4.10-18</td>
<td>Gold Beach Training Impact Area-Depth</td>
<td>4-318</td>
</tr>
<tr>
<td>4.10-19</td>
<td>Gold Beach Training Impact Area-Coral Cover</td>
<td>4-319</td>
</tr>
<tr>
<td>4.12-1</td>
<td>Tinian Alternative 1 Key Observation Points</td>
<td>4-367</td>
</tr>
<tr>
<td>4.12-2</td>
<td>Tinian Alternative 2 Key Observation Points</td>
<td>4-375</td>
</tr>
<tr>
<td>4.12-3</td>
<td>Tinian Alternative 3 Key Observation Points</td>
<td>4-377</td>
</tr>
<tr>
<td>4.12-4</td>
<td>Pagan Alternative 1 Visual Resources</td>
<td>4-381</td>
</tr>
<tr>
<td>4.12-5</td>
<td>Pagan Alternative 2 Visual Resources</td>
<td>4-383</td>
</tr>
<tr>
<td>4.13-1</td>
<td>Ground Transportation Improvements</td>
<td>4-391</td>
</tr>
</tbody>
</table>
4.16-1 Tinian All Action Alternatives Hazardous Materials/Waste Use and Storage Areas and Contaminated Sites for Range Training Area ......................................................... 4-461
4.16-2 Tinian All Action Alternatives Hazardous Materials/Waste Use and Storage Areas, Base Camp Munitions Storage, and Airport Improvements ........................................ 4-462
4.16-3 Tinian All Action Alternatives Hazardous Materials/Waste Use and Storage Areas for Tinian Port and Supply Route ................................................................. 4-463
4.16-4 Pagan Alternative 1 Hazardous Materials/Waste Use and Storage Area ........................................ 4-482
4.16-5 Pagan Alternative 2 Hazardous Materials/Waste Use and Storage Area ........................................ 4-486
4.18-1 Potential Rota Site .................................................................................................................. 4-506
4.18-2 Potential Saipan Site ............................................................................................................. 4-507
4.18-3 Potential Tinian Site ............................................................................................................. 4-508
4.18-4 Potential Guam Site ............................................................................................................. 4-510
4.18-5 Proposed Pagan Pier and Breakwater ................................................................................. 4-522

List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2-1</td>
<td>Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 1</td>
</tr>
<tr>
<td>4.2-2</td>
<td>Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 2</td>
</tr>
<tr>
<td>4.2-3</td>
<td>Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 3</td>
</tr>
<tr>
<td>4.2-4</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.2-5</td>
<td>Summary of Ground Disturbance, Slope, Geologic Units and Geologic Hazards Associated with Construction under Pagan Alternative 1</td>
</tr>
<tr>
<td>4.2-6</td>
<td>Summary of Ground Disturbance, Slope, Geologic Units and Geologic Hazards Associated with Construction under Pagan Alternative 2</td>
</tr>
<tr>
<td>4.2-7</td>
<td>Summary of Impacts for Pagan Alternatives</td>
</tr>
<tr>
<td>4.3-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.3-2</td>
<td>Summary of Impacts for Pagan Alternatives</td>
</tr>
<tr>
<td>4.4-1</td>
<td>Annual Average Construction Emissions – Tinian Alternative 1</td>
</tr>
<tr>
<td>4.4-2</td>
<td>Operational Training Annual Emissions – Tinian Alternatives 1, 2, and 3</td>
</tr>
<tr>
<td>4.4-3</td>
<td>Annual Average Construction Emissions – Tinian Alternative 2</td>
</tr>
<tr>
<td>4.4-4</td>
<td>Annual Average Construction Emissions – Tinian Alternative 3</td>
</tr>
<tr>
<td>4.4-5</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.4-6</td>
<td>Annual Construction Emissions – Pagan Alternative 1</td>
</tr>
<tr>
<td>4.4-7</td>
<td>Operational Training Activity Annual Emissions – Pagan Alternative 1</td>
</tr>
</tbody>
</table>
4.4-8 Annual Construction Emissions – Pagan Alternative 2 .......................................................... 4-76
4.4-9 Summary of Impacts for Pagan Alternatives ..................................................................... 4-76
4.5-1 Area and Population on Tinian Affected by Small-caliber Weapons Noise for All
Tinian Alternatives (A-weighted) ............................................................................................. 4-84
4.5-2 Area and Population on Tinian Affected by Small-caliber Weapons Noise for All
Tinian Alternatives (Peak) ...................................................................................................... 4-84
4.5-3 Tinian Alternative 1 Representative Points of Interest on Tinian Affected by Small-
caliber Weapons Noise (A-weighted and Peak) .................................................................... 4-89
4.5-4 Area and Population on Tinian and Saipan Affected by Large-caliber Weapons Noise
for All Tinian Alternatives (C-weighted) ............................................................................... 4-90
4.5-5 Area and Population on Tinian and Saipan Affected by Large-caliber Weapons Noise
- Risk Complaint Neutral Weather for All Tinian Alternatives (Peak) ................................. 4-97
4.5-6 Area and Population on Tinian and Saipan Affected by Large-caliber Weapons Noise
- Risk Complaint Unfavorable Weather for All Tinian Alternatives (Peak) ....................... 4-97
4.5-7 Representative Points of Interest on Tinian Affected by Large-caliber Weapons
Noise under All Tinian Alternatives (C-weighted) ................................................................ 4-98
4.5-8 Representative Points of Interest on Saipan Affected by Large-caliber Weapons
Noise under All Tinian Alternatives (C-weighted) ................................................................ 4-99
4.5-9 Representative Points of Interest on Tinian Affected by Large-caliber Weapons
Noise for All Tinian Alternatives (Peak) .............................................................................. 4-100
4.5-10 Representative Points of Interest on Saipan Affected by Large-caliber Weapons
Noise for All Tinian Alternatives (Peak) .............................................................................. 4-101
4.5-11 Annual Airfield Operations at Tinian International Airport and North Field for All
Tinian Alternatives .................................................................................................................. 4-102
4.5-12 Noise Area and Population Generated by Aircraft Operations for All Tinian
Alternatives Compared to Baseline (2012) Levels (A-weighted) ........................................... 4-104
4.5-13 All Tinian Alternatives Points of Interest Noise Level Exposure Generated by Aircraft
Operations (A-weighted) ........................................................................................................ 4-106
4.5-14 Representative Unit Level Vehicle Requirements ............................................................ 4-107
4.5-15 All Tinian Alternatives Proposed Base Vehicles ............................................................... 4-107
4.5-16 Tinian Alternative 2 Representative Points of Interest Affected by Small-caliber
Weapons Noise on Tinian (A-weighted and Peak) ................................................................ 4-110
4.5-17 Tinian Alternative 3 Representative Points of Interest Affected by Small-caliber
Weapons Noise on Tinian (A-weighted and Peak) ................................................................ 4-113
4.5-18 Summary of Impacts for Tinian Alternatives ................................................................. 4-116
4.5-19 All Pagan Alternatives Affected by Small-caliber Weapons Noise (A-weighted and
Peak) ........................................................................................................................................ 4-120
4.5-20 All Pagan Alternatives Area Affected by Large-caliber Weapons Noise (C-weighted
and Peak) .................................................................................................................................. 4-121
4.5-21 All Pagan Alternatives Points of Interest from Large-caliber Weapon Activity
(C-weighted) .............................................................................................................................. 4-125
4.5-22 All Pagan Alternatives Representative Points of Interest Affected by Large-caliber
Weapons Noise (Peak) ............................................................................................................ 4-126
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5-23</td>
<td>All Pagan Alternatives Noise Exposure Area at and Around the Airfield (A-weighted)</td>
</tr>
<tr>
<td>4.5-24</td>
<td>Summary of Impacts for Pagan Alternatives</td>
</tr>
<tr>
<td>4.6-1</td>
<td>Change in Tinian International Airport Annual Airport Operations</td>
</tr>
<tr>
<td>4.6-2</td>
<td>Distances between Saipan and Tinian</td>
</tr>
<tr>
<td>4.6-3</td>
<td>North Field Annual Operations</td>
</tr>
<tr>
<td>4.6-4</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.6-5</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
</tr>
<tr>
<td>4.6-6</td>
<td>Summary of Impacts for Pagan Alternatives</td>
</tr>
<tr>
<td>4.6-7</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.6-8</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
</tr>
<tr>
<td>4.6-9</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.6-10</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.7-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.7-2</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
</tr>
<tr>
<td>4.7-3</td>
<td>Summary of Impacts for Pagan Alternatives</td>
</tr>
<tr>
<td>4.7-4</td>
<td>Summary of Impacts for Pagan Alternatives</td>
</tr>
<tr>
<td>4.7-5</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
</tr>
<tr>
<td>4.7-6</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.7-7</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
</tr>
<tr>
<td>4.7-8</td>
<td>Summary of Impacts for Tinian Alternatives</td>
</tr>
<tr>
<td>4.7-9</td>
<td>Summary of Potential Mitigation Measures for Tinian Alternatives</td>
</tr>
<tr>
<td>4.8-1</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Tinian Alternative 1</td>
</tr>
<tr>
<td>4.8-2</td>
<td>Potential Direct and Permanent Impacts to Five Native Bird Species from Proposed Construction Activities under Tinian Alternative 1</td>
</tr>
<tr>
<td>4.8-3</td>
<td>Potential Direct and Permanent Impacts to Three Migratory Bird Treaty Act-listed Species from Proposed Construction Activities under Tinian Alternative 1</td>
</tr>
<tr>
<td>4.8-4</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Tinian Alternative 2</td>
</tr>
<tr>
<td>4.8-5</td>
<td>Potential Direct and Permanent Impacts to Five Native Bird Species from Proposed Construction Activities under Tinian Alternative 2</td>
</tr>
<tr>
<td>4.8-6</td>
<td>Potential Direct and Permanent Impacts to Three Migratory Bird Treaty Act-listed Bird Species from Proposed Construction Activities under Tinian Alternative 2</td>
</tr>
<tr>
<td>4.8-7</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Tinian Alternative 3</td>
</tr>
<tr>
<td>4.8-8</td>
<td>Potential Direct and Permanent Impacts to Five Native Bird Species from Proposed Construction Activities under Tinian Alternative 3</td>
</tr>
<tr>
<td>4.8-9</td>
<td>Potential Direct and Permanent Impacts to Three Migratory Bird Treaty Act-listed Bird Species from Proposed Construction Activities under Tinian Alternative 3</td>
</tr>
<tr>
<td>4.9-1</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Pagan Alternative 1</td>
</tr>
<tr>
<td>4.9-2</td>
<td>Modeled Weapons and Aircraft Noise Levels at Mariana Fruit Bat Colonies on Pagan under Alternative 1</td>
</tr>
<tr>
<td>4.9-3</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Pagan Alternative 2</td>
</tr>
<tr>
<td>4.9-4</td>
<td>Modeled Weapons and Aircraft Noise Levels at Mariana Fruit Bat Colonies on Pagan under Alternative 2</td>
</tr>
<tr>
<td>4.9-5</td>
<td>Potential Direct Impacts to Vegetation Communities with Implementation of Pagan Alternative 3</td>
</tr>
<tr>
<td>4.9-6</td>
<td>Modeled Weapons and Aircraft Noise Levels at Mariana Fruit Bat Colonies on Pagan under Alternative 3</td>
</tr>
</tbody>
</table>
Chapter 4, Environmental Consequences

Table of Contents

4.10-1 Summary of Potential Direct and Indirect Impacts to Marine Habitat at Unai Chulu ......... 4-274
4.10-2 Potential Impacts to Acropora globiceps at Unai Chulu During Construction ................ 4-280
4.10-3 Tinian Beach Activity Overview ......................................................................................... 4-283
4.10-4 Summary of Potential Direct and Indirect Impacts to Marine Habitat on Tinian .......... 4-291
4.10-5 Potential Impacts to Acropora globiceps at Unai Chulu, Unai Babui, Unai Masalok, and Unai Lam Lam During Operation/Training Activities† ........................................................................................................... 4-294
4.10-6 Summary of Impacts for Tinian Alternatives ................................................................. 4-299
4.10-7 Summary of Potential Mitigation Measures for Tinian Alternatives ......................... 4-300
4.10-8 Pagan Beach Activity Overview ......................................................................................... 4-302
4.10-9 Summary of Potential Direct and Indirect Impacts to Marine Habitat on Pagan .......... 4-304
4.10-10 Potential Impacts to Acropora globiceps at Green, Red, Blue, South, Gold, and North Beach on Pagan ................................................................................................................. 4-321
4.10-11 Summary of Impacts for Pagan Alternatives ................................................................. 4-325
4.10-12 Summary of Potential Mitigation Measures for Pagan Alternatives ......................... 4-326
4.11-1 Tinian Alternative 1: Summary of Significant Direct Impacts on Historic Properties from Construction .......................................................................................................................................... 4-330
4.11-2 Tinian Alternative 1 Summary of Significant Direct Impacts on Historic Properties from Operations ........................................................................................................................................................................... 4-335
4.11-3 Tinian Alternative 2 Summary of Significant Direct Impacts on Historic Properties from Construction ........................................................................................................................................................................... 4-338
4.11-4 Tinian Alternative 2 Summary of Significant Direct Impacts on Historic Properties from Operations ........................................................................................................................................................................... 4-341
4.11-5 Tinian Alternative 3 Summary of Significant Direct Impacts on Historic Properties from Construction ........................................................................................................................................................................... 4-344
4.11-6 Tinian Alternative 3 Summary of Significant Direct Impacts on Historic Properties from Operations ........................................................................................................................................................................... 4-347
4.11-7 Summary of Impacts for Tinian Alternatives ................................................................ 4-350
4.11-8 Summary of Potential Mitigation Measures for Tinian Alternatives ......................... 4-351
4.11-9 Pagan Alternative 1 Summary of Significant Direct Impacts on Historic Properties from Construction ........................................................................................................................................................................... 4-353
4.11-10 Pagan Alternative 1 Summary of Significant Direct Impacts on Historic Properties from Operations ........................................................................................................................................................................... 4-356
4.11-11 Pagan Alternative 2: Summary of Significant Direct Impacts on Historic Properties from Construction ........................................................................................................................................................................... 4-358
4.11-12 Pagan Alternative 2: Summary of Significant Direct Impacts on Historic Properties from Operations ........................................................................................................................................................................... 4-360
4.11-13 Summary of Impacts for Pagan Alternatives ................................................................. 4-362
4.11-14 Summary of Potential Mitigation Measures for Pagan Alternatives ......................... 4-363
4.12-1 Degree of Visual Contrast Defined .................................................................................. 4-364
4.12-2 Degree of Visual Impact Defined ...................................................................................... 4-365
4.12-3 Tinian Alternative 1 Summary of Visual Impacts ............................................................ 4-373
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.12-4</td>
<td>Tinian Alternative 2 Summary of Visual Impacts</td>
<td>4-376</td>
</tr>
<tr>
<td>4.12-5</td>
<td>Tinian Alternative 3 Summary of Visual Impacts</td>
<td>4-378</td>
</tr>
<tr>
<td>4.12-6</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-379</td>
</tr>
<tr>
<td>4.12-7</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-384</td>
</tr>
<tr>
<td>4.13-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-404</td>
</tr>
<tr>
<td>4.13-2</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-409</td>
</tr>
<tr>
<td>4.14-1</td>
<td>Total Estimated Change to Tinian Population</td>
<td>4-410</td>
</tr>
<tr>
<td>4.14-2</td>
<td>Tinian Alternative 1 Projected Construction Waste</td>
<td>4-417</td>
</tr>
<tr>
<td>4.14-3</td>
<td>Tinian Future Proposed Plan Electrical Power Demand Forecast</td>
<td>4-419</td>
</tr>
<tr>
<td>4.14-4</td>
<td>Estimated Potable Water Demand for Proposed Tinian Range Training Area System</td>
<td>4-419</td>
</tr>
<tr>
<td>4.14-5</td>
<td>Estimated Wastewater Flows generated by Military Personnel</td>
<td>4-420</td>
</tr>
<tr>
<td>4.14-6</td>
<td>CNMI Secondary Treated Effluent Requirements (Base Camp)</td>
<td>4-421</td>
</tr>
<tr>
<td>4.14-7</td>
<td>Estimated Influent Loading (Base Camp)</td>
<td>4-421</td>
</tr>
<tr>
<td>4.14-8</td>
<td>Estimated Total Solid Waste Generation</td>
<td>4-423</td>
</tr>
<tr>
<td>4.14-9</td>
<td>Tinian Alternative 2 Projected Construction Waste</td>
<td>4-425</td>
</tr>
<tr>
<td>4.14-10</td>
<td>Tinian Alternative 3 Projected Construction Waste</td>
<td>4-427</td>
</tr>
<tr>
<td>4.14-11</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-429</td>
</tr>
<tr>
<td>4.14-12</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-432</td>
</tr>
<tr>
<td>4.15-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-453</td>
</tr>
<tr>
<td>4.15-2</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-456</td>
</tr>
<tr>
<td>4.16-1</td>
<td>Potentially Contaminated Sites Within or Near Training Areas Under Alternative 1</td>
<td>4-471</td>
</tr>
<tr>
<td>4.16-2</td>
<td>Potentially Contaminated Sites Within or Near Training Areas Under Alternative 2</td>
<td>4-475</td>
</tr>
<tr>
<td>4.16-3</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-478</td>
</tr>
<tr>
<td>4.16-4</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-488</td>
</tr>
<tr>
<td>4.17-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-498</td>
</tr>
<tr>
<td>4.17-2</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-502</td>
</tr>
<tr>
<td>4.18-1</td>
<td>Density Estimates for Species Potentially Occurring in the Project Area</td>
<td>4-532</td>
</tr>
<tr>
<td>4.20-1</td>
<td>Summary of Impacts for Tinian Alternatives</td>
<td>4-547</td>
</tr>
<tr>
<td>4.20-2</td>
<td>Summary of Impacts for Pagan Alternatives</td>
<td>4-555</td>
</tr>
<tr>
<td>4.20-3</td>
<td>Summary of Potential Mitigation Measures</td>
<td>4-559</td>
</tr>
</tbody>
</table>
## Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td>%</td>
<td>percent</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CJMT</td>
<td>Commonwealth of the Northern Mariana Islands Joint Military Training</td>
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<td>CNMI</td>
<td>Commonwealth of the Northern Mariana Islands</td>
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<td>DoN</td>
<td>Department of the Navy</td>
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<tr>
<td>EA</td>
<td>Environmental Assessment</td>
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<td>EIS</td>
<td>Environmental Impact Statement</td>
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<tr>
<td>MSL</td>
<td>mean sea level</td>
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<td>n.d.</td>
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<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<td>OEA</td>
<td>Overseas EA</td>
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<tr>
<td>OEIS</td>
<td>Overseas EIS</td>
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<tr>
<td>RTA</td>
<td>Range and Training Area</td>
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<td>U.S.</td>
<td>United States</td>
</tr>
</tbody>
</table>
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CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter describes potential environmental consequences associated with implementing the proposed action and no-action and alternatives. In accordance with National Environmental Policy Act (NEPA) guidelines, the scope of the Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) was guided by emphasizing potentially significant issues and deemphasizing insignificant issues (40 Code of Federal Regulations [CFR] §1501.1[d]). The following topics provide an overview of Chapter 4 and are discussed below:

- Environmental Resource Sections
- Programmatic Analysis
- Section 4(f) Evaluation
- Summary of Impacts and Potential Mitigation Measures

4.1.1 Environmental Resource Sections

Consistent with the discussion of the affected environment (see Chapter 3, Affected Environment), this chapter is divided into 16 resource areas (Sections 4.2 through 4.17) to provide a framework for evaluating the impacts of each alternative. Each environmental resource section is divided into the following subsections.

4.1.2 Approach to Analysis

The Approach to Analysis section describes the methodology and impact assessment criteria used to identify and evaluate resource impacts in this EIS/OEIS.

4.1.3 Resource Management Measures

The Resource Management Measures section discusses applicable (1) avoidance and minimization measures and, (2) best management practices and standard operating procedures, and how they serve to lessen impacts to specific resources. Resource management measures include avoidance and minimization measures, best management practices, and standard operating procedures. Resource management measures would be incorporated into the proposed action and are common to all action alternatives.

Avoidance and minimization measures that further reduce environmental impacts are not necessarily required by law, regulation, or policy. However, they are incorporated into the site planning and design of the proposed action. Examples of avoidance and minimization include moving target locations, moving firing positions, adjusting engagement zones, limiting weapons deployment, adjusting High Hazard Impact Area boundaries, and adjusting use of tactical landing beaches.
Best management practices include standard operating procedures and commonly accepted practices routinely implemented by the Department of the Navy (DoN) in design, construction, and operations to provide for the safety of personnel and equipment, as well as aid with regulatory compliance. The EIS/OEIS impact analysis (Chapter 4) assumes that resource management measures are successfully incorporated into the proposed action. Best management practices and standard operating procedures are described in Appendix D, *Best Management Practices*.

### 4.1.4 Action Alternatives

Chapter 4 covers both the action and no-action alternatives. Each resource area includes analysis of impacts under the three Tinian action alternatives and the two Pagan action alternatives. The separate Tinian and Pagan presentations enable the unique characteristics of each island as well as distinct types of training venues to be clearly depicted. These separate presentations do not change the intent of the proposed action which is to establish Range and Training Areas (RTAs) on both Tinian and Pagan.

### 4.1.5 Construction and Operation Impacts

A separate discussion of the potential impacts resulting from both construction, and operational activities associated with implementation of the Tinian and Pagan action alternatives is provided. Some resource areas do not include discussion of either construction period or operations period impacts, as those activities are not applicable to the discussion. For example, there are no construction period impacts under Section 4.6, *Airspace*.

#### 4.1.5.1 Impact Determination

A determination is made for each potential impact as to whether it would be significant or not, as appropriate. If the impact would be significant, a determination is made as to whether it could be mitigated to less than significant. If not, the consequences of the significant impacts are presented.

#### 4.1.5.2 Potential Mitigation Measures

For the purpose of this EIS/OEIS, mitigation measures are additional project-specific measures to actively minimize, rectify, reduce, or provide compensation for impacts identified through the NEPA environmental review process. Mitigation measures are implemented and monitored as practicable in addition to the avoidance and minimization measures, best management practices, and standard operating procedures that are included as part of the proposed action. Examples of potential mitigation measures include habitat restoration to mitigate for habitat removed during construction, and removal of existing non-native invasive species. Unlike resource management measures, which are incorporated into the proposed action, commitments to specific mitigation measures will be documented through the Record of Decision, a permit/approval, programmatic agreement or other formal agreement. Section 4.20 summarizes the impacts and potential mitigation measures for the Tinian alternatives and the Pagan alternatives analyzed in this EIS/OEIS. Table 4.20-1 and Table 4.20-2 provides a summary of the impacts for both construction and operation activities for the Tinian and Pagan alternatives.

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**Significant Impacts**

According to NEPA, a determination of significance requires consideration of both the context of the action and the intensity or severity of the impact (40 CFR § 1508.27).
4.1.6 No-Action Alternative

A discussion of impacts related to the no-action alternative is provided for each resource area as a basis of comparison of the potential environmental consequences of the proposed action alternatives. The discussions are presented in Sections 2.4.5, Tinian No-Action Alternative and 2.5.4, Pagan No-Action Alternative.

4.1.7 Programmatic Analysis

Section 4.18 provides a programmatic analysis of two additional projects that are not included within the proposed action: (1) relocation of the existing International Broadcasting Bureau (currently located on Tinian) and (2) construction and operation of a new dock and associated breakwater on Pagan. These two projects are presented and analyzed in a broader context than the proposed action analyzed in this EIS/OEIS.

4.1.8 Section 4(f) Evaluation

Section 4.19 provides a Section 4(f) evaluation of the Tinian International Airport improvements and associated historic properties. Section 4(f) of the Department of Transportation Act of 1966, codified in Federal law at 49 United States (U.S.) Code § 303, requires that the U.S. government endeavors to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites.

4.1.9 Summary of Impacts and Mitigations

Section 4.20 summarizes the potential impacts and mitigation measures identified in Sections 4.2 through 4.17.
4.2 **GEOLOGY AND SOILS**

Section 4.2 describes the potential impacts to geology and soils including changes to topography and slope stability; impacts to geological functions (i.e., ability for soil and rock to filter and transmit groundwater); the potential for increased risk of exposure to geologic hazards as a result of the proposed action; and changes in soil productivity, erosion, or soil runoff.

### 4.2.1 Approach to Analysis

The methodology for identifying and evaluating impacts to geology and soils involves establishing baseline conditions through review and evaluation of maps, reports, and other relevant data showing the location and known status of topographic features, geology (i.e., geologic units and geologic hazards), and soil types. This information is then correlated to elements of the proposed action and alternatives to determine potential effects. Known deposits of mineral resources to which access would potentially be constrained or eliminated by the proposed action are evaluated qualitatively for their relative importance and value in a regional context.

The analysis of potential impacts to geology and soils considers both direct and indirect impacts. Direct impacts result from physical soil disturbances or topographic alterations, while indirect impacts include risks to soil and erosion and the impacts to water and marine biological resources away from the construction/operation site.

Appendix F, *Geology and Soils Technical Memo*, provides a detailed characterization of the geology and soils in relationship to the proposed action and alternatives.

The impact assessment for geology and soils considers the following:

- Substantial alteration of the surrounding landscape
- Effects on important geologic features (including large-scale soil or rock removal)
- Effects to site drainage from filling karst features (e.g., sinkholes)
- Diminished slope stability
- A change to soil and/or bedrock conditions that would increase the vulnerability of people or property to a geologic hazard (e.g., seismic activity, flood, tsunami, liquefaction) and the probability that such a hazard could result in injury or property damage
- Physical disturbance that would substantially increase the rate of erosion and soil loss
- Physical disturbance that would substantially increase impervious surfaces
- Reduced amounts of productive soils

Potential project impacts are evaluated based on the degree of project-induced change in a particular factor (e.g., karst geology, soil erosion) relative to existing conditions, as well as by regulatory standards, where applicable. Potential impacts related to chemical constituents that may enter soil or groundwater are indirectly related to geology and soils, and are evaluated in Section 4.3, *Water Resources*, and Section 4.16, *Hazardous Materials and Waste*. 
4.2.2 Resource Management Measures

Resource management measures applicable to geology and soils are provided below.

4.2.2.1 Avoidance and Minimization Measures

As discussed in Section 2.3, Alternatives Development, all beaches within the Military Lease Area were initially considered for amphibious training. A careful selection process was employed to determine where amphibious training with Amphibious Assault Vehicles could occur. Based on environmental criteria including analysis of bathymetry and coral cover, Unai Babui and Unai Chulu were both considered for Amphibious Assault Vehicle training. A detailed engineering analysis of construction alternatives was conducted for these two locations (see Appendix J, Amphibious Beach Landing Site Engineering and Coastal Processes Analyses). After careful consideration and input from resource agencies, it was determined that the tactical amphibious landing training beach requirements for Amphibious Assault Vehicle training could be met at one beach. Unai Chulu was chosen as the single beach for Amphibious Assault Vehicle landings because of its wider configuration in comparison to Unai Babui. Ultimately, Unai Babui was dismissed for Amphibious Assault Vehicle training to lessen environmental impacts and in accordance with input from resource management agencies, but it would still support training for Landing Craft Air Cushion vessels, small boat, and swimmer training.

4.2.2.2 Best Management Practices and Standard Operating Procedures

Best management practices and standard operating procedures that are applicable for geology and soils are listed below and described in Appendix D, Best Management Practices.

- Unified Facilities Criteria 3-310-04 (Department of Defense construction guidelines) would be employed when designing and constructing facilities and roadways in order to reduce geologic hazards associated with slope instability, seismic activity, and liquefaction (Department of Defense 2010).
- Project design and construction would minimize impacts to karst geology.
- Project design and construction would minimize erosion as required by the Commonwealth of the Northern Mariana Islands (CNMI) Earthmoving and Erosion Control Regulations.
- Engineering and drainage controls, such as silt fences, fiber rolls, gravel bag berms, mulch, and erosion control blankets would be used to avoid or minimize any potential slope instability, and changes to surface drainage resulting from the changes to the existing slopes would be avoided or minimized.
- Construction-specific stormwater management practices, such as retention ponds, swales, silt fences, fiber rolls, gravel bag berms, mulch, and erosion control blankets would be implemented to provide erosion and sediment control during the construction period. This would be done by employing on-site measures that reduce the flow and velocity of stormwater and minimize the transport of soils and sediment off-site, whenever possible.
• Operation-specific stormwater management would be accomplished through infrastructure improvements, such as retention ponds, that would manage the increased runoff associated with new impervious surfaces and minimize soil erosion in surrounding areas.

• Procedures, such as use of mulch, erosion control blankets, and preventative design measures would be in place to manage and maintain vegetation at the training and support facilities that would minimize soil erosion in surrounding areas.

• Operation-specific beach training protocols, such as use of non-mechanized methods (e.g., rakes or other hand tools) would be implemented upon initiation of the CNMI Joint Military Training (CJMT) amphibious training activities to restore beach topography as best possible.

To the extent applicable to federal projects, the CNMI Earthmoving and Erosion Control Regulations (Volume 15, Number 10, October 15, 1993) and the CNMI Environmental Protection Act (Public Law 3-23, 2 Northern Mariana Islands Commonwealth Code §§ 2601 to 2605) establish a permit process for construction activities; identify investigations and studies that are required prior to design and construction; and provide standards for grading, filling, and clearing.

4.2.3 Tinian

4.2.3.1 Tinian Alternative 1

4.2.3.1.1 Construction Impacts

Construction under Tinian Alternative 1 would involve ground disturbance, ranging from vegetation control to excavation, over approximately 1,902 acres (771 hectares). The discussion of construction impacts for Tinian Alternative 1 is divided into three parts: (1) Topography; (2) Geology; and (3) Soils. Appendix F, Geology and Soils Technical Memo, provides a detailed characterization of the topographic, geology, and soil disturbances that could occur as a result of construction activities under Tinian Alternative 1. Table 4.2-1 provides a summary of the ground disturbance, newly created impervious surface, slope, geologic units, soil conditions, prime farmland soils, and geologic hazards under Tinian Alternative 1. These topics are discussed further with relation to topography, geology, and soils following the table in this section.

4.2.3.1.1.1 Topography

Construction of the Tinian RTA support facilities, roads, related infrastructure, and training facilities associated with Tinian Alternative 1 would include clearing, grubbing, and grading; excavating (cut); and filling. Appendix F, Geology and Soils Technical Memo, summarizes the areas of ground disturbance.

Impacts resulting from changes to topography include slope instability and alteration of surface drainage patterns. These could occur when excavation and fill would take place to form level surfaces for support facilities, roads, infrastructure, and training facilities. Potential slope instability and changes to surface drainage resulting from the changes to the existing slopes would be avoided or minimized by using engineering design and controls identified in Section 4.2.2, Resource Management Measures. The following paragraphs describe the topographic disturbances associated with Tinian Alternative 1.
Table 4.2-1. Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Approximate Area of Ground Disturbance (acres)</th>
<th>Approximate Newly Created Impervious Surface (acres)</th>
<th>Elevation (feet)</th>
<th>Slope</th>
<th>Geologic Units</th>
<th>Soil Conditions</th>
<th>Approximate Prime Farmland Soils in acres</th>
<th>Geologic Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Improvements</td>
<td>5</td>
<td>5</td>
<td>0 to 33</td>
<td>&lt;1% to 2%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>Potential for liquefaction and tsunami inundation</td>
</tr>
<tr>
<td>Airfield Improvements</td>
<td>41</td>
<td>41</td>
<td>243 to 270</td>
<td>&lt;1%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Base Camp</td>
<td>257</td>
<td>30</td>
<td>254 to 279</td>
<td>1%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Munitions Storage Area</td>
<td>38</td>
<td>8</td>
<td>235 to 259</td>
<td>1%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; slight erosion factor</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Road Improvements (includes Tracked Driver Vehicle, Drivers Course and the Convoy Course)</td>
<td>299</td>
<td>299</td>
<td>0 to 314</td>
<td>Variable</td>
<td>Mariana Limestone, Tagpochau Limestone, Tinian Pyroclastics</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Range Complex A</td>
<td>527</td>
<td>0</td>
<td>145 to 285</td>
<td>Variable</td>
<td>Mariana Limestone, Tagpochau Limestone, Tinian Pyroclastics</td>
<td>Slow to medium runoff; slight to medium erosion factors</td>
<td>205</td>
<td>Fault lines</td>
</tr>
</tbody>
</table>
### Table 4.2-1. Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Approximate Area of Ground Disturbance (acres)</th>
<th>Approximate Newly Created Impervious Surface (acres)</th>
<th>Elevation (feet)</th>
<th>Slope</th>
<th>Geologic Units</th>
<th>Soil Conditions</th>
<th>Approximate Prime Farmland Soils$^1$ in acres</th>
<th>Geologic Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex B</td>
<td>47</td>
<td>47</td>
<td>125 to 290</td>
<td>1% to 11%</td>
<td>Mariana Limestone</td>
<td>Ponded, very slow, to medium runoff; slight to medium erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>80</td>
<td>80</td>
<td>85 to 310</td>
<td>1% to 11%</td>
<td>Mariana Limestone</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>14</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Range Complex D</td>
<td>475</td>
<td>22</td>
<td>35 to 115</td>
<td>1% to 9%</td>
<td>Mariana Limestone</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Facilities</td>
<td>130</td>
<td>130</td>
<td>Variable</td>
<td>Variable</td>
<td>Beach Deposits, Alluvium, Colluvium, Marsh, Mariana Limestone and Tagpochau Limestone</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>1</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Amphibious Training Area</td>
<td>3</td>
<td>0</td>
<td>0 to 15</td>
<td>5% to 15%</td>
<td>Beach Deposits</td>
<td>Slow runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Potential for tsunami inundation</td>
</tr>
<tr>
<td>Total</td>
<td>1,902</td>
<td>562</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>220</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes:**
- Prime farmland soils identified within the footprint of the facility.
- Operational footprint is the same as construction footprint, except where noted otherwise.
Support Facilities. Construction or improvements made for support facilities (i.e., port improvements, airfield improvements, base camp, and Munitions Storage Area) would include ground disturbance. However, the near-level area where this work would take place does not have substantial grade changes such as steep hills or canyons that would have to be leveled or filled. Relatively minor changes in grade are anticipated to provide a buildable surface for constructing the support facilities.

Roadways and Utilities. Construction or improvements made for roadways and access trails would involve leveling and/or filling steeper natural slopes. The majority of road improvements would be along existing roads and pathways and would only involve leveling, widening and/or filling portions where conditions are not currently suitable to accommodate necessary vehicles. Utility improvements would generally be co-located with existing improvements for supporting facilities and roadways.

Training Facilities. As described in Section 2.4.1.2 and detailed in Appendix F, Geology and Soils Technical Memo, ground disturbance associated with Range Complex A would include clearing for range construction, target placement, and associated access roads and firebreaks around the High Hazard Impact Area. Construction or improvements made to create the various training facilities within Range Complex B, Range Complex C, and Military Lease Area-wide training facilities would be limited and localized to specific features of the individual training facilities. For example, for these range complexes, the earth-moving activities would be limited to small areas such as firing points and objectives or internal trails. These activities would involve leveling and/or filling steep natural slopes. Ground disturbance within Range Complex D would include vegetation clearing of large areas for the Landing Zone and Drop Zone but mostly on relatively flat areas previously cleared for the construction of North Field. Construction and improvements for the Convoy Course would largely be co-located with existing roads or training courses; for engagement areas, there would be limited and localized clearance and earth moving activities.

Amphibious Training Areas. One amphibious landing area would be constructed at Unai Chulu. Heavy equipment and materials would be staged on land at this location. Refer to Section 4.10, Marine Biology, for discussion of construction impacts to coral, and coral reefs. Ground disturbance associated with the construction of the amphibious landing area would include a dredging volume of approximately 798,111 cubic feet (22,600 cubic meters) of earthen material. Grading would occur on the 656-foot (200-meter) location of the proposed landing ramp at a slope of 15 degrees. Construction or improvements made to create the amphibious landing area would include steel sheet pilings, temporary causeways, and access roads that would be removed following construction.

A Coastal Processes Report was conducted in support of this EIS/OEIS to assess possible impacts to Unai Chulu as a result of the development of the Amphibious Assault Vehicle landing area for details on this study see Appendix J, Amphibious Beach Landing Site Engineering and Coastal Processes Analyses. The assessment included a site investigation, a historical shoreline analysis, and modeling of waves and nearshore currents. The modeling analysis showed that the configuration of the offshore reef and the embayed shorelines at Unai Chulu combine to produce wave alignments at the shoreline that result in the formation of a beach. Model results comparing the existing condition with the Amphibious Assault Vehicle landing zone configuration suggest that the alteration of the nearshore bathymetry by dredging the Amphibious Assault Vehicle approach area and ramp should not significantly modify shoreline coastal processes and trigger erosion of the beaches. The limited spatial extent and volume of sand at
Unai Chulu suggests that the beach is vulnerable to either natural or man-made disturbances. Occasional large wave events could strip the beach nearly completely of sand, as occurs under existing conditions. The prevailing wave and current dynamics would act to rebuild the beach over time, although it is not known how quickly or to what degree.

Therefore, construction of the Amphibious Assault Vehicle landing area would not result in significant impacts to topography or the geologic processes of the beach because of the small amount of area being disturbed within the beach and the ability of prevailing wave and current dynamics to similarly alter beach topography over time.

Tinian Alternative 1 construction activities would occur in relatively flat areas and along existing roadways. This construction would not increase the potential for impacts to topography including major elevation changes, substantial alteration of the surrounding landscape, slope instability, or significant alteration of surface drainage patterns. Based upon the above analysis and implementation of the resource management measures identified in Section 4.2.2, construction of Tinian Alternative 1 would result in less than significant direct and indirect impacts to topography.

### 4.2.3.1.1.2 Geology

#### Geologic Units

Of the 1,902 acres (771 hectares) of total ground disturbance through construction activities associated with Tinian Alternative 1, approximately 1,563 acres (632 hectares) would occur over limestone formations (i.e., Mariana Limestone, Tagpochau Limestone) which are areas of high water infiltration (see Section 3.2, Geology and Soils). The disturbed area covers approximately 6.5 percent (%) of total limestone formations on Tinian. Impacts to limestone formations could affect the rock’s ability to allow water to filter down to aquifers; however, soil compaction over these limestone formations would be minimized by limiting construction vehicles to the road/trail system such that these activities would not substantially change the overall ability of the limestone formations to recharge groundwater to underlying aquifers.

Many of the proposed facilities, roads, and infrastructure are underlain by permeable limestone (i.e., Mariana Limestone, Tagpochau Limestone) which contains karst features such as caves and sinkholes. Disturbance of these karst features could have potential long-term impacts to natural drainage systems and groundwater aquifers. Construction of support facilities, roads, infrastructure, or training facilities over a sinkhole could lead to structural failure (i.e., collapse of buildings, roads, or utility conduits). Therefore, prior to any construction activities, as indicated in Section 4.2.2, Resource Management Measures, engineering studies would be conducted to identify karst features in the project area. To the extent possible, impacts would be avoided by siting facilities and infrastructure away from these karst features. Furthermore, during the construction period, construction vehicles would primarily use designated roads and construction laydown areas to minimize the disturbance to karst features.

Based on the above analysis and implementation of resource management measures identified in Section 4.2.2, Tinian Alternative 1 construction activities would result in less than significant direct and indirect impacts to geologic units.
Geological Hazards

**Seismic Activity.** Earthquakes are a type of seismic activity caused by movements of the earth's crust and originate at distances of zero to hundreds of miles underground (U.S. Geological Survey 2014). One surface manifestation of earthquakes is the displacement of the earth's crust commonly known as fault lines or ruptures. As shown in Figure 4.2-1, fault lines underlie portions of the proposed support facilities, roadways, infrastructure, and training facilities. To the extent practicable, construction directly on fault lines would be avoided. However, for those portions of the construction footprint which could not be moved to avoid fault lines, engineering designs would be employed to minimize potential effects from earth movement along fault lines. Buildings, facilities, and infrastructure would be designed, situated, and constructed in adherence to Unified Facility Criteria recommendations for seismic protection.

**Landslides.** The majority of the proposed construction (i.e., base camp, airport improvements, Munitions Storage Area, port improvements, and most of the training and support facilities) would be located on relatively level ground and would not increase the risk of landslides. However, a few portions of the supporting infrastructure for roadways would be located in areas of high topographic relief which could increase the potential for landslides. Resource management measures such as engineering design for construction, erosion controls, and protective barriers would be employed to reduce the potential for landslides to occur as a result of construction.

**Liquefaction.** Most of the Tinian Alternative 1 footprint is underlain by consolidated limestone bedrock that is not subject to liquefaction in the event of an earthquake. However, portions of the port improvements would be constructed near the coast on artificial fill materials or other unconsolidated materials that could fail due to liquefaction. An engineering study would be conducted for the site of the proposed port improvements prior to construction to evaluate subsurface conditions and determine design and construction procedures for seismic safety. Port improvements would also be constructed in adherence with Unified Facilities Criteria recommendations for seismic safety to minimize potential hazards associated with ground movement and liquefaction.

**Tsunami Inundation.** Construction activities associated with Tinian Alternative 1 are largely located inland and would not remove a substantial topographic barrier that would increase the likelihood of tsunami inundation. Construction of an amphibious landing area at Unai Chulu would not increase the likelihood of tsunami inundation in that area because the remaining surrounding limestone shelf would continue to protect the shoreline and the landing area would not significantly change the wave behavior.

Based on the above analysis and implementation of resource management measures listed in Section 4.2.2, Tinian Alternative 1 construction activities would result in less than significant direct and indirect impacts due to geologic hazards.
Figure 4.2-1 Tinian Ground Disturbance and Geologic Map for Alternatives 1 and 2

Sources: Gingerich 2002; Water and Environmental Research Institute 2002
4.2.3.1.3 Soils

Under Tinian Alternative 1, newly created impervious surface areas that would be constructed for the port improvements, base camp, Munitions Storage Area, airport improvements, road improvements, and training and support facilities for Tinian Alternative 1 would comprise approximately 562 acres (227 hectares) and represent less than 4% of the overall project footprint (i.e., Military Lease Area, airfield improvements, port improvements). This would create a minimal increase in stormwater runoff, as compared with existing conditions. Stormwater management through infrastructure improvements under Alternative 1 would include best management practices (e.g., retention ponds, swales, silt fences) to manage the increased runoff from impervious surfaces and minimize soil erosion in surrounding areas. Specific resource management measures include development and implementation of an erosion control measures, stormwater pollution prevention measures, and a stormwater management measures.

Construction-specific stormwater best management practices would be implemented to provide erosion and sediment control during the construction period (see Appendix D, Best Management Practices). These include employing on-site measures, such as retention ponds, swales, silt fences, fiber rolls, gravel bag berms, mulch, and erosion control blankets that reduce soil erosion and the flow and velocity of stormwater and minimize the transport of soils and sediment off-site. Roadway-specific best management practices would be used in the design and construction of the proposed access roads and vehicle training courses. Through compliance with the CNMI Earthmoving and Erosion Control Regulations and implementation of engineering controls and stormwater best management practices, construction activities would not substantially increase the rate of erosion and soil loss under Alternative 1.

Based on the above analysis and implementation of resource management measures identified in Section 4.2.2, Tinian Alternative 1 construction activities would result in less than significant direct and indirect impacts to soils.

Prime Farmland Soils

There are approximately 1,474 acres (597 hectares) of prime farmland soils on Tinian, with approximately 72% (1,054 acres [427 hectares]) located within the Military Lease Area. The Tinian Alternative 1 construction footprint includes approximately 220 acres (89 hectares) of area identified as prime farmland soils or 15% of the total prime farmland soils on the island. The majority of those soils (205 acres [83 hectares]) would not be permanently altered as a result of the construction activities that would primarily consist of vegetation clearance within Range Complex A. Therefore, implementation of Tinian Alternative 1 would result in less than significant direct and indirect impacts to prime farmland soils during the construction phase.

4.2.3.1.2 Operation Impacts

4.2.3.1.2.1 Support Facilities, Roadways, and Utilities

After construction is completed, ongoing operational activities are expected to involve only minor changes to topography, geology, and soils as a result of operational activities (e.g., maintenance, use) at support facilities, roadways, and utilities. These activities would not increase the potential for geologic hazards to occur.
4.2.3.1.2.2 Training Facilities

Impacts to topography, geologic units, and soils would occur as a direct result of operational training activities described in Section 2.4, Tinian Alternatives. In addition, maintenance activities (e.g., vegetation maintenance, vehicle and foot maneuvers, munitions use) could also impact soils.

Range Control would be responsible for maintaining access roads, configuring ranges and training areas, and maintaining training areas in usable condition. The training facilities would be managed in accordance with Marine Corps Order 3550.10, Policies and Procedures for Range and Training Area Management (DoN 2005). Additional resource management measures would include implementation of facilities management policies and procedures for controlling erosion such as maintaining vegetation, drainage ways, and turf on the ranges; and allowing vegetation to re-establish in the training and support facilities. Vegetation within objective areas (i.e., target location) would be maintained at a minimum of 6 inches (15 centimeters) above the ground surface, which would provide ground cover and root systems to hold soil in place.

Range Complex A. As described in Section 2.4, Tinian Alternatives, operational activities at Range Complex A would include the use of high explosives within the High Hazard Impact Area. Munitions would be thrown, fired at, or dropped on targets within the High Hazard Impact Area. Target placements would be located in areas of moderate to low slope and thus detonation of high explosives in these areas would not be expected to have an increase on the potential for landslides. In addition, these operational activities could create munitions impact craters within the upper 6 feet (2 meters) of the underlying geologic units (Army Corps of Engineers 1961) over a 527-acre (213-hectare) area. However, these operations would not substantially impact the overall function of the geologic units within the High Hazard Impact Area because these craters would be relatively shallow compared to the overall thickness of the limestone formation.

Operational activities would include ground combat training in conjunction with aviation support activities. This type of training would include the use of high explosive munitions. Earthquakes are caused by movements of the earth’s crust and originate at distances of zero to hundreds of miles underground (U.S. Geological Survey 2014). To date, there is no evidence linking earthquake activity with the use of explosives by humans (U.S. Geological Survey 2014). Therefore, training activities would not increase the potential for seismic activity.

Soil erosion could occur within Range Complex A when lands are cleared and or disturbed on a regular basis and thus decrease overall soil productivity and inhibit plant growth in those areas. Approximately 205 acres (83 hectares) of prime farmland soils are located within the High Hazard Impact Area, resulting in these soils to likely be precluded from future agricultural uses. This represents a potential permanent loss of approximately 14% of Tinian’s prime farmland soils due to the potential presence of unexploded ordnance and change in the character and productivity of the soil due to detonation of munitions, controlled burns for vegetation maintenance, and/or potential presence of munitions constituents (see Section 4.16, Hazardous Materials and Waste).

Range Complex B. As described in Section 2.4, Tinian Alternatives, within Range Complex B, personnel would move via vehicles (wheeled and tracked) along established roads and pathways and by foot over these same roads and pathways as well as open areas within the range complex. Personnel would employ their weapons systems aiming at target objective areas within the range complex.
activities would not create substantial changes to topography; alter the function of geologic units or soil productivity; or increase the potential for a geologic hazard to occur.

**Range Complex C.** Within Range Complex C, personnel would move primarily on foot to firing points where they would employ their weapons systems aiming at target objective areas within the range complex. These activities would not create substantial changes to topography; alter the function of geologic units or soil productivity; or increase the potential for a geologic hazard to occur except in the Multi-purpose Unknown Distance Range where approximately 14 acres (6 hectares) of prime farmland soils are located which will be permanently altered due to repeated heavy use which would alter soil productivity; therefore, they would be removed from use as prime farmland soils.

**Range Complex D.** Within Range Complex D, personnel would move on foot to firing points where they would employ their weapons systems aiming at target objective areas within the range complex. These activities would not create substantial changes to topography; alter the function of geologic units or soil productivity; or increase the potential for a geologic hazard to occur.

**Military Lease Area-wide Training.** As described in Section 2.4, Tinian Alternatives, some types of training would involve training assets that are distributed in areas other than Range Complexes A, B, C, and D. These training operations include Convoy Course training and Tracked Vehicle Driver’s Course training, aviation activities, amphibious training, and foot maneuvering.

**Convoy Course Training.** Convoy Course training would involve movement of wheeled vehicles along the course and employment of weapons systems aimed at Convoy Course engagement areas adjacent to the course. These activities would not result in a substantial change in topography or function of the geologic units because training would be limited to established routes and engagement areas and thus not create additional impervious surfaces. These activities would not increase the potential for a geologic hazard to occur. Approximately 1 acre (0.4 hectare) of prime farmland soils located in a Convoy Course engagement area would be permanently altered due to repeated heavy use which would alter soil productivity; therefore, they would be removed from use.

**Tracked Vehicle Driver’s Course Training.** Tracked Vehicle Driver’s Course training would involve movement of tracked vehicles along the established course. These activities would not result in a substantial change in topography, function of the geologic units, or soil productivity because training would be limited to the established routes and thus not create additional impervious surfaces. These activities would not increase the potential for a geologic hazard to occur.

**Aviation Activities.** Aviation activities associated with the Tinian RTA would be limited to take offs and landings of fixed-wing aircraft from the Landing Zone at North Field and from Tinian International Airport; take offs and landings of rotor and tilt-rotor aircraft at Landing Zones within the Military Lease Area and Tinian International Airport; and aviation support training associated with Range Complexes A, B, C, and D. Unmanned aircraft systems (i.e., drones) would take off and land from Landing Zones as well as other open areas. Aviation activities would not create substantial changes to topography, alter the function of geologic units, or decrease soil productivity. These activities would not increase the potential for a geologic hazard to occur.

**Amphibious Training.** Wave and hydrodynamic modeling conducted for the amphibious landing ramp that would be constructed at Unai Chulu indicates that minimal changes in nearshore and along-beach current velocity and wave height would occur due to the operation of the ramp, and therefore would
not result in substantial changes to beach topography (Appendix J, Amphibious Beach Landing Site Engineering and Coastal Processes Analyses).

As described in Section 2.4, Tinian Alternatives, tactical amphibious training at Unai Chulu would involve Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, inflatable boats, and combat swimmers. This is the only location proposed for tactical Amphibious Assault Vehicle landings. At Unai Babui and Unai Masalok, tactical amphibious training would include Landing Craft Air Cushion vessels, inflatable boats, and combat swimmers. At Unai Lam Lam, tactical amphibious training would include inflatable boats and combat swimmers. At the Port of Tinian, administrative amphibious training would take place at the old boat ramp.

When landing and launching Amphibious Assault Vehicles, the tracks would come in contact with the ocean bottom to depths of up to 12 feet (4 meters) and this could potentially alter the underwater topography in the landing area. For this reason, landing and launching of Amphibious Assault Vehicles during training operations would be strictly limited to the amphibious landing area at Unai Chulu for tactical landings and the old boat ramp at the Port of Tinian for administrative landings. Use of these established landing areas during the landing and launching of Amphibious Assault Vehicles would not substantially alter coastal processes that could result in erosion of the nearshore topography.

Training involving Amphibious Assault Vehicles and/or Landing Craft Air Cushion vessels would disturb the sandy beaches at Unai Babui, Unai Chulu, and Unai Masalok similar to that from normal wave action during stormy conditions (DoN 2010a), resulting in localized disturbance of soils and beach substrates. The affected beaches consist of mixed sand and coral rubble that are resistant to compaction. Landing Craft Air Cushion vessels would be on “full cushion” (i.e., fully inflated) for beach landings and are designed not to compact the sand (DoN 2010a). Amphibious Assault Vehicles are tracked vehicles and, by design, distribute weight to minimize impacts to the beach (DoN 2010a). However, Amphibious Assault Vehicle operational impacts could lead to loss of beach sand through entrainment and transport of sand off the beach by the vehicles, and through abrasion and crushing of the beach sand. If this loss is greater than the rate of natural supply of sand to the beach, the beach could gradually erode over time. Because of the limited volume of sand, even small amounts of erosion could have noticeable impacts (Appendix J, Amphibious Beach Landing Site Engineering and Coastal Processes Analyses). Training involving inflatable boats and combat swimmers would minimally disturb sandy beaches at Unai Babui, Unai Chulu, Unai Masalok, and Unai Lam Lam. After amphibious operations, beach topography would be returned to pre-training conditions to the extent possible using non-mechanized means such as hand-held tools. Because the vehicles would be operated to minimize impacts to beaches, and because beaches would be returned to the extent possible to their pre-training condition following the operation, long-term compaction of sand would not be expected to occur.

As part of all amphibious training, personnel and equipment would come and go from the beaches using designated routes. Amphibious Assault Vehicles would use the designated Tracked Vehicle Driver’s Course. Landing Craft Air Cushion vessels would on- and off-load equipment and personnel at the designated beaches (Unai Babui, Unai Chulu, Unai Masalok). Tracked vehicles would utilize the Tracked Vehicle Driver’s Course, wheeled vehicles on- and off-loaded from Landing Craft Air Cushion vessels would utilize designated roadways as well as the Tracked Vehicle Driver’s Course; and pedestrians on- and off-loaded from Landing Craft Air Cushion vessels would use the Tracked Vehicle Drivers Course, roadways, or foot paths. By using designated landing areas, courses, roadways, and pathways,
amphibious training would not result in a substantial change in topography, geologic units, soil productivity, or result in an increase in the potential for geologic hazards to occur.

**Foot Maneuvering.** Foot maneuvering would occur over a wide area which would include established training courses, roadways, pathways, and trails as well as open areas. These activities would not result in a substantial change in topography or function of underlying geologic units, soil productivity, or result in an increase in the potential for geologic hazards to occur because pedestrian activities would have lesser impact to soil cohesion and vegetation.

Based on the analysis above and implementation of resource management measures identified in Section 4.2.2, Tinian Alternative 1 operations would result in less than significant direct and indirect impacts to topography and geology. Operations would result in a significant direct impact to prime farmland soils due to the permanent loss of 15% of Tinian’s prime farmland soils, mostly within the High Hazard Impact Area.

### 4.2.3.2  Tinian Alternative 2

#### 4.2.3.2.1  Construction Impacts

Construction impacts associated with Tinian Alternative 2 would be similar to those described for Tinian Alternative 1 (Section 4.2.3.1). Appendix F, *Geology and Soils Technical Memo*, provides a detailed characterization of the topographic, geologic, and soil disturbances that could occur as a result of construction activities under Tinian Alternative 2. Table 4.2-2 provides a summary of the ground disturbance, slope, geologic units, soil conditions, prime farmland soils, and geologic hazards associated with construction under Tinian Alternative 2. Figure 4.2-1 depicts the differences in ground disturbance between Tinian Alternative 1 and Tinian Alternative 2.

Impacts to geology and soils resulting from Tinian Alternative 2 construction activities would be similar to those described for Tinian Alternative 1 with the following exceptions:

- The land area associated with Tinian Alternative 2 construction activities is larger compared to Alternative 1, because Alternative 2 would include the southern Battle Area Complex and five additional engagement areas associated with the Convoy Course. Tinian Alternative 2 would thus disturb an additional 123 acres (50 hectares) or approximately 7% more than Tinian Alternative 1 for a total of 2,025 acres (820 hectares).

- The impervious surface areas that would be constructed for Tinian Alternative 2 would comprise approximately 785 acres (319 hectares), which is an 18% increase compared to Tinian Alternative 1 but is about 4% of the total land area within the Military Lease Area. The additional impervious surfaces in Tinian Alternative 2 are related to additional objective areas in the Battle Area Complex and associated Urban Assault Course, as well as the Convoy Course engagement areas which are considered impervious surfaces due to repeated use and compaction of the soils.

- Through construction activities, Tinian Alternative 2 would disturb approximately 115 acres (46 hectares) more of limestone formations than Tinian Alternative 1 for a total 1,678 acres (679 hectares). This represents a 0.5% increase compared with Tinian Alternative 1. This represents a total of 7% disturbance of these formations across Tinian.
Table 4.2-2. Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 2

<table>
<thead>
<tr>
<th>Description</th>
<th>Approximate Area of Ground Disturbance (acres)</th>
<th>Approximate Newly Created Impervious Surface (acres)</th>
<th>Elevation (feet)</th>
<th>Slope</th>
<th>Geologic Units</th>
<th>Soil Conditions</th>
<th>Approximate Prime Farmland Soils in acres</th>
<th>Geologic Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Improvements (Same as Alternative 1)</td>
<td>5</td>
<td>5</td>
<td>0 to 33</td>
<td>&lt;1% to 2%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>Potential for liquefaction and tsunami inundation</td>
</tr>
<tr>
<td>Airfield Improvements (Same as Alternative 1)</td>
<td>41</td>
<td>41</td>
<td>243 to 270</td>
<td>&lt;1%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Base Camp (Same as Alternative 1)</td>
<td>257</td>
<td>30</td>
<td>254 to 279</td>
<td>1%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Munitions Storage Area (Same as Alternative 1)</td>
<td>38</td>
<td>8</td>
<td>235 to 259</td>
<td>1%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Road Improvements (includes Tracked Driver Vehicle Drivers Course and the Convoy Course)</td>
<td>295</td>
<td>295</td>
<td>0 to 314</td>
<td>Variable</td>
<td>Mariana Limestone, Tagpochau Limestone, Tinian Pyroclastics</td>
<td>Slow to rapid runoff; Slight to severe erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Range Complex A (Same as Alternative 1)</td>
<td>527</td>
<td>0</td>
<td>145 to 285</td>
<td>Variable</td>
<td>Mariana Limestone, Tagpochau Limestone, Tinian Pyroclastics</td>
<td>Slow to medium runoff; Slight to medium erosion factors</td>
<td>205</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Description</td>
<td>Approximate Area of Ground Disturbance (acres)</td>
<td>Approximate Newly Created Impervious Surface (acres)</td>
<td>Elevation (feet)</td>
<td>Slope</td>
<td>Geologic Units</td>
<td>Soil Conditions</td>
<td>Approximate Prime Farmland Soils* in acres</td>
<td>Geologic Hazards</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>------------------</td>
<td>-------------</td>
<td>------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Range Complex B (Same as Alternative 1)</td>
<td>47</td>
<td>47</td>
<td>125 to 290</td>
<td>1% to 11%</td>
<td>Mariana Limestone</td>
<td>Ponded, very slow, to medium runoff; slight to medium erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>157</td>
<td>157</td>
<td>85 to 310</td>
<td>1% to 11%</td>
<td>Mariana Limestone</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>25</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Range Complex D (Same as Alternative 1)</td>
<td>475</td>
<td>22</td>
<td>35 to 115</td>
<td>1% to 9%</td>
<td>Mariana Limestone</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Facilities</td>
<td>180</td>
<td>180</td>
<td>Variable</td>
<td>Variable</td>
<td>Beach Deposits, Alluvium, Colluvium, Marsh, Mariana Limestone and Tagpochau Limestone</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Amphibious Training Area (Same as Alternative 1)</td>
<td>3</td>
<td>0</td>
<td>0 to 15</td>
<td>5% to 15%</td>
<td>Beach Deposits</td>
<td>Slow runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Potential for tsunami inundation</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,025</strong></td>
<td><strong>785</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>230</strong></td>
<td><strong>-</strong></td>
</tr>
</tbody>
</table>

Notes: *Prime farmland soils identified within the footprint of the facility.

Operational footprint is the same as construction footprint, except where noted otherwise.
• Through construction activities, Tinian Alternative 2 would disturb approximately 10 acres (4 hectares) more of prime farmland soils, as compared to Tinian Alternative 1, for a total of 230 acres (93 hectares). This represents an increase of approximately 1% as compared to Tinian Alternative 1. As described for Tinian Alternative 1, most of the identified prime farmland soils in the proposed action area would not be permanently altered as a result of construction activities.

Tinian Alternative 2 would follow the same resource management measures as those described in Section 4.2.2. The very small increase in the amount of on-land construction, limestone formation disturbance, soil disturbance, and earthwork does not change the effectiveness of the resource management measures at avoiding or minimizing adverse impacts.

Based on the above analysis and implementation of resource management measures, Tinian Alternative 2 construction activities would result in less than significant impacts to topography, geology, and soils.

4.2.3.2.2 Operation Impacts

Impacts resulting from Tinian Alternative 2 operations would be similar to those described under Tinian Alternative 1. However, the addition of a southern Battle Area Complex and associated Urban Assault Course, as well as five additional engagement areas associated with the Convoy Course, results in a larger area used for foot and vehicle maneuvers and training. Implementation of Tinian Alternative 2 would also follow the same resource management measures as described in Section 4.2.2. The small acreage increase located proximate to areas already contemplated for training and sharing their same physical characteristics does not change the impact conclusions described for Tinian Alternative 1.

As described under construction impacts for Tinian Alternative 2, approximately 230 acres (93 hectares) of prime farmland soils would be included in the footprint of Tinian Alternative 2. Only a small portion of the identified prime farmland soils in the Tinian Alternative 2 footprint would represent temporary losses, and would be available for agricultural production after the duration of military use has ended. However, approximately 205 acres (83 hectares) of prime farmland soils would be located within the High Hazard Impact Area for Tinian Alternative 2, resulting in these soils to likely be precluded from future agricultural uses. This represents a potential permanent loss of approximately 14% of Tinian’s prime farmland soils due to the potential presence of unexploded ordnance and change in the character and productivity of the soil. Compared with Tinian Alternative 1, approximately 11 acres (4 hectares) of additional prime farmland soils are located within Range Complex C that are associated with the additional objective areas under Tinian Alternative 2; this results in a total of 25 acres (10 hectares) of prime farmland soils associated with Range Complex C for Tinian Alternative 2. These prime farmland soils would be permanently altered due to repeated heavy use which would alter soil productivity; therefore, they would be removed from use. In total, approximately 230 acres (93 hectares) of prime farmland soils would be lost to future use under Tinian Alternative 2 which is approximately 16% of Tinian’s total prime farmland soils. The loss of these prime farmland soils for future use is considered a significant impact to prime farmland soils under operations.

Based on the above analysis and implementation of resource management measures described in Section 4.2.2, Tinian Alternative 2 operations would result in less than significant direct and indirect impacts to topography and geology. Tinian Alternative 2 would result in a significant direct impact to
prime farmland soils due to the permanent loss of 16% of Tinian’s prime farmland soils within the Military Lease Area.

### 4.2.3.3 Tinian Alternative 3

#### 4.2.3.3.1 Construction Impacts

Construction impacts for Tinian Alternative 3 would be similar to those described under Section 4.2.3.1, Tinian Alternative 1. Appendix F, Geology and Soils Technical Memo, provides a characterization of the topographic, geologic, and soil disturbances that could occur as a result of construction activities under Tinian Alternative 3. Table 4.2-3 provides a summary of the ground disturbance, slope, geologic units, soil conditions, prime farmland soils, and geologic hazards associated with construction under Tinian Alternative 3. Figure 4.2-2 depicts the differences in ground disturbance between Tinian Alternative 1 and Tinian Alternative 3.

Impacts resulting from Tinian Alternative 3 construction activities would be similar to those described for Tinian Alternative 1 with the following exceptions:

- Slightly more on-land construction would take place for Alternative 3 as compared with Alternative 1 because Alternative 3 would include the southern Battle Area Complex and five additional engagement areas associated with the Convoy Course; however, it would not include the northern Battle Area Complex and thus impact less acreage than Tinian Alternative 2 which has two Battle Area Complexes. Tinian Alternative 3 would disturb approximately 101 acres (41 hectares) or about 5% more than Tinian Alternative 1 for an approximate total of 2,002 acres (811 hectares).

- The impervious surface areas that would be constructed for the port improvements, base camp, Munitions Storage Area, airport improvements, and training and support facilities for Tinian Alternative 3 would comprise a total of approximately 763 acres (309 hectares) or approximately 15% more impervious surface than Tinian Alternative 1, approximately 4% of the total land area within the Military Lease Area. The additional impervious surfaces associated with Tinian Alternative 3 that are not part of Tinian Alternative 1 are located in the Convoy Course engagement areas which would become impervious as a result of repeated use.

- Through construction activities, Tinian Alternative 3 would disturb approximately 93 acres (38 hectares) more of limestone formations than Tinian Alternative 1 for a total 1,656 acres (670 hectares). This represents a 0.5% increase in disturbance of these formations as compared to Tinian Alternative 1 for a total of 7% disturbance of these formations across Tinian.

- Through construction activities, Tinian Alternative 3 would temporarily disturb approximately 10 acres (4 hectares) more prime farmland soil, as compared to Tinian Alternative 1, for a total of 230 acres (93 hectares). This represents an increase of approximately 1% compared to Tinian Alternative 1 and represents 16% of the total prime farmland soils across Tinian.

Tinian Alternative 3 would follow the same resource management measures as those described in Section 4.2.2. The very small difference in the amount of on-land construction, limestone formation disturbance, soil disturbance, and earthwork would not change the effectiveness of the resource management measures at avoiding or minimizing adverse impacts.
### Table 4.2-3. Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 3

<table>
<thead>
<tr>
<th>Description</th>
<th>Approximate Area of Ground Disturbance (acres)</th>
<th>Approximate Newly Created Impervious Surface (acres)</th>
<th>Elevation (feet)</th>
<th>Slope</th>
<th>Geologic Units</th>
<th>Soil Conditions</th>
<th>Approximate Prime Farmland Soils in acres</th>
<th>Geologic Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Improvements (Same as Alternative 1)</td>
<td>5</td>
<td>5</td>
<td>0 to 33</td>
<td>&lt;1% to 2%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>Potential for liquefaction and tsunami inundation</td>
</tr>
<tr>
<td>Airfield Improvements (Same as Alternative 1)</td>
<td>41</td>
<td>41</td>
<td>243 to 270</td>
<td>&lt;1%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Base Camp (Same as Alternative 1)</td>
<td>257</td>
<td>30</td>
<td>254 to 279</td>
<td>1%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; Slight erosion factor</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Munitions Storage Area (Same as Alternative 1)</td>
<td>38</td>
<td>8</td>
<td>235 to 259</td>
<td>1%</td>
<td>Mariana Limestone</td>
<td>Slow runoff; slight erosion factor</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Road Improvements (includes Tracked Driver Vehicle Course and the Convoy Course)</td>
<td>295</td>
<td>295</td>
<td>0 to 314</td>
<td>Variable</td>
<td>Mariana Limestone, Tagpochau Limestone, Tinian Pyroclastics</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Range Complex A (Same as Alternative 1)</td>
<td>527</td>
<td>0</td>
<td>145 to 285</td>
<td>Variable</td>
<td>Mariana Limestone, Tagpochau Limestone, Tinian Pyroclastics</td>
<td>Slow to medium runoff; slight to medium erosion factors</td>
<td>205</td>
<td>Fault lines</td>
</tr>
</tbody>
</table>
Table 4.2-3. Summary of Ground Disturbance, Slope, Geologic Units, Soil Conditions, Prime Farmland Soils, and Geologic Hazards Associated with Construction Under Tinian Alternative 3

<table>
<thead>
<tr>
<th>Description</th>
<th>Approximate Area of Ground Disturbance (acres)</th>
<th>Approximate Newly Created Impervious Surface (acres)</th>
<th>Elevation (feet)</th>
<th>Slope</th>
<th>Geologic Units</th>
<th>Soil Conditions</th>
<th>Approximate Prime Farmland Soils in acres</th>
<th>Geologic Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex B (Same as Alternative 1)</td>
<td>47</td>
<td>47</td>
<td>125 to 290</td>
<td>1% to 11%</td>
<td>Mariana Limestone</td>
<td>Ponded, very slow, to medium runoff; slight to medium erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Range Complex C (Same as Alternative 2)</td>
<td>157</td>
<td>157</td>
<td>85 to 310</td>
<td>1% to 11%</td>
<td>Mariana Limestone</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>25</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Range Complex D</td>
<td>453</td>
<td>0</td>
<td>35 to 115</td>
<td>1% to 9%</td>
<td>Mariana Limestone</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Facilities (includes Convoy Course engagement areas) (Same as Alternative 2)</td>
<td>180</td>
<td>180</td>
<td>Variable</td>
<td>Variable</td>
<td>Beach Deposits, Alluvium, Colluvium, Marsh, Mariana Limestone and Tagpochau Limestone</td>
<td>Slow to rapid runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Fault lines</td>
</tr>
<tr>
<td>Amphibious Training Area (Same as Alternative 1)</td>
<td>3</td>
<td>0</td>
<td>0 to 15</td>
<td>5% to 15%</td>
<td>Beach Deposits</td>
<td>Slow runoff; slight to severe erosion factors</td>
<td>None</td>
<td>Potential for tsunami inundation</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,003</strong></td>
<td><strong>763</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>230</strong></td>
<td></td>
</tr>
</tbody>
</table>

Notes: ¹Prime farmland soils identified within the footprint of the facility.
Operational footprint is the same as construction footprint, except where noted otherwise.
Figure 4.2-2 Tinian Ground Disturbance and Geologic Map for Alternatives 1 and 3

Legend
- Ground Disturbance Alternative 1
- Ground Disturbance Alternative 3
- Military Lease Area
- Surface Radar Site
- Fault Line (tectonic)
- Convoy Course Alternative 1 and 3
- Convoy Course Alternative 1 Only
- Convoy Course Alternative 3 Only

Geologic Units
- Tinian Pyroclastic Rocks
- Tagpochau Limestone
- Mariana Limestone
- Beach Deposits, Alluvium, Colluvium and Marsh
- Karst Feature (closed depressions)
  - Banana Hole (BH)
  - Discharge Feature (DF)
  - Flank Margin Cave (FM)
  - Fracture Cave (FC)
  - Recharge Feature (RF)

Sources: Gingerich 2002; Water and Environmental Research Institute 2002
Based on the above analysis and the implementation of resource management measures, construction under Tinian Alternative 3 would result in less than significant impacts to topography, geology, and soils.

4.2.3.3.2 Operation Impacts

Impacts resulting from Tinian Alternative 3 operations would be similar to those described under Tinian Alternative 1. Tinian Alternative 3 would also follow the same resource management measures as described in Section 4.2.2. The only difference is that operational activities would take place over a slightly larger area for Tinian Alternative 3 as compared with Tinian Alternative 1. The small acreage increase located proximate to areas already contemplated for training and sharing their same physical characteristics does not change the impact conclusions described for Tinian Alternative 1.

As described under construction impacts for Tinian Alternative 3, approximately 230 acres (96 hectares) of prime farmland soils would be included in the footprint of Tinian Alternative 3. Only a small portion of the identified prime farmland soils in the Tinian Alternative 3 footprint would represent temporary losses, and would be available for agricultural production after the duration of military use has ended. However, approximately 205 acres (83 hectares) of prime farmland soils would be located within the High Hazard Impact Area for Tinian Alternative 3, resulting in these soils to likely be precluded from future agricultural uses. Compared with Tinian Alternative 1, approximately 11 acres (4 hectares) of additional prime farmland soils are located within Range Complex C that are associated with the additional objective areas under Tinian Alternative 3; this results in a total of 25 acres (10 hectares) of prime farmland soils associated with Range Complex C for Tinian Alternative 3. These prime farmland soils will be permanently altered due to repeated heavy use which would alter soil productivity; therefore, they would be removed from use. In total, approximately 230 acres (93 hectares) of prime farmland soils would be lost to future use under Tinian Alternative 3 which is approximately 16% of Tinian’s total prime farmland soils. The loss of these prime farmland soils for future use is considered a significant impact to prime farmland soils under operations.

Based on the above analysis, Tinian Alternative 3 operations would result in less than significant direct and indirect impacts to topography and geology. Tinian Alternative 3 operations would result in a significant direct impact to prime farmland soils due to the permanent loss of 16% of Tinian’s prime farmland soils within the Military Lease Area.

4.2.3.4 Tinian No-Action Alternative

Activities during the periodic military non-live-fire training exercises on Tinian in the Military Lease Area would have short-term and minor effects on geology and soils due to vehicle and troop movements. The military operations on the four ranges proposed in the 2010 Record of Decision in the Guam and CNMI Military Relocation EIS (DoN 2010b) would not significantly change the topography, effect geologic units, increase the potential for soil erosion and sedimentation, or intensify risks from geologic hazards (see Table 3.2-2; DoN 2010c). Other military training in the Mariana Islands Range Complex does not overlie Tinian’s main potable water supply, so soil compaction during training activities would not affect infiltration of surface water into the groundwater (see Table 3.1-2; DoN 2010a and Section 4.3, Water Resources). Training activities would not alter the functions of the geologic units or soils. Therefore, the no-action alternative would result in less than significant impacts to geology and soils on Tinian.
4.2.3.5 Summary of Impacts for Tinian Alternatives

Table 4.2-4 provides a comparison of the potential impacts to geology and soils resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>Geology and Soils</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Topography</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Geology</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Soils</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Prime Farmland Soils</td>
<td>LSI</td>
<td>SI</td>
<td>LSI</td>
<td>SI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.
4.2.4  Pagan

4.2.4.1  Pagan Alternative 1

4.2.4.1.1  Construction Impacts

Proposed development and construction activities associated with Pagan Alternative 1 would involve approximately 764 acres (310 hectares) of ground disturbance as described below. The discussion of construction impacts for Pagan Alternative 1 is divided into three parts: (1) Topography; (2) Geology; and (3) Soils. Table 4.2-5 provides a summary of the ground disturbance, newly created impervious surface, elevation, slope, geologic units, and geologic hazards under Pagan Alternative 1. The discussion of construction period impacts to topography, geology, and soils is provided in the section below.

4.2.4.1.1.1  Topography

Construction of the training and support facilities, military training trails, and related infrastructure associated with Pagan Alternative 1 would include clearing, grubbing, and grading; excavating (cut); and filling. Appendix F, Geology and Soils Technical Memo, summarizes the areas of ground disturbance.

Potential slope instability and changes to surface drainage resulting from the changes to the existing slopes would be avoided or minimized by using resource management measures identified in Section 4.2.2 and described in Appendix D, Best Management Practices. The following paragraphs generally describe the topographic disturbances associated with Pagan Alternative 1.

Airfield Clear Zone. Approximately 484 acres (196 hectares) would require 100% vegetation clearance to 6 inches (15 centimeters) in height in order to create an airfield clear zone around the 41-acre (17-hectare) expeditionary airfield. It would also encompass the 42-acre (17-hectare) expeditionary base camp/bivouac area. The ground disturbance for these facilities is described below.

- Grading and removal of lava rock (basalt) at the airfield (approximately 41 acres [17 hectares]). Construction methods used to remove the lava rock would include use of explosive charges to discretely break apart the lava rock into manageable pieces. Heavy equipment would be used to remove the rock materials for use as gravel and fill materials at other locations. Approximately 615,000 cubic yards (470,000 cubic meters) of lava rock would be removed under the construction activities associated with the airfield.

- Grading and vegetation clearance the expeditionary base camp/bivouac area (approximately 42 acres [17 hectares]).

- Construction of a concrete berm and pad for the Forward Arming and Refueling Point and a concrete pad for the Hot Cargo Pad would be completed.

Military Training Trails. Approximately 22 miles (35 kilometers) of existing all-terrain vehicle trails would be widened, cleared, and graded only where necessary to create 14-foot (4-meter)-wide military training trails (approximately 39 acres [16 hectares]) to accommodate vehicle traffic.

Some training facilities would have a reduced infiltration rate due to the compaction associated with the proposed training activity and may contribute to increased stormwater flows. Therefore, as a conservative estimate, these areas are included in construction impacts as impervious surface.
Table 4.2-5. Summary of Ground Disturbance, Slope, Geologic Units and Geologic Hazards Associated with Construction under Pagan Alternative 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Approximate Area of Ground Disturbance (acres)</th>
<th>Approximate Newly Created Impervious Surface (acres)</th>
<th>Elevation (feet)</th>
<th>Slope</th>
<th>Geologic Units</th>
<th>Geologic Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expeditionary Base Camp/ Bivouac Area</td>
<td>42</td>
<td>42</td>
<td>0 to 200</td>
<td>&lt;1% to 5%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Airfield</td>
<td>41</td>
<td>41</td>
<td>0 to 200</td>
<td>&lt;1% to 5%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Military Training Trails</td>
<td>37</td>
<td>37</td>
<td>0 to 400</td>
<td>&lt;1% to &gt;31%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Unpaved route between the Airfield and the Munitions Storage Area</td>
<td>7</td>
<td>7</td>
<td>0 to 250</td>
<td>&lt;1% to 5%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Unpaved Access Roads</td>
<td>2</td>
<td>2</td>
<td>0 to 400</td>
<td>Variable</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Munitions Storage Area</td>
<td>35</td>
<td>10</td>
<td>25 to 100</td>
<td>&lt;1%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>North Range Complex</td>
<td>216</td>
<td>216</td>
<td>0 to 400</td>
<td>&lt;0% to 31%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Northern High Hazard Impact Target Areas (Mount Pagan)</td>
<td>319</td>
<td>0</td>
<td>0 to 1,870</td>
<td>&lt;1% to 5%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Isthmus High Hazard Impact Target Area</td>
<td>64</td>
<td>0</td>
<td>0 to 1,700</td>
<td>&lt;1 to 31+%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>764</strong></td>
<td><strong>355</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
</tr>
</tbody>
</table>

*Note: Operational footprint is the same as construction footprint, except where noted otherwise.*
Munitions Storage Area. Grading and clearing for a Munitions Storage Area would be completed (approximately 10 acres [4 hectares]) and concrete pads and fencing would be constructed. Unpaved gravel access routes between the Munitions Storage Area and the airfield would be cleared and graded (10 acres [4 hectares]). Total ground disturbance during the construction phase would be 35 acres (14 hectares).

North Range Complex. Training facilities within the North Range Complex including Landing Zones, Field Artillery Indirect Fire Range and Mortar Range firing positions, and a Field Artillery Direct Fire Range firing position (216 acres [88 hectares]) would be cleared and graded.

In addition, approximately 319 acres (130 hectares) inside the northern High Hazard Impact Area have been identified for target placement. Targets are generally located in relatively flat (10-20% slopes), sparsely vegetated areas of barren lava flow which would not require grading or clearing. However, two target placements are located in areas with forest vegetation which would require some vegetation clearance. The target boxes are assumed to be pervious surfaces.

Approximately 64 acres (26 hectares) inside the isthmus High Hazard Impact Area would be cleared for target placement and firebreaks. The target area is located across a section of the isthmus with an average slope of 23%. The target boxes are assumed to be pervious surfaces.

South Range Complex. The South Range Complex would not require any construction footprint.

Impacts resulting from changes to topography (e.g., slope instability and alteration of surface drainage patterns) could occur when excavation and fill activities take place to form level surfaces for RTA facilities and military training trails. Although the overall Pagan Alternative 1 construction footprint encompasses different elevations across the northern part of the island (see Chapter 2, Proposed Action and Alternatives, Figure 2.5-6), most of the earth work would occur in areas of modest elevation changes. The most extensive construction with potential for impacts to topography would be associated with the improvements for the airfield and expeditionary base camp/bivouac area. However, this work would take place on the surface of the near-level existing grass airfield. The removal of the lava from the airfield footprint would require a substantial change in topography in a limited area (i.e., on the airfield); however, no substantial grade changes (e.g., excavation of steep hills or fill of canyons) would be required within the expeditionary base camp/bivouac area. For this reason, moderate changes in grade are anticipated to provide a buildable surface for improving the airfield and constructing the expeditionary base camp/bivouac area under Pagan Alternative 1.

Resource management measures would be used to minimize any potential slope instability and changes to surface drainage. As described in Section 2.5.1.1, construction would occur in short phases over an 8 to 10 year period, which would reduce the amount of soil disturbance and erosion that would occur at any given time, allowing vegetation to re-establish and re-stabilize soils in construction-disturbed areas.

Construction outside of the expeditionary base camp and airfield for the Pagan Alternative 1 would be very limited and localized to specific components (e.g., firing points and targets) within the High Hazard Impact Areas and Live-Fire Maneuver Area and military training trails. In the small areas where construction would involve levelling/filling steeper natural slopes, impacts to slope stability would be avoided or minimized by using resource management measures described in Section 4.2.2. Construction activities associated with Pagan Alternative 1 would not involve large-scale cut and fill work in areas of
major elevation changes and therefore would not substantially alter the surrounding landscape, reducing slope stability, or alter surface drainage patterns.

Based on the analysis presented above and the implementation of resource management measures, Pagan Alternative 1 construction activities would result in less than significant direct and indirect impacts to topography.

4.2.4.1.1.2 Geology

Geologic Units

The construction footprint associated with Pagan Alternative 1 is located in an area of lava and ash deposits, with limited portions of the shoreline supporting raised reef deposits. Additionally, there is an estimated 13.1 million tons (11.9 million metric tons) of commercial grade pozzolan, a material used as an additive to strengthen concrete (Ding and Wilson 2007). Construction activities under Pagan Alternative 1 would disturb portions of the pozzolan deposit and other geologic units. However, these disturbances would be limited in aerial extent and most would be temporary, resulting in no loss of function of the geologic unit.

Based on the analysis above and the resource management measures identified in Section 4.2.2, Pagan Alternative 1 construction activities would result in less than significant impacts to geologic units.

Geologic Hazards

Pagan is located in an active seismic zone and is home to two active volcanos. As a result, the potential for geologic hazards such as seismic activity (i.e., earthquakes, fault ruptures), volcanic activity, landslides, and potential tsunami inundation exists.

Seismic Activity. Seismic activity on Pagan is related to its close proximity to the Mariana Trench subduction zone and volcanic activity on the island. There would be no permanent buildings under the Pagan alternatives and therefore adherence to Unified Facility Criteria recommendations for seismic protection would not apply. Most of the Pagan Alternative 1 footprint is underlain by consolidated volcanic rock that would not be subject to liquefaction in the event of an earthquake. Surface level construction activities would not interfere with these geological processes and would not increase the risk of seismic activity.

Volcanic Activity. Construction activities would occur primarily on the northern portion of Pagan, in the immediate vicinity of Mount Pagan, an active volcanic vent. Volcanic activity occurs when there are changes to the density of magma or pressure surrounding magma deep within the earth. Surface level construction activities would not interfere with these geological processes and would not increase the risk of volcanic activity.

Landslides. The majority of the proposed construction (i.e., the airfield and expeditionary base camp/bivouac area) would be located on relatively level ground. As such, land-disturbing activities in association with construction of these facilities are not likely to increase the risk of landslides. However, some components of the training and support facilities (e.g., military training trails) would be located in areas of high topographic relief resulting in some potential for slope instability. This potential would be reduced through the use of standard engineering practices. Clearance of targets in the High Hazard
Impact Areas would not involve any changes in topography – only vegetation clearance for target placement.

Tsunami Inundation

Construction activities associated with Pagan Alternative 1 are largely located inland. Construction of military training trails near the coast would not remove a substantial topographic barrier that would increase the likelihood of tsunami inundation.

Pagan Alternative 1 construction activities would not significantly increase the potential for geologic hazards. Therefore, Pagan Alternative 1 would result in less than significant direct and indirect impacts with respect to geologic hazards.

4.2.4.1.1.3 Soils

As part of construction, approximately 764 acres (310 hectares) would be disturbed under Pagan Alternative 1. Construction and future repeated use for training would result in approximately 355 acres (144 hectares) of newly created impervious surfaces. There is a potential for increased erosion, compaction, and soil loss from physical disturbance caused by construction activity and changes to existing topography. However, project design and construction would incorporate best management practices (see Appendix D, Best Management Practices) to minimize erosion as required by CNMI Earthmoving and Erosion Control Regulations, including construction-specific stormwater best management practices. These practices would be implemented to provide erosion and sediment control during the construction period. This would be done by employing on-site measures that would reduce the flow and velocity of stormwater runoff and minimize the transport of soils and sediment off-site, whenever possible. Best management practices would be used in the design and construction of the proposed military training trails. Through compliance with the CNMI Earthmoving and Erosion Control Regulations and implementation of stormwater best management practices, construction activities would not substantially increase the rate of erosion and soil loss under Pagan Alternative 1.

Based on the analysis above and the implementation of resource management measures, Pagan Alternative 1 would result in less than significant direct and indirect impacts to soils.

4.2.4.1.2 Operation Impacts

Under Pagan Alternative 1, use of high explosive munitions (i.e., naval gunfire, ground-based artillery, inert aviation ordnance) in the northern and isthmus High Hazard Impact Areas would impact topography. The use of high-explosive munitions on ground targets in the two High Hazard Impact Areas could trigger localized rockslides/landslides. In the northern High Hazard Impact Area, targets are generally located on relatively flat, sparsely vegetated areas of the lava field, with some exceptions. The target area in the isthmus High Hazard Impact Area would be located across a 64-acre (26-hectare) area on a steep-sloped isthmus (15% slope). Small scale rockslides could occur as a result of high explosive munitions landing in the target area. Outside of the two High Hazard Impact Areas, ongoing training and maintenance activities would not involve alteration of topography other than minor excavation or filling (e.g., repairs to military training trails).

In addition, detonations of high-explosive munitions in the two High Hazard Impact Areas would create munitions impact craters within the upper 6 feet (2 meters) of the underlying geologic unit (Army Corps
of Engineers 1961). These impact craters would be limited to the target areas and would not substantially alter the function of the geologic units.

Most of the Pagan Alternative 1 footprint is underlain by consolidated volcanic rock that would not be subject to liquefaction in the event of an earthquake. In addition, there would not be a change to soil and/or bedrock conditions that would increase vulnerability to seismic activity. Earthquakes are caused by movements of the earth’s crust, and originate at distances of tens to hundreds of miles underground. There is no evidence linking earthquake activity with the use of explosives (U.S. Geological Survey 2014).

Impacts to soils would occur as a direct result of training and maintenance activities (e.g., vegetation maintenance, vehicle and foot maneuvers, and ordnance use). The impervious surface areas associated with Pagan Alternative 1 would include approximately 355 acres (144 hectares). The increase of impervious surface would be relatively small compared to the overall land area and would create a minimal increase in runoff as compared with existing conditions. Stormwater management through infrastructure improvements associated with Pagan Alternative 1 would include best management practices to manage the increased runoff from the new impervious surfaces and minimize soil erosion in surrounding areas.

Vehicle and foot maneuver areas in the North Range Complex would be limited to proposed military training trails or areas easily accessible due to relatively flat terrain and lack of vegetation (i.e., barren lava). Maneuver areas in the South Range Complex would be limited to accessible pathways within densely vegetated areas.

Targets would be established over approximately 319 acres (130 hectares) in the northern High Hazard Impact Area. A total of eight targets are proposed in an array around Mount Pagan, three to the northeast and five to the south and southwest. Size of the target areas varies from 5 acres (2 hectares) to 135 acres (55 hectares). Slopes on the target areas range between 5% and 25%. Six of the eight targets would be located on barren ground or barren lava where there would be minimal soil or vegetation cover. However, a total of approximately 91 acres (37 hectares) at two of the proposed high explosive targets would be located in forested areas. Within the northern High Hazard Impact Area stormwater runoff would continue to follow the natural drainage patterns. Soil erosion associated with operations within the northern High Hazard Impact Area is expected to be limited because targets have relatively low slopes and are largely devoid of soil cover (i.e., barren lava field). Best management practices would be utilized in areas that require vegetation clearance to prevent soil erosion during storm events.

A single target area would be established over approximately 64 acres (26 hectares) in the isthmus High Hazard Impact Area. The target area is underlain by weathered volcanic material (i.e., clay material). Soil erosion associated with operations within the isthmus High Hazard Impact Area is expected to be limited because targets are largely devoid of soil cover (i.e., barren lava). Best management practices would be utilized in areas within the isthmus High Hazard Impact Area that require vegetation clearance to prevent soil erosion during storm events. In the isthmus High Hazard Impact Area, stormwater runoff controls would not be practicable due to the steep topography. Although the average slope of the target area within the isthmus High Hazard Impact Area would be approximately 30%, the areas around the plateau are steep; therefore, some localized soil erosion could occur during heavy rainfall events but will not result in significant impacts to soil erosion. Soil-laden stormwater runoff could flow through the
vegetation in the cleared area around the targets and eventually into vegetated areas on the steep slopes of the isthmus and into the nearshore waters.

Areas disturbed by operational activities on hillsides would erode much faster than on flat ground, as stormwater runoff would have greater erosive energy as it moves downhill. Soil compaction, disturbance, and movement would be minimized by limiting the use of wheeled and tracked vehicles to established military training trails or accessible open areas and limiting ordnance expenditures to target areas within the established range complexes.

Range Control would be responsible for maintaining support facilities, training facilities, and military training trails. The training and support facilities would be managed in accordance with Marine Corps Order 3550.10, *Policies and Procedures for Range and Training Area Management*, which is designed to ensure safe, efficient, effective, and environmentally sustainable use of ranges (DoN 2005). Procedures would be implemented for managing stormwater; controlling erosion; maintaining vegetation, drainage ways, and turf within the RTA; and restricting vehicle and foot maneuver activities to designated areas. Range military training trails would be maintained to minimize erosion. Vegetation would be allowed to re-establish at the training and support facilities to minimize the potential for soil erosion. Periodic vegetation maintenance would occur as necessary.

Pagan Alternative 1 operations would not significantly increase the potential for impacts to topography, geologic units, geologic hazards, and soils. Therefore, Pagan Alternative 1 operations would result in less than significant direct and indirect impacts to topography, geologic units, geologic hazards, and soils.

### 4.2.4.2 Pagan Alternative 2

#### 4.2.4.2.1 Construction Impacts

Construction activities associated with Pagan Alternative 2 would use the same construction methods as those described for Pagan Alternative 1 and would take place in the same general topography, geology, and soils. Geologic hazards would also be similar to those described under Pagan Alternative 1. The primary difference is that Pagan Alternative 2 would have no isthmus High Hazard Impact Area and the northern High Hazard Impact Area would be smaller than that for Pagan Alternative 1. In addition, there would be two additional Landing Zones and one less mortar firing position resulting in 68 acres (28 hectares) less ground disturbance. Under Pagan Alternative 2, the same area of the northern High Hazard Impact Area would be improved for target placement as described under Pagan Alternative 1. A summary of ground disturbance for Pagan Alternative 2 is provided below in Table 4.2-6.

Pagan Alternative 2 would also follow the same construction resource management measures as those described for Pagan Alternative 1 (see Section 4.2.2). The difference in the amount of on-land construction, soil disturbance, and earthwork would not change the effectiveness of the construction resource management measures at avoiding or minimizing adverse impacts to geology and soils.

Pagan Alternative 2 construction activities would not significantly increase the potential for impacts to topography, geologic units, geologic hazards, and soils. Therefore, construction activities associated with Pagan Alternative 2 would result in less than significant direct and indirect impacts to topography, geologic units, geologic hazards, and soils.
### Table 4.2-6. Summary of Ground Disturbance, Slope, Geologic Units and Geologic Hazards Associated with Construction under Pagan Alternative 2

<table>
<thead>
<tr>
<th>Description</th>
<th>Approximate Area of Ground Disturbance (acres)</th>
<th>Approximate Newly Created Impervious Surface (acres)</th>
<th>Elevation (feet)</th>
<th>Slope</th>
<th>Geologic Units</th>
<th>Geologic Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expeditionary Base Camp/Bivouac Area (Same as Alternative 1)</td>
<td>42</td>
<td>42</td>
<td>0 to 200</td>
<td>&lt;1% to 5%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Airfield (Same as Alternative 1)</td>
<td>41</td>
<td>41</td>
<td>0 to 200</td>
<td>&lt;1% to 5%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Military Training Trails (Same as Alternative 1)</td>
<td>37</td>
<td>37</td>
<td>0 to 400</td>
<td>&lt;1% to &gt;31%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Unpaved route between the Airfield and the Munitions Storage Area</td>
<td>7</td>
<td>7</td>
<td>0 to 250</td>
<td>&lt;1% to 5%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Unpaved Access Roads (Same as Alternative 1)</td>
<td>2</td>
<td>2</td>
<td>0 to 400</td>
<td>Variable</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Munitions Storage Area (Same as Alternative 1)</td>
<td>35</td>
<td>10</td>
<td>25 to 100</td>
<td>&lt;1%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>North Range Complex</td>
<td>213</td>
<td>213</td>
<td>0 to 400</td>
<td>&lt;0% to 31%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td>Northern High Hazard Impact Target Area (Same as Alternative 1 [Mount Pagan])</td>
<td>319</td>
<td>0</td>
<td>0 to 1,870</td>
<td>&lt;1% to 5%</td>
<td>Sedimentary Deposits and volcanic rocks (lava and ash)</td>
<td>Potential for seismic activity and tsunami inundation</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>696</strong></td>
<td><strong>347</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note:* Operational footprint is the same as construction footprint, except where noted otherwise. The isthmus High Hazard Impact Area is not included in Pagan Alternative 2.
4.2.4.2 Operation Impacts

Pagan Alternative 2 operational activities would be similar to those described under Pagan Alternative 1. The main difference with Pagan Alternative 2 is that there would be more area for ground maneuver training due to a smaller northern High Hazard Impact Area and the absence of the isthmus High Hazard Impact Area (areas where maneuver would not be allowed due to the presence of unexploded ordnance). Due to the larger maneuver area, there would be more surface area potentially affected by vehicle and foot maneuvers. Target placements within the northern High Hazard Impact Area would be the same under both alternatives but there would be no target placements in the South Range Complex.

Pagan Alternative 2 would follow the same resource management measures as those described for Pagan Alternative 1 (see Section 4.2.2). The differences in the size of the High Hazard Impact Area and vehicle maneuver areas and number of vehicle maneuvers would not change the effectiveness of the resource management measures in preventing and minimizing adverse impacts to geology and soils.

Pagan Alternative 2 operations would not significantly increase the potential for impacts to topography, geologic units, geologic hazards, and soils. Therefore, Pagan Alternative 2 operations would result in less than significant direct and indirect impacts to topography, geologic units, geologic hazards, and soils.

4.2.4.3 Pagan No-Action Alternative

Potential activities on Pagan under the no-action alternative would include the continuation of periodic visits to the island by small eco-tourism cruises, scientific surveys, and military non-live-fire training related to search and rescue. Ocean going vessels would periodically moor offshore with small boats bringing small groups of people ashore. Helicopters or small planes may transport visitors to and from the island. In all cases, known activities associated with the no-action alternative would have minor effects on geology and soils on Pagan.

4.2.4.4 Summary of Impacts for Pagan Alternatives

Table 4.2-7 provides a comparison of the potential impacts to geology and soils resources for the two Pagan alternatives and the no-action alternative.

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<td>Geology and Soils</td>
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<td>Topography</td>
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<td>Soils</td>
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Legend: LSI = less than significant impact.
4.3 WATER RESOURCES

Section 4.3 describes impacts to water resources as a result of the proposed action. It presents the analysis for the potential of the proposed action and its alternatives to alter drainage patterns, decrease water recharge rates, or adversely affect water quality. In general, potential impacts to water resources can cause changes to water quality and water supply, increased flooding, and concerns for erosion and sedimentation associated with stormwater runoff. The impacts of water resources on terrestrial and aquatic ecosystems are addressed in Section 4.9, Terrestrial Biology and Section 4.10, Marine Biology, respectively. Potential impacts to water supply and hydrology are addressed in Section 4.14, Utilities.

4.3.1 Approach to Analysis

This analysis considers information from the technical studies and surveys conducted for the CJMT EIS/OEIS and factors and conditions that can potentially affect water resources.

4.3.1.1 Surface Water

Surface water concerns include impacts to surface water features, drainage alterations, flood protection, and water quality degradation. Threats to surface water features include increased pollutant loads and loss of surface water area (dredge/fill alterations). Effects were assessed relative to the potential impacts from area loss where the proposed action may directly involve the fill or excavation of surface water features. Indirect impacts to surface water features were also assessed if the proposed action would potentially alter (i.e., divert or restrict) water circulation into/from surface waters features, and/or potentially involve the release of pollutants into these ecosystems. Potential impacts to surface water quantity during construction and operation were analyzed by examining changes in drainage patterns and runoff rates associated with alterations to topography/groundcover and increased impervious area. Loss of functionality in surface water features (i.e., ecosystem health and circulation) is assessed in Section 4.9, Terrestrial Biology.

In areas prone to flooding, construction of buildings and roads were evaluated relative to flood risks and hazards, such as inundation and erosion. Effects that also contribute to increasing flood flows (e.g., impermeable surface increases and reduced natural infiltration) were also addressed in this assessment. Topographic changes from grading and re-contouring of natural slopes were analyzed for their potential contribution to altering existing drainage patterns and potentially exacerbating flood hazards.

4.3.1.2 Groundwater

Groundwater concerns include potential impacts to groundwater quality and quantity associated with construction activities and training operations, such as the handling, use, and potential discharge (e.g., munitions constituents, spills, leaks, and deposition) of pollutants from materials and equipment. Once introduced to the ground surface, such contamination has the potential to impact groundwater quality through percolation. The availability of adequate groundwater resources may be impacted from increased impervious area, decreased infiltration potential, and increased groundwater consumption as a result of the proposed action. These issues were evaluated relative to construction and operation
activities that could potentially affect groundwater recharge by altering the infiltration ability, and natural filtering qualities of area soils, as well as possibly introducing pollutants to groundwater resources through percolation, both of which would potentially decrease groundwater quality and availability.

4.3.1.3 Nearshore Waters

The nearshore water impact analysis focused on both potential impacts to water quality and the placement of permanent fill (e.g., structures or fill) in nearshore waters as a result of the proposed action. The potential impacts to nearshore water quality during construction and training operations were evaluated with respect to dredge/fill activities, training activities, potential chemical releases, munitions constituents deposition, and improper stormwater management that could lead to increases in or accidental direct discharges of pollutants and sediment laden stormwater runoff into nearshore waters. These activities and materials could result in localized turbidity; decreased water clarity and quality (e.g., reduced dissolved oxygen, photosynthetic potential, and increased nutrient load); or benthic siltation of marine resources that could individually or collectively impact the ecological health of the nearshore environment.

4.3.2 Resource Management Measures

Resource management measures applicable to water resources are provided below.

4.3.2.1 Avoidance and Minimization Measures

- **No Training Areas.** The U.S. military would implement training restrictions for surface water features on Tinian. Lake Hagoi and the two Bateha sites remain designated by the U.S. military as “No Training Areas.” Within these “No Training Areas,” ground disturbance and vegetation removal of any kind will be prohibited during construction. “No Training Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.

- **Amphibious Assault Vehicle Landings.** As discussed in Section 2.3, all beaches within the Military Lease Area were initially considered for amphibious training. A careful selection process was employed to determine where amphibious training with Amphibious Assault Vehicles could occur. Based on environmental criteria including analysis of bathymetry and coral cover, Unai Babui and Unai Chulu were both considered for Amphibious Assault Vehicle training. A detailed engineering analysis of construction alternatives was conducted for these two locations (see Appendix J, Amphibious Beach Landing Site Engineering and Coastal Processes Analyses). After careful consideration, it was determined that the tactical amphibious landing training beach requirements for Amphibious Assault Vehicle training could be met at one beach. Unai Chulu was chosen as the single beach for Amphibious Assault Vehicle landings because of its wider configuration in comparison to Unai Babui. Ultimately, Unai Babui was dismissed for Amphibious Assault Vehicle training but it would still support training for Landing Craft Air Cushion vessels, small boat, and swimmer training.

Potential operational impacts would be minimized or avoided through the proper design and implementation of stormwater management practices, which would include the use of Low Impact Development best management practices for the proposed action. Low Impact Development
provides a sustainable stormwater management system, in an environmentally conscious manner. A pre-versus-post development hydrologic analysis would be performed to provide a basis of design for monitoring and controlling the quality and quantity of stormwater runoff generated from the proposed action. Permanent stormwater management facilities would include a combination of natural and engineered features such as retention/detention ponds that control the volume, direction, and rate of stormwater runoff (i.e., minimize or eliminate hydromodification), filter out pollutants, and facilitate groundwater recharge through increased infiltration; with a focus on mimicking pre-development hydrology to the maximum extent feasible, while protecting water resources from pollutants. Hydrologic analysis would follow the CNMI Stormwater Management Manual, Department of Defense Guidance, and Navy Low Impact Development criteria, as described in the Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act (U.S. Environmental Protection Agency 2009).

4.3.2.2 Best Management Practices and Standard Operating Procedures

Best management practices and standard operating procedures that are applicable for water resources are listed below and described in Appendix D, Best Management Practices.

- **Properly closed existing groundwater wells.** To the extent that unused wells are encountered, the U.S. military will properly close existing unused (production or monitoring) wells within the Military Lease Area to protect the groundwater resources.

- **Erosion control measures.** The erosion control measures such as retention ponds, swales, silt fences, fiber rolls, gravel bag berms, mulch, and erosion control blankets would be implemented during construction and operations to eliminate and/or minimize nonpoint source pollution in surface waters due to sediment.

- **Clean Water Act National Pollutant Discharge Elimination System Program.** A Stormwater Management Plan and Stormwater Pollution Prevention Plan would be prepared and implemented in compliance with the CNMI Stormwater Management Manual. Best management practices could include:
  - Avoidance and/or minimization of soil disturbing and earth moving work during the wet season.
  - Limiting in-water construction activities to period around low tide.
  - Temporary soil stabilization (such as mulch and erosion control blankets).
  - Temporary perimeter and sediment control (such as silt fences, fiber rolls, gravel bag berms, and sediment traps).
  - Management and covering of material, waste, and soil stockpiles when not in use.
  - Storage of fuels and hazardous materials with proper secondary containment, and establishment of designated vehicle and equipment maintenance and fueling areas.
  - Management of spills and leaks from vehicles and equipment through inspections and use of drip pans, absorbent pads, and spill kits.
The Stormwater Pollution Prevention Plans are based on construction plans and drawings and will specifically identify these best management practices, inspection frequency, and water sampling to be performed throughout the construction phase for protection of water quality.

Ranges would be managed in accordance with current Marine Corps range management policies and procedures. The proposed RTAs on Tinian and Pagan would be managed in accordance with Marine Corps Order 3550.10, Policies and Procedures for Range and Training Area Management (DoN 2005). The Marine Corps would utilize the Range Environmental Vulnerability Assessment program, in compliance with Department of Defense Instruction 4715.14, Operational Range Assessment, to assess the potential impacts to human health and the environment from live-fire training operations (Department of Defense 2005). Department of Defense Instruction 4715.14 Operational Range Assessment requires the establishment and implementation of procedures to assess the potential environmental impacts of military munitions use on operational ranges and determine whether there has been a release or substantial threat of release of munitions constituents to an off-range area as well as a determination if the release of munitions constituents creates an unacceptable risk to human health or the environment. Operational ranges that are addressed under the Range Environmental Vulnerability Assessment program include target/impact areas, firing positions, small arms ranges, and training and maneuver areas. The Range Environmental Vulnerability Assessment program also assesses areas with historical munitions use within operational range boundaries. The Range Environmental Vulnerability Assessment program does not evaluate future ranges or ranges that are covered under a separate program (e.g., cleanup of closed ranges under the Munitions Response Program, permitted Open Burning/Open Detonation sites under the Resource Conservation and Recovery Act).

The Range Environmental Vulnerability Assessment would be implemented on all live-fire operational ranges after they have been in use for a minimum of 1 year to provide a snapshot of the current environmental conditions of operational ranges as well as a detailed assessment of potential munitions constituent migration from operational ranges to off-range areas. Reevaluations would occur at a minimum every five years. The munitions constituents evaluated under the Range Environmental Vulnerability Assessment program include high explosives (e.g., trinitrotoluene, royal demolition explosive, high melting explosive from munitions items containing high explosives), perchlorate (from propellant in rocket fuels), and lead (from small arms). The analyses would include the development of a range Conceptual Site Model that uses physical, hydrologic, geographic, and operational range data to characterize current environmental conditions at the range and identify whether people or endangered/threatened animal species, could potentially be impacted by munitions constituents (chemical components of munitions) migrating from operational range activities via surface water, sediment, or groundwater and to identify potential pathways for munitions constituents to reach humans and sensitive animal species. Key factors that influence the potential for the migration of munitions constituents including range design/layout, physical and chemical characteristics of the area, and current/past maintenance operations would also be evaluated under the Range Environmental Vulnerability Assessment program.

The results of the Range Environmental Vulnerability Assessments would determine if additional actions are necessary. These additional actions may include environmental sampling, characterization of physical properties, implementing best management practices, and/or conducting a risk assessment.
4.3.3 Tinian

4.3.3.1 Tinian Alternative 1

4.3.3.1.1 Construction Impacts

A comprehensive drainage and Low Impact Development study is being prepared for Tinian. Under Tinian Alternative 1, construction would require ground-disturbing activities that would include vegetation clearing and grubbing, grading, and excavation activities, all of which would increase the potential for erosion and sedimentation from exposed earth. In addition, an amphibious landing ramp at Unai Chulu would be constructed which would require in-water work. Improvements to an existing public boat ramp at the Port of Tinian may be required to support continued or increased military use, but would not require in-water construction or fill. Tinian RTA development and construction is generally described in Section 2.4, Tinian Alternatives, and summarized in Section 4.2, Geology and Soils; a detailed evaluation is presented in Appendix F, Geology and Soils Technical Memo. Impacts to coastal processes, coral, and coral reefs are described in Section 4.10, Marine Biology.

The anticipated stormwater management system would include improvements to address both stormwater quantity and quality. The stormwater quantity would be managed through the use of directional flow controls (i.e., vegetated swales and grading) to maintain the pre-development flow patterns and through the use of detention/retention ponds downstream of new impervious surfaces to maintain the pre-development flow rates.

Stormwater quality would be addressed in conjunction with groundwater recharge to provide appropriate treatment and infiltration of rainwater/stormwater throughout the proposed development in order to maintain and protect the quality of the groundwater resources. The treatment would be provided via small scale structural devices and landscape treatments integrated into the proposed master plan to capture and treat stormwater at or near its source. The Low Impact Development best management practices would be selected based on land use and known pollutants and combined into treatment trains that applied downstream of the pollutant generating facilities to provide pollutant removal prior to discharge to downstream conveyances.

Findings from the comprehensive drainage and Low Impact Development study would be used to inform the final design of the proposed stormwater management system. The majority of these proposed stormwater facilities are expected to occur within and adjacent to the base camp, Munitions Storage Area, airport improvements, and port improvements where impervious surfaces and/or potential pollutant generating facilities are proposed. Additional water quality controls would be located throughout the live-fire ranges to address munitions concerns and along access roads to address transportation of sediment, including improvements adjacent to surface and coastal waters. Proposed stormwater features associated with each of the improvement areas is provided below.

- **Base Camp:** Up slope stormwater flows would be redirected around the proposed base camp improvements where feasible, limiting the internal stormwater facility sizes. On-site flows generally flow southwesterly across the base camp. Frequent, low volume, low intensity surface stormwater flows would be directed to Low Impact Development best management practices treatment devices/trains for capture, treatment, and infiltration. These small scale integrated Low Impact Development devices would be selected and strategically located across the entire
base camp site to address the pollutants anticipated from each land use/facility and to meet groundwater recharge requirements. Overflow from these devices during higher volume, higher intensity storm events would be routed via vegetated swales and culverts to detention ponds located within the base camp boundary, downstream of new impervious areas. The ponds would restrict discharge flows to pre-development rates for the 25-year 24-hour design storm and provide additional groundwater recharge. The ponds would also include high level controlled overflow weirs (dams created to reduce, but not stop the flow of water) directing excessive runoff during rainfall events beyond the 25-year design storm towards downstream receiving conveyance systems.

- **Munitions Storage Area**: The Munitions Storage Area contains a minimal amount of new impervious area and ground disturbance consisting primarily of access roads and storage pads. As a result, the stormwater management facilities would be minimal, including roadside channels, culverts, and Low Impact Development features for water quality and groundwater recharge adjacent to and downstream of pads, with some small detention ponds to mitigate additional runoff rates from proposed impervious surfaces. The stormwater runoff occurs in a westerly direction, therefore, stormwater facilities would be placed westerly of the proposed improvements.

- **Tinian International Airport**: The airport improvements would generate a substantial volume of stormwater runoff due to the high quantity of new impervious surfaces. As a result, detention ponds would be designed to accommodate this volume to maintain pre-development hydrology to downstream receiving conveyance systems. The direction of flow is southwesterly; therefore, proposed stormwater facilities would be located southwesterly of the proposed impervious areas. Runoff from paved surfaces would flow across filter strips and bio-retention swales prior to comingling with other surface runoff. Pre-treated sheet flow and shallow channelized flow would then be directed to larger vegetated swales to convey stormwater to detention ponds, which would provide extended detention for both water quantity and quality including groundwater recharge. Additional inline pre-treatment, if required, may be provided within conveyance system including baffle boxes, hydrodynamic separators, and/or additional bio-retention. High level overflow would be provided with the same intent as used for the base camp.

- **Port of Tinian**: The port improvements would generate a significant volume of stormwater runoff for the relatively small facility size because nearly all improvements proposed are impervious. Structural best management practices and perimeter Low Impact Development features would be utilized to intercept and treat runoff from pavement areas before stormwater is routed to detention ponds. Stormwater runoff would flow in a southerly direction towards the harbor and Philippine Sea; therefore, stormwater ponds would be located just south of the improvements/impervious surfaces. Treated discharge and high level overflow would be directed southwesterly away from existing boat ramps and public areas, towards natural points of discharge into the Philippine Sea.

- **Unai Chulu amphibious landing ramp**: As described in Section 4.2.3.1.1, *Construction Impacts* (for Geology and Soils), a Coastal Processes Assessment was completed to assess the potential impacts of construction of Unai Chulu to coastal processes. The Coastal Processes Report (Appendix J, *Amphibious Beach Landing Site Engineering and Coastal Processes Analyses*)
concluded that construction of the proposed Amphibious Assault Vehicle landing ramp would not significantly modify shoreline coastal processes and trigger erosion of the beaches. Post-development stormwater management would mainly focus on a combination of natural and engineered features (i.e., Low Impact Development) that control the volume and rate of stormwater runoff and filter out pollutants.

- **Range Complex A:** Grading within the High Hazard Impact Area consists of the perimeter road, roadside drainage swale, and live hand grenade range pits. Drainage facilities would include conveyance swales, culverts, and linear detention ponds to control flow rates. Stormwater flow would be split with a high point located at the south central portion of the High Hazard Impact Area. Half of the potential stormwater runoff would flow internally to the High Hazard Impact Area in a northwesterly direction toward the Mahalang Complex, while the remainder of the High Hazard Impact Area would flow easterly.

- **Range Complex B:** Grading associated with the Range Complex B is primarily limited to the Tracked Vehicle Driver’s Course and the small arms ranges. With minimal impervious surfaces and grade changes, drainage improvements would be focused on capturing munitions constituents as part of the range management program. Additional conveyance swales and minor detention ponds would be utilized as needed to maintain pre-development flows.

- **Range Complex C:** The grading associated with the Range Complex C primarily consists of range access roads, the Multi-purpose Automated Unknown Distance Range, and limited grading for access and objective operations for the Infantry Platoon Battle Course and associated Urban Assault Courses. Drainage improvements would be minimal primarily consisting of channelized conveyance and flow control via culverts and spreader swales. Low Impact Development would be utilized in conjunction with other range management practices to provide treatment, control munitions constituents and protect water resources.

- **Range Complex D:** No grading or drainage improvements are proposed at North Field.

### 4.3.3.1.1 Surface Water Resources

Lake Hagoi is located in northern Tinian, west of the proposed Battle Area Complex (Range Complex D). The Bateha isolated wetlands are outside of the proposed boundaries of Range Complex C and no training facilities or other improvements are proposed within 1,500 feet (450 meters). Lake Hagoi and the Bateha isolated wetlands have been designated a “No Training Area,” where no construction activities are proposed. Therefore, as a result of the separation of these surface waters from construction activities and use of best management practices, the existing topography would be maintained and construction activities associated with Tinian Alternative 1 would result in no direct or indirect impacts to Lake Hagoi or the Bateha isolated wetlands. Surface waters on Tinian are shown in [Figure 4.3-1](#).
Figure 4.3-1
Tinian Alternative 1
Surface Waters and Flood Zones

Sources: DoN 2010, DoN 2013

Legend
- **Surface Waters**
- **100-year Flood Zone (Type A)**
- **100-year Coastal Flood Zone (Type V)**

**Tactical Amphibious Landing Beaches**
- Amphibious Assault Vehicles, Landing Craft Air Cushion, Small Boat and Swimmer Training
- Landing Craft Air Cushion, Small Boat and Swimmer Training
- Small Boat and Swimmer Training
- Indirect Artillery Firing Position
- Mortar Firing Position

- **Observation Post**
- **Surface Radar Site**
- **Landing Zone**
- **Tracked Vehicle Driver's Course**
- **Tracked Vehicle Transit Lane**
- **Proposed Firebreak Road**
- **Proposed Access Road**
- **Convoy Course**
- **Existing Roads**
- **Base Camp**
- **Munitions Storage Area**
- **Proposed Airfield Operations**
- **Cleared Area**
- **Drop Zone**
- **No Training Area**
- **Convoy Course Engagement Area**
- **Objective Area**
- **High Hazard Impact Area**
- **Range Complex**
- **International Broadcasting Bureau**
- **Military Lease Area**

Landing Zone activities could occur in cleared areas.
The majority of the Mahalang Complex, approximately 92% of the complex (22 out of 24 mapped depressions), is located within the proposed Range Complex A, High Hazard Impact Area. Construction activities within Range Complex A include a perimeter road/firebreak, grenade range with grenade pits, and fencing. Proposed construction of the Hand Grenade Range and Grenade Launcher Range within the western portion of the High Hazard Impact Area would remove two ephemeral ponds (labeled MC2 and MD3), totaling less than 0.5 acre (0.2 hectare) of the Mahalang Complex. As described in Section 3.3, Water Resources, MC2 is not considered a wetland and MD3 is considered an isolated wetland (see the Wetland Survey Report in Appendix L). Although Tinian Alternative 1 construction activities would result in direct impacts to these two surface water features, the remainder of the Mahalang Complex would not be impacted by construction; therefore, construction activities associated with Tinian Alternative 1 would result in less than significant direct impacts to the Mahalang Complex.

Low-lying areas, including areas surrounding the surface water features, could be subject to flooding during heavy rainfall events. Small areas near the proposed base camp, along the proposed Tracked Vehicle Driver’s Course and Convoy Course, and within Tinian RTA are within depressions that could be subject to a greater flooding hazard. Nearshore areas may also be subject to flooding and wave hazards during extreme storm and tidal events. Construction work would follow the CNMI erosion control requirements and utilize best management practices such as limiting ground disturbance during wet weather, minimizing compaction of native soils, and through use of temporary diversions and sedimentation basins that direct stormwater away from construction areas to minimize potential erosion and transportation of sediment and pollutants to downstream conveyance and surface waters. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, construction activities associated with Tinian Alternative 1 would result in less than significant direct and indirect impacts from flooding hazards. Flood zones are shown in Figure 4.3-1.

Drainage throughout most of Tinian is internal (underground), and water generally percolates downward into porous limestone rock (Doan et al. 1960). With the natural drainage of the porous limestone rock and through the implementation of erosion control practices including perimeter controls, construction scheduling, tracking pads, minimizing disturbance and sedimentation basins (as detailed in Appendix D, Best Management Practices), stormwater runoff impacted by construction activities is not anticipated to discharge to surface water features and would not affect surface water quality. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, construction activities associated with Tinian Alternative 1 would result in less than significant indirect impacts to surface water quality.

**4.3.3.1.1.2 Groundwater Resources**

Existing groundwater wells, the proposed notional well fields, groundwater elevations, and the general direction of groundwater flow are shown in Figure 4.3-2. The increase in residents living on Tinian during the construction phase (i.e., temporary construction workers) may result in an increased dependence on the Commonwealth Utilities Corporation’s potable water system. This would require increased pumping from Maui Well #2 and could result in temporary increased chloride levels as a result of saltwater intrusion (the movement of saline water into freshwater aquifers). However, this increase would be limited to the duration of construction and the modest increase in pumping over and above current levels is expected to result in less than significant impacts to groundwater in the Makpo Valley sub-watershed.
Figure 4.3.2
Tinian Alternative 1
Groundwater Wells, Elevation, and Flow Direction

Legend

- Agricultural Water Supply Well
- Municipal Potable Water Supply Well
- Inactive Groundwater Well
- Generalized Groundwater Flow Direction
- Water-table Contour (0.4 ft interval)
- Water-table Contour, Approximately Located
- Proposed Well Field
- Low-Permeability Tinian Pyroclastic Rocks at Sea Level
- Proposed Base Camp
- Munitions Storage Area
- Proposed Airfield Operations

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, Small Boat and Swimmer Training
- Landing Craft Air Cushion, Small Boat and Swimmer Training
- Small Boat and Swimmer Training
- Proposed Firebreak Road
- Existing Road
- High Hazard Impact Area
- Proposed Range Complex
- International Broadcasting Bureau
- Military Lease Area

Sources: Doan and Others 1960, Gingerich and Yeatts 2000, CNMI DEQ 2014
A proposed well field has been identified north and east of the airport. New wells are required to support construction activities and operations associated with the proposed action. The new well sites would be selected to minimize negative impacts to groundwater quantity and quality resulting from increased extraction. New well sites would be established in compliance with CNMI Well Drilling and Well Operation Regulations (CNMI Division of Environmental Quality 2005). These regulations include well seal and construction specifications, pump testing, water quality analysis, and designated wellhead setback distances from potential sources of contamination. Testing and monitoring would be performed prior to production at each new well site.

The pumping of groundwater from the proposed new military wells could potentially cause saltwater intrusion by reducing the thickness and lateral limits of the fresh water lens, reducing the quality of groundwater in the Military Lease Area. However, this impact would be limited to the duration of construction and due to the size of the freshwater basal lens (i.e., availability of groundwater) impacts are expected to be minimal.

Improperly abandoned existing wells in the Military Lease Area could provide a preferential flow path for runoff from the RTA; therefore, encountered unused wells (production or monitoring will properly close existing unused (production or monitoring) wells within the Military Lease Area to protect the groundwater resources.

Best management practices that would be implemented during construction to protect groundwater resources include capture and treatment of pollutant laden stormwater with Low Impact Development devices; restricting untreated stormwater runoff from entering depressional areas and surface waters; limiting use of heavy equipment in areas that support groundwater recharge; proper abandonment (closure) of historic groundwater wells, and proper management of spills and leaks of hazardous materials and waste. Based on the general direction of groundwater flow (shown in Figure 4.3-2), pollutants unintentionally released from construction sites or proposed facilities within the Military Lease Area would not flow to the public water system well (i.e., Maui Well #2). Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, Tinian Alternative 1 construction activities would result in less than significant direct and indirect impacts to groundwater resources.

4.3.3.1.1.3 Nearshore Water Resources

General Construction Activities in Coastal Areas

The majority of the construction activities would take place inland and away from the nearshore environment. However, some construction activities would take place near the shore including port improvements, portions of road improvements, some surface radars and an amphibious beach landing area. Construction activities could result in the accidental release of pollutants (e.g., petroleum, oils, and lubricants) resulting in impacts to nearshore water quality. However, accidental release of pollutants would be rare, and best management practices would be followed to reduce the likelihood of an accidental release or spill occurring. Any spills that do occur would be cleaned up immediately. With the implementation of pollutant prevention best management practices, including construction scheduling only during ideal conditions, sediment traps to control stormwater flowing through and from the work area, vehicle tracking pads, silt fencing and floating turbidity barriers, construction impacts to nearshore waters are not anticipated. Based upon the above analysis and the implementation of resource...
management measures in Section 4.3.2, land-based construction activities under Tinian Alternative 1 would result in less than significant direct and indirect impacts to nearshore water resources.

**In-Water Work at Tactical Amphibious Landing Beach**

An amphibious landing ramp would be constructed at Unai Chulu to create a safe landing surface for training operations. In-water construction at Unai Chulu would result in direct impacts to nearshore waters. Construction activities would disturb sediment and increase turbidity and thus impact water quality, clarity, and dissolved oxygen levels. Best management practices, including isolating the in-water construction area with floating turbidity barriers, would be utilized to capture sediment and debris caused by in-water construction activities.

An assessment was completed to assess the potential impacts of construction of Unai Chulu to coastal processes. The *Coastal Processes Report* included in Appendix J concluded that construction of the proposed amphibious landing ramp would not significantly modify shoreline coastal processes or trigger erosion of the beaches. Best management practices would be in place to monitor and minimize impacts to nearshore water resources that may result from the construction of the underwater landing areas. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, in-water construction activities under Tinian Alternative 1 would result in less than significant direct and indirect impacts to nearshore water resources.

**4.3.3.1.2 Operation Impacts**

The post-development stormwater management system would maintain pre-development hydrology and reduce flooding hazards to downstream facilities and new infrastructure, including the base camp facilities, Munitions Storage Area, port facilities, and airport facilities. Tinian Alternative 1 training and maintenance operations may result in impacts to localized natural hydrology/drainage systems with potential impacts to surface water, groundwater, and nearshore waters. Newly constructed impervious surfaces (primarily associated with the proposed base camp area, airfield improvements, Munitions Storage Area, port improvements, and limited roadway improvements), vegetation removal and control, foot-trails created during training maneuvers, and off-road vehicle use may alter natural drainage courses. Vegetation maintenance, foot-trails, and use of vehicles off-road may cause erosion and increased sediment in stormwater runoff, which would be minimized through the use of strategically selected and located erosion control techniques and devices.

Newly created impervious surfaces would be created at the port, base camp, airport, Munitions Storage Area, roadways, and at some of the training facilities (see Section 2.4.1.2, *Construction and Improvements*). The proposed impervious surfaces along with a brief summary of operational facilities are provided for each improvement area below.

- **Base Camp:** The base camp area would include a variety of hardscaping as part of the support facilities, new roads, vehicle wash racks with effluent treatment ponds and wash-water recycling system, a package wastewater treatment plant, wastewater disposal field, Low Impact Development features, and stormwater detention basins. Wastewater would be treated prior to disposal via leach field, minimizing potential impacts to groundwater quality. Vegetated roadside swales would convey runoff while providing water quality treatment, and minimize erosion and sediment runoff from gravel/stabilized roads.
• **Munitions Storage Area:** The Munitions Storage Area includes eight munitions storage magazines, a maintenance facility in addition to the entry control gate, access roads, and storage facilities. The proposed improvements also include Low Impact Development features for water quality, vegetated swales for stormwater conveyance, and stormwater detention basins.

• **Port of Tinian:** Port improvements would include a vehicle inspection area; cargo inspection and holding area; vehicle wash-down area with effluent treatment pond and wash-water recycling system; and stormwater detention basins. The stormwater management system would be maintained to ensure proper function and to prevent release of pollutants to downstream receiving waters.

• **Tinian International Airport:** The Tinian International Airport improvements include significant impervious areas such as the aircraft parking ramps, hot fuel pits, and aircraft taxi lanes. The proposed improvements also include Low Impact Development features for water quality, vegetated swales for stormwater conveyance, and stormwater detention basins.

Following the completion of construction, vegetation within the Tinian RTA would be allowed to reestablish or managed at allowable heights. The preservation and reestablishment of vegetation would minimize the potential for erosion and sediment runoff. The height of vegetation would be managed in certain portions of the RTA, including objective areas, fire breaks, roadway/trail alignments, firing points, Landing Zones, Drop Zones, target areas, and Observation Posts. Because root systems and ground cover would be maintained, these areas would remain anchored and not pose a significant source of erosion. Controlled burning may be used to manage vegetation within Range Complex A, which could create temporary increases in soil erosion during periods of vegetation grow in.

### 4.3.3.1.2.1 Surface Water Resources

New wells would be developed in the Military Lease Area for U.S. military use outside the Makpo Valley sub-watershed. None of the identified surface waters are near the notional locations of the new wells.

Lake Hagoi is located west of the proposed Range Complex D, northern Battle Area Complex (see Figure 4.3-1). Lake Hagoi and surrounding areas have been designated a “No Training Area,” where no training activities or target areas are proposed. As a result, no direct or indirect impacts from training or munitions are anticipated. The majority of the Mahalang Complex is located within the Range Complex A, with the exception of a small portion on the western border of the High Hazard Impact Area. The High Hazard Impact Area would not be utilized during Maneuver Area (Light Forces) training thus protecting the portion of the Mahalang Complex within Range Complex A, not already permanently impacted during construction, from potential direct impacts associated with foot traffic. The Bateha isolated wetlands are located within the proposed Range Complex C (see Figure 4.3-1). However, the isolated wetlands have been designated a “No Training Area.” No training facilities, targets objective areas, or other improvements (i.e., roads) are proposed in the vicinity (i.e., within 1,500 feet [500 meters]) of the Bateha isolated wetlands. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, Tinian Alternative 1 operations would result in no direct impacts to Lake Hagoi or the Bateha isolated wetlands.

Training operations in the High Hazard Impact Area, including controlled burning of vegetation and use of high explosives and other munitions, may result in indirect impacts to the remaining surface water
features of the Mahalang Complex because half of the potential stormwater runoff from the High Hazard Impact Area would flow in a northwesterly direction toward the Mahalang Complex. Stormwater runoff can erode and transport contaminated soil and leachable munition constituents. Munitions constituents from operation of the Tinian RTA contain potentially leachable compounds that can impact water quality if not managed properly. Low Impact Development features would be utilized to control stormwater runoff from the Tinian RTA and water quality controls would be located throughout the live-fire ranges to address munitions concerns. With proper range management and the implementation of the Range Environmental Vulnerability Assessment program, Tinian Alternative 1 operations would result in less than significant indirect impacts to surface water quality. Reevaluations would occur at a minimum every 5 years.

Without proper stormwater management controls, increased impervious areas would increase the amount of runoff and the potential for downstream flooding. Development in the floodplain may also result in potential damage to facilities within low lying areas from inundation during high runoff storm events. Some of the proposed improvements east of the base camp, along the Tracked Vehicle Driver’s Course and Convoy Course, and within the Tinian RTA are proposed within the Federal Emergency Management Agency “100-year flood zone” and may be subject to flood hazards. However, with the implementation of avoidance and minimization measures such as low impact training within high risk areas, along with monitoring and adaptive management of range operations and proper maintenance of the stormwater management facilities, runoff rates and erosion would be controlled and flooding hazards would be minimized. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, Tinian Alternative 1 operations would result in less than significant impacts from flooding hazards.

4.3.3.1.2.2 Groundwater Resources

Newly constructed impervious surfaces could alter infiltration characteristics within the project footprint, but in many cases, the impacted acreage is relatively small and potentially adverse effects would be mitigated through increased infiltration through other means within the development, meeting the required groundwater recharge rates and resulting in no net impact. In cases such as the airport improvements with significant increases in impervious areas, additional infiltration galleries would be used, after treatment, and within vegetated areas to capture, retain, and infiltrate larger volumes of stormwater to recharge groundwater resources.

Additional groundwater extraction would occur due to the proposed action that could affect groundwater availability and quality. New potable extraction wells (same wells established during construction) would be utilized in the Military Lease Area for U.S. military use to prevent overextending the existing Makpo Valley well (i.e., Maui Well #2). This change in source would result in no impacts to the municipal water supply. The new well sites would be selected to minimize negative impacts to groundwater quantity and quality resulting from increased extraction. The pumping of groundwater from the proposed new military wells to support military operations could potentially cause saltwater intrusion (the movement of saline water into freshwater aquifers) by reducing the thickness and lateral limits of the fresh water lens, thus reducing the quality of groundwater in the Military Lease Area during operations. However, this impact is not expected to be significant because the pumping would be limited to periods when training exercises occur and because of the size and recharge characteristics of the freshwater basal lens (i.e., availability of groundwater).
Munitions constituents could affect groundwater quality through percolation of leachable compounds. The accidental release of other pollutants associated with the use and maintenance of vehicles and septic leachate from the wastewater leach field also has the potential to impact groundwater quality. Impacts to the public water system (i.e., Maui Well #2 in the Makpo Valley sub-watershed), are not anticipated based on the separation distance and direction of general groundwater flow (see Figure 4.3-2). Groundwater resources located along the northern and eastern portions of the High Hazard Impact Area would have the greatest potential to be affected. Those are the areas where the surface soils are moderately permeable, shallow rocky clays, and/or moderately deep to deep clay (see Appendix F, Geology and Soils Technical Memo, for details). However, the risk of munitions constituent contamination to groundwater is expected to be less than significant because of: (1) limited existence of basal groundwater in the High Hazard Impact Area, (2) relatively deep soil formation in the gentler sloping areas, (3) the depth to groundwater (i.e., greater than 200 feet [60 meters]), and (4) proper range management and the implementation of the Range Environmental Vulnerability Assessment program.

Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, Tinian Alternative 1 operations would result in less than significant impacts to groundwater resources.

**4.3.3.1.2.3 Nearshore Waters**

Groundwater could potentially carry munitions constituents from training facilities to nearshore waters through the porous limestone, affecting nearshore water quality. These impacts would be minimized by employment of resource management measures described in Section 4.3.2.

Unai Chulu, Unai Babui, Unai Lam Lam, and Unai Masalok are proposed tactical amphibious landing beaches (see Figure 4.3-1). Training at amphibious landing beaches could include combat swimmer training and landing of rigid-hulled inflatable boats at all four beaches. Landing Craft Air Cushion vessels would land at Unai Chulu, Unai Babui, and Unai Masalok. Amphibious Assault Vehicles would land at Unai Chulu only. Amphibious Assault Vehicles are tracked vehicles that would come ashore at Unai Chulu and cross the beach to access the Tracked Vehicle Driver’s Course.

Rigid-hulled inflatable boats, Landing Craft Air Cushion vessels, and Amphibious Assault Vehicles are powered by diesel engines and must be operated with petroleum-based products. The use of these products creates a possibility of accidental discharge of pollutants into the nearshore waters, but impacts would be minimized by personnel awareness (visual observations) and by implementing standard spill response procedures. In addition, the Amphibious Assault Vehicles track mechanism is lubricated with water repellant grease that would have a negligible impact on water quality (Marine Corps Forces Reserve 2014).

Operation of Landing Craft Air Cushion vessels and Amphibious Assault Vehicles would result in temporary increase in suspended sediment and turbidity (suspension of sand in the water column) in localized areas when approaching the shore, resulting in a temporary impact to water quality. Observations from Landing Craft Air Cushion operations at Unai Chulu (Department of Defense 1999) documented that the sediment plumes generated by these vehicles are likely not qualitatively different from naturally occurring turbidity during periods of storm-generated waves that routinely occur on
Tinian. When the Landing Craft Air Cushion vessel is stationary, water displacement is similar to a small wave, localized, and of short duration.

The landing of amphibious and small craft vehicles on beaches could affect nearshore water quality through increased turbidity, erosion, sediment transport, and accidental discharge of pollutants. However, these impacts would be temporary in nature and only occur during training activities. Accidental release of pollutants would be rare, and best management practices would be followed to reduce the likelihood of an accidental release or spill occurring. Any spills that do occur would be cleaned up immediately. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, Tinian Alternative 1 operations would result in less than significant impacts to nearshore water resources.

4.3.3.2 Tinian Alternative 2

Tinian Alternative 2 construction activities and operations would have similar impacts to water resources as those identified under Tinian Alternative 1 (see Section 4.3.3.1, Tinian Alternative 1). The main difference that would affect water resources is that the southern Battle Area Complex and associated Urban Assault Course would be constructed and operated within the present location of the International Broadcasting Bureau and other portions of Range Complex C (Figure 4.3-3). The Bateha isolated wetlands are located within the proposed southern Battle Area Complex (Range Complex C).

4.3.3.2.1 Construction Impacts

Tinian Alternative 2 construction impacts to water resources would be similar to those identified under Tinian Alternative 1. Construction of the training facilities and support facilities (buildings, roads, and related infrastructure) associated with the Tinian Alternative 2 would require ground-disturbing activities similar to but slightly greater than those under Tinian Alternative 1. The Bateha isolated wetlands and surrounding areas would not be included in any construction footprint (i.e., objectives, access roads, pathways). Therefore, Tinian Alternative 2 construction of activities would result in no impacts to Lake Hagoi or the Bateha isolated wetlands; less than significant direct and indirect impacts to the Mahalang Complex (as described under Tinian Alternative 1); and less than significant direct and indirect impacts from flooding hazards and to surface water quality, groundwater resources, and nearshore waters.

4.3.3.2.2 Operation Impacts

Impacts to water resources from Tinian Alternative 2 operations would be similar to those identified under Tinian Alternative 1. The Bateha isolated wetlands and surrounding areas would be included in Range Complex C; however, they have been designated a “No Training Area,” where no training activities or object areas are proposed. Therefore, Tinian Alternative 2 operations would result in no impacts to Lake Hagoi or the Bateha isolated wetlands and less than significant direct and indirect impacts to the Mahalang Complex (as described under Tinian Alternative 1); and less than significant direct and indirect impacts from flooding hazards and to surface water quality, groundwater resources, and nearshore waters.
Figure 4.3-3
Tinian Alternative 2
Surface Waters

Legend
- Surface Waters
- Tactical Amphibious Landing Beaches
  - Amphibious Assault Vehicles, Landing Craft Air Cushion, Small Boat and Swimmer Training
  - Landing Craft Air Cushion, Small Boat and Swimmer Training
  - Small Boat and Swimmer Training
- Landing Zone
- Indirect Artillery Firing Position
- Mortar Firing Position
- Observation Post
- Surface Radar Site
- Proposed Airfield Operations
- Cleared Area
- Drop Zone
- No Training Area
- Convoy Course Engagement Area
- Objective Area
- High Hazard Impact Area
- Range Complex
- International Broadcasting Bureau
- Military Lease Area

Sources: DoN 2010, DoN 2013

Tinian International Airport

Philippine Sea

Ushi “Cross” Point

Lake Hagoi

International Broadcasting Bureau

Battle Area Complex

High Hazard Impact Area

Mount Lasso

Unai Babui

Unai Lam Lam

Unai Chulu

Mahalang Complex

Infantry Platoon Battle Course

Airfield Operations

Base Camp

Munitions Storage Area

Observe

Unai Masalok

Unai Dankulo

Battle Area Complex

Proposed Firebreak Road

Proposed Access Road

Convoy Course

Existing Roads

Unai Lam Lam

86th Street

123rd Street

96th Street

Broadway

North Field

Unai Lam Lam

Unai Chulu

Unai Babui

Lake Hagoi

Tinian International Airport

Proposed Airfield Operations

Cleared Area

Drop Zone

No Training Area

Convoy Course Engagement Area

Objective Area

High Hazard Impact Area

Range Complex

International Broadcasting Bureau

Military Lease Area

Sources: DoN 2010, DoN 2013

Figure 4.3-3
Tinian Alternative 2
Surface Waters

0 0.5 1 2
Miles

0 0.5 1 2
Kilometers

NORTH

Figure 4.3-3
Tinian Alternative 2
Surface Waters

Sources: DoN 2010, DoN 2013

4-52
4.3.3.3 **Tinian Alternative 3**

Tinian Alternative 3 construction activities and operations would have similar impacts to water resources as those identified under Tinian Alternative 1. The main differences that would affect water resources are that Range Complex D would not include a northern Battle Area Complex and associated Urban Assault Course at North Field, and Range Complex C would include a southern Battle Area Complex and associated Urban Assault Course. The Bateha isolated wetlands are located within the proposed southern Battle Area Complex (Range Complex C), as shown in Figure 4.3-4.

### 4.3.3.3.1 Construction Impacts

Tinian Alternative 3 construction impacts to water resources would be similar to those identified under Tinian Alternative 1. Construction of the training facilities and support facilities (buildings, roads, and related infrastructure) associated with the Tinian Alternative 3 would require ground-disturbing activities similar to but slightly greater than those under Tinian Alternative 1. The Bateha isolated wetlands and surrounding areas would not include any construction footprint (i.e., objectives, access roads, pathways). This alternative would minimize construction activities at Range Complex D. Therefore, Tinian Alternative 3 construction would result in no impacts to Lake Hagoi or the Bateha isolated wetlands; less than significant direct and indirect impacts to the Mahalang Complex (as described under Tinian Alternative 1); and less than significant direct and indirect impacts from flooding hazards and to surface water quality, groundwater resources, and nearshore waters.

### 4.3.3.3.2 Operation Impacts

Impacts to water resources resulting from Tinian Alternative 3 operations would be similar to those identified under Tinian Alternative 1. The Bateha isolated wetlands have been designated a “No Training Area,” where no training activities or objective areas are proposed. Therefore, Tinian Alternative 3 operations would result in no impacts to Lake Hagoi or the Bateha isolated wetlands and less than significant direct and indirect impacts to the Mahalang Complex (as described under Tinian Alternative 1); and less than significant direct and indirect impacts from flooding hazards and to surface water quality, groundwater resources, and nearshore waters.

### 4.3.3.4 Tinian No-Action Alternative

The periodic non-live-fire military training exercises that occur in the Military Lease Area on Tinian consist of troop maneuvering, ground vehicle movements, and helicopter and fixed-wing aircraft operations. These military training exercises are short term with limited activities on Tinian and would result in less than significant impacts to water resources on Tinian. As included in the Guam and CNMI Military Relocation EIS (DoN 2010a), military training on the four live-fire training ranges would introduce minor increases in stormwater runoff with introduction of more impervious surfaces along with potential for surface water and localized groundwater contamination because of the increase in training activities (see Table 4.2-1; DoN 2010a). Training in the Mariana Islands Range Complex would not introduce any long-term degradation of stormwater, groundwater, surface waters, or wetlands (see Table 3.3-13; DoN 2010b). Significant impacts would be avoided by implementing best management practices. Therefore, the no-action alternative would result in less than significant impacts to surface water, groundwater, and nearshore waters.
Figure 4.3-4
Tinian Alternative 3
Surface Waters

Sources: DoN 2010, DoN 2013

4-54
### 4.3.3.5 Summary of Impacts for Tinian Alternatives

Table 4.3-1 provides a comparison of the potential impacts to water resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>Water Resources</td>
<td>NI (Lake Hagoi, Bateha isolated wetlands)</td>
<td>NI (Lake Hagoi, Bateha isolated wetlands)</td>
<td>NI (Lake Hagoi, Bateha isolated wetlands)</td>
<td>LSI</td>
</tr>
<tr>
<td></td>
<td>LSI (Mahalang Complex)</td>
<td>LSI (Mahalang Complex)</td>
<td>LSI (Mahalang Complex)</td>
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<tr>
<td></td>
<td>LSI (flooding hazards and surface water quality)</td>
<td>LSI (flooding hazards and surface water quality)</td>
<td>LSI (flooding hazards and surface water quality)</td>
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<tr>
<td>Nearshore Water Resources</td>
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<td>LSI</td>
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<td></td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
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</tbody>
</table>

**Legend:** NI = no impact; LSI = less than significant impact.
4.3.4  Pagan

4.3.4.1  Pagan Alternative 1

4.3.4.1.1  Construction Impacts

A comprehensive drainage and Low Impact Development study is currently underway for Pagan. Under Pagan Alternative 1, development and construction would occur in the level area surrounding the existing airfield, along the military training trails, and within the proposed High Hazard Impact Areas for target placement.

The anticipated stormwater management system would include improvements to address both stormwater quantity and quality. The stormwater quantity would be managed through the use of directional flow controls (i.e., vegetated swales and grading) to maintain the pre-development flow patterns and through the use of detention/retention ponds downstream of new and reduced impervious surfaces to maintain the pre-development flow rates.

The improvements on Pagan are primarily expeditionary in nature with minimal additional impervious surfaces proposed. Some training facilities would have a reduced infiltration rate due to the compaction associated with the proposed training activity and may contribute to increased stormwater flows. Therefore, these areas are considered in the stormwater analysis and associated facilities are included in construction. The proposed grading and drainage improvements would also be minimal and focused on strategic placement of vegetated swales and small detention ponds for conveyance and flow control along with specific Low Impact Development and best management practices to address water quality for pollutant generating facilities.

- **Airfield and Bivouac Area**: Airfield and bivouac improvements are proposed in the same area as an existing airfield and within a relatively flat valley. Minimal earthwork would be required, with the exception of removal of the lava flow from the 1981 eruption that has covered the eastern half of the former grass airfield. The airfield would require compaction which may reduce surface water infiltration. As a result, stormwater that does not infiltrate would flow westerly along the airfield and bivouac area through bio-retention swales for treatment and infiltration, and to detention ponds for additional infiltration and flow rate control into downstream receiving conveyance systems towards the Philippine Sea.

- **Munitions Storage Area**: The five small proposed pads for biosecurity, assembly, and storage would include a minimal amount of new impervious area and require minimal grading and drainage improvements.

- **Military Training Trails**: Many of the proposed trails follow existing trail alignments. Widening and stabilization of these trails would occur. New trail alignments would require additional slope cut, fill, and stabilization. All trails would be all-weather surfaces using local materials as a compacted granular base. Drainage culverts or protected low water crossings are anticipated to maintain hydrology, slope stabilization, and trail function. The military training trails would be pervious and thus are not anticipated to increase runoff volumes or adversely affect hydrology. Therefore, the trail would require minimal volume controls for stormwater runoff. The focus would be on stabilization and erosion control to maintain trail usability and prevent transportation of sediment downstream.
• **Landing Zones:** Numerous landing zones are proposed at locations throughout the north half of the island along military trails and firing positions. Nominal vegetation clearing and minimal grading is anticipated at each site, with natural drainage patterns being preserved. No impervious areas or permanent improvements are proposed at these sites.

• **Beach Landings:** The beach landing areas would not include any construction improvements (i.e., grading, drainage, or permanent improvements).

• **Target Areas:** Minor localized disturbances are anticipated for construction and maintenance of target structures throughout the northern and isthmus High Hazard Impact Areas. Minimal grading, clearing, and drainage is anticipated for these improvements. Small retention swales would be located down-gradient of targets to capture and retain target and munitions constituents in compliance with a range management plan.

### 4.3.4.1.1 Surface Water Resources

No in-water construction is proposed under Pagan Alternative 1. Laguna Sanhiyon is located outside of the northern High Hazard Impact Area, and Laguna Sanhalom is surrounded by the northern High Hazard Impact Area. Surface Water Resources on Pagan are shown in Figure 4.3-5. Because of increased exposed surface area and soil disturbance activities associated with construction activities (i.e., military training trails, target placements), the potential for erosion and sedimentation would be greater during the construction period. Construction-specific best management practices (such as temporary erosion control practices, perimeter controls, construction scheduling, tracking pads, minimizing disturbance, and sedimentation basins) would be implemented to reduce indirect impacts (e.g., sediment and pollutant-laden runoff) to Laguna Sanhalom from construction of military training trails and target placement areas.

New impervious surfaces would be limited to the munitions storage pads; however, other improvements such as expeditionary airfield, expeditionary base camp/bivouac area, access trails and military training trails may take on impervious characteristics in some areas due to high levels of compaction and repeated use. The areas anticipated to reduce infiltration would be minimal, and would not alter surface drainage or flood patterns significantly as high porosity in surrounding areas would compensate. Construction activities could result in the accidental release of pollutants that could affect surface water quality through percolation and stormwater runoff. However, accidental release of pollutants would be rare, and best management practices would be followed to reduce the likelihood of an accidental release or spill occurring. Any spills that do occur would be cleaned up immediately. Storage and maintenance of construction equipment and supplies is anticipated to occur away from surface waters to reduce potential for impacts. In addition, sediment basins, silt fence, tracking pads, filter strips and other forms of temporary erosion control would be utilized to mitigate adverse effects to surface water resources resulting from construction activities.

Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, Pagan Alternative 1 construction activities would result in less than significant impacts to surface water resources.
Figure 4.3-5
Pagan Alternative 1
Surface Waters

Legend
- Helicopter Landing Zone
- Proposed Military Training Trail
- Munitions Storage Area
- No Training
- Lakes
- Target Area
- High Hazard Impact Area
- Dedicated Live-Fire Maneuver Area
- Non-Live-Fire Maneuver Area
- Proposed Bivouac Area

Proposed Actions:
- Field Artillery Direct Fire Range Firing Position
- Field Artillery Indirect Firing Position
- Mortar Range Firing Position

Proposed Airfield Elements
- Airfield Runway
- Forward Arming and Refueling Point
- Hot Cargo Pad
- Overrun
- Parking Apron
- Runway Apron
- Turnaround

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

Source: USGS 2010
### 4.3.4.1.1.2 Groundwater Resources

Groundwater is not planned to be used during construction. Instead, temporary reverse osmosis of seawater would be used to provide potable water during construction. The accidental release of other pollutants associated with the use and maintenance of construction vehicles could also impact groundwater. However, accidental release of pollutants would be rare, and best management practices would be followed to reduce the likelihood of an accidental release or spill occurring. Any spills that do occur would be cleaned up immediately. Silt fence, sediment basins, turbidity barriers, tracking pads, filter strips, and other forms of temporary erosion/sedimentation control would be utilized to mitigate adverse effects to groundwater resulting from construction activities. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, Pagan Alternative 1 construction activities would result in less than significant impacts to groundwater resources.

### 4.3.4.1.1.3 Nearshore Water Resources

No in-water construction is proposed under Pagan Alternative 1. Potential short-term impacts related to land-based construction include erosion, sedimentation, turbidity, decreased water clarity, and accidental discharge of pollutants. The accidental release of pollutants associated with the use and maintenance of vehicles could also impact nearshore waters. However, accidental release of pollutants would be rare, and best management practices would be followed to reduce the likelihood of an accidental release or spill occurring. Any spills that do occur would be cleaned up immediately. Storage and maintenance of construction equipment and supplies is anticipated to occur away from nearshore waters to reduce potential for impacts. In addition, best management practices including silt fence, turbidity barriers, tracking pads, filter strips, and other forms of temporary erosion/sedimentation control would be utilized to minimize impacts to nearshore waters resulting from construction activities. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, Pagan Alternative 1 construction activities would result in less than significant impacts to nearshore water resources.

### 4.3.4.1.2 Operation Impacts

Pagan Alternative 1 training and maintenance operations may result in impacts to surface waters, groundwater resources, and nearshore waters. Groundwater is not planned to be used during operations. Instead, temporary reverse osmosis of seawater would be used to provide potable water during operations.

#### 4.3.4.1.2.1 Surface Water Resources

Laguna Sanhiyon is located adjacent to proposed military training trails. The proposed trail to the west of the lake would be located on the sand bar that separates the lake from the ocean. During windy conditions and high tides, waves occasionally over the top of the sand bar. Use of vehicles on this trail would be limited to emergencies. During a rare emergency event, sediment and hydrocarbon runoff from military vehicles using the training trail could impact Laguna Sanhiyon water quality.

Much of the proposed material used on trails throughout Pagan will include crushed lava from lava flow across the air strip. This angular material will be crushed to appropriate size for use as road base and surface with minimal quantities of fine particles, reducing the likelihood of being easily transported by stormwater runoff. Additional protection from sediment laden runoff resulting from military trail use
would be provided through the use of vegetated swales and stormwater velocity dissipaters and other best management practices at crossings. High porosity of surface soils and geology limit the volume of surface stormwater runoff, further decreasing the likelihood of transportation of sediment.

Stormwater runoff from the northern High Hazard Impact Area could transport munitions constituents to Laguna Sanhalom and Laguna Sanhiyon either as surface runoff or sub-surface conveyance, resulting in indirect water quality impacts to those surface waters. Target placement has been selected so that stormwater runoff potentially transporting munition constituents would drain away from the lakes, with the following target placement exceptions: the two targets due west of Mount Pagan, which would potentially drain to Laguna Sanhalom via surface flow and to both Laguna Sanhalom and Laguna Sanhiyon via sub-surface flow. Stormwater runoff can erode and transport contaminated soil and leachable munition constituents. Munitions constituents from operation of the Pagan RTA contain potentially leachable compounds that can impact water quality if not managed properly. Low Impact Development features would be utilized to control stormwater runoff from the Pagan RTA and water quality controls would be located throughout the live-fire ranges to address munitions concerns. The distance between the two targets sited up gradient of Laguna Sanhalom and Laguna Sanhiyon on Mount Pagan within the High Hazard Impact Area is greater than 1,150 feet (350 meters) horizontally, reducing likelihood of transportation of munitions constituents via surface stormwater runoff. However, the potential for transportation of munitions constituents to the surface waters does exist based on the target location relative to the surface waters and as a result of the nature of the fractured surface geology and potential for sub-surface flow. Whether by intense rainfall events or by sub-surface conveyance there is the potential for future impacts. As a result of the target placement up gradient of the surface waters and military trail adjacent to Laguna Sanhiyon, Pagan Alternative 1 operations could result in impacts to surface water resources. Best management practices including filter strips, bio-retention, vegetated swales, and other forms of permanent erosion/sedimentation control practices would be utilized to minimize impacts to surface waters resulting from operation activities. Monitoring and adaptive management plans would identify if conditions change and concerns arise, allowing early intervention to reduce potential impacts to the surface water resources. Through creation of downstream catch areas to prevent direct runoff from transporting pollutants via overland flow directly to surface waters and proper range construction and management and the implementation of the Range Environmental Vulnerability Assessment program, Pagan Alternative 1 operations would result in less than significant impacts to surface water resources.

Low-lying areas, including areas surrounding Laguna Sanhalom, Laguna Sanhiyon, and shoreline areas, could be subject to flooding during high wind, high tide, and storm surge events. Proposed operational activities are not anticipated to increase flooding hazards; therefore, Pagan Alternative 1 operations would result in no impacts with regards to flooding.

### 4.3.4.1.2.2 Groundwater Resources

Surface runoff within the areas of target placements in each of the High Hazard Impact Areas is expected to be moderate due to the relative flatness of the target areas and the underlying soil/rock conditions. Once the water passes through the rooting zone of the soils (primarily associated with the isthmus High Hazard Impact Area) or through course, highly permeable lava rock (associated with the northern High Hazard Impact Area) it would percolate to the groundwater aquifer system several hundred feet below. Risk of contamination to groundwater from munitions constituent in the northern
High Hazard Impact Area on Mount Pagan is possible, however, would be somewhat reduced by: (1) the possibly limited existence of a basal groundwater lens in the area and (2) dilution from rapidly percolating waters migrating radially toward the coast. The High Hazard Impact Area on the isthmus was mapped as containing “generally meager to small quantities of fair to poor quality water” (Corwin et al. 1957). There is not likely to be a substantial groundwater resource in this area. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2, Pagan Alternative 1 operations would result in less than significant impacts to groundwater resources.

4.3.4.1.2.3 Nearshore Water Resources

The landing of amphibious and small craft vehicles on beaches, beach and amphibious training maneuvers, and the use of Amphibious Assault Vehicles could impact nearshore water quality. Potential impacts include erosion, sedimentation, turbidity, decreased water clarity, and accidental discharge of pollutants. The accidental release of other pollutants associated with the use and maintenance of vehicles could also impact nearshore water quality. However, accidental release of these pollutants would be rare and only occur as a result from the failure of a materials-handling best management practice, and any spills would be cleaned up immediately.

Stormwater runoff from High Hazard Impact Areas could also transport munitions constituents to nearshore waters resulting in indirect water quality impacts. Targets in the northern High Hazard Impact Area and most of the isthmus High Hazard Impact Area would be placed away from coastal cliff lines on relatively flat terrain that is visible from the firing positions. However, proposed targets on the steep slopes along the isthmus High Hazard Impact Area are close enough to the coast that dislodged rock, soil, or target material could fall into the nearshore waters below.

Constituents associated with target material that falls into nearshore waters are not expected to substantially impact nearshore water quality. When metals are exposed to seawater, they begin to slowly corrode, a process that creates a layer of corroded material between the seawater and metal. This layer of corrosion removes the metal from direct exposure to the corrosiveness of seawater, a process that further slows movement of the metals into the adjacent sediments and water column. This is particularly true of aluminum. Elevated levels of metals in sediments would be restricted to a small zone around the metal, and any release to the overlying water column would be diluted. In a similar fashion, as materials become covered by marine life, the direct exposure of the material to seawater decreases and the rate of corrosion decreases. Dispersal of these materials in the water column is controlled by physical mixing and diffusion, both of which tend to vary with time and location. Consequently, impacts to nearshore marine water quality would be minimal. Furthermore, a recent study conducted by the U.S. Marine Corps sampled sediments and water quality for 26 different constituents related to munitions at several U.S. Marine Corps training ranges. Metals included lead and magnesium. These areas were also used for bombing practice. No munitions constituents were detected above screening values used at these ranges (DoN 2010c).

Potential indirect impacts would be minimized (reduced) through the implementation of a stormwater management system, which would include the use of integrated management practices (Low Impact Development/best management practices), for the proposed development. The post-development stormwater management system for Pagan Alternative 1 would be developed and Low Impact Development features would be utilized to control stormwater runoff from the Pagan RTA. Best
management practices could include filter strips, bio-retention, vegetated swales and other forms of permanent erosion/sedimentation control and management practices. Proper range management and implementation of a Range Environmental Vulnerability Assessment program would reduce potential impacts to water quality. Reevaluations would occur at a minimum every 5 years. Based upon the above analysis and the implementation of resource management measures in Section 4.3.2 Pagan Alternative 1 operations would result in less than significant impacts to nearshore water resources.

### 4.3.4.2 Pagan Alternative 2

Pagan Alternative 2 construction and training activities would have similar impacts to water resources as those identified under Pagan Alternative 1 (Figure 4.3-6). The main differences that would affect water resources are the northern High Hazard Impact Area would be smaller and the isthmus High Hazard Impact Area would not be constructed.

#### 4.3.4.2.1 Construction Impacts

Under Pagan Alternative 2, development and construction would occur in largely the same areas as under Pagan Alternative 1. However, there would be differences in the number of firing positions associated with the Mortar Range (total of five; one less than Pagan Alternative 1), the number of landing zones (total of 13; 2 more than Pagan Alternative 1), and there would no target areas on the isthmus because the isthmus High Hazard Impact Area would not be constructed. The South Range Complex would consist of maneuver area and would not involve construction improvements. Impacts to water resources under Pagan Alternative 2 construction would be similar to those identified under Pagan Alternative 1. Therefore, Pagan Alternative 2 construction activities would result in less than significant impacts to water resources.

#### 4.3.4.2.2 Operation Impacts

Impacts to water resources resulting from Pagan Alternative 2 training activities would be similar to those identified under Pagan Alternative 1 but would not include the potential impacts to nearshore water quality associated with the isthmus High Hazard Impact Area. Therefore, Pagan Alternative 2 operations would result in less than significant impacts to surface water, groundwater, and nearshore water resources.

### 4.3.4.3 Pagan No-Action Alternative

Limited activities would occur on Pagan under the no-action alternative. There would be no live-fire military training. As described in the Chapter 2, the no-action alternative would assume the continued infrequent and low impact events of periodic eco-tourism and scientific survey visits. Military activities would consist of periodic and low impact search and rescue training. The no-action alternative would continue to have less than significant impacts.
4.3.4.4 Summary of Impacts for Pagan Alternatives

Table 4.3-2 provides a comparison of the potential impacts to water resources for the two Pagan alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Water Resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Water Resources</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Groundwater Resources</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Nearshore Water Resources</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact.
4.4 **AIR QUALITY**

Section 4.4 addresses the potential impacts to air quality as a result of the proposed action. Air quality can be affected by air pollutants produced by mobile sources, such as vehicular traffic, aircraft, or non-road equipment used for construction activities, and by fixed or immobile facilities, referred to as “stationary sources.” Stationary sources can include combustion and industrial stacks and exhaust vents. The impact analysis includes an incremental emissions analysis of criteria air pollutants associated with the following construction and operation activities:

- Construction equipment and vehicle emissions during RTA and supporting facilities construction
- Land training, inclusive of associated weapon firing and vehicle usage
- Amphibious training
- Air support and training
- Operations for transporting military training personnel
- Supporting equipment emissions within the base camp and training ranges
- Barge and equipment operations for solid waste transfer

Greenhouse gas emissions associated with the above activities occur locally; however, their impacts are both global in scale and cumulative over time. Therefore, greenhouse gas emissions have been calculated and are presented in this section, but their impacts are assessed in Chapter 5, *Cumulative Impacts*.

### 4.4.1 Approach to Analysis

The air quality impact analysis estimates emissions that would occur from proposed construction and operational activities. These emissions are compared against the thresholds established in the Clean Air Act’s Prevention of Significant Deterioration program, to evaluate the extent of potential air quality impacts.

Air quality impacts associated with the proposed construction activities result from both construction equipment and vehicle exhaust, as well as from fugitive dust generated by earth moving activities. Emission sources associated with operational activities include: aircraft during landing, take-off, and cruising below 3,000 feet (914 meters) above ground level; marine vessels; vehicles; support equipment; use of ordnance; and mobile sources associated with interim solid waste transfer operations. The proposed training facilities would also generate fugitive dust emissions if training operations occur within areas of exposed soil.

Both Tinian and Pagan are considered unclassified and in attainment for all criteria pollutants. Because no regulatory de minimis emission thresholds have been established for an attainment area and the proposed alternatives would occur in areas that are considered to be in attainment, the “major stationary source” definition (250 tons [227 metric tons] per year or more of air pollutants that are subject to regulations under the Clean Air Act) from the Prevention of Significant Deterioration program applicable in an attainment area was selected as a comparable significant impact threshold for this EIS/OEIS. This threshold only applies to criteria pollutants and is not applicable to greenhouse gas emissions in terms of carbon dioxide. There is no specific impact threshold for carbon dioxide.
potential impacts of greenhouse gas emissions, including carbon dioxide, are discussed in Chapter 5, Cumulative Impacts.

More detailed information on methodology for determining air quality impacts related to the proposed action, including annual emission calculations, is presented in Appendix G, Air Quality Technical Memo.

4.4.1.1 Construction

Air quality impacts were evaluated based on the construction and ground disturbance activities described in Chapter 2, Proposed Action and Alternatives. Criteria pollutants and carbon dioxide emissions were calculated based on the equipment type, the duration of equipment use, and anticipated manpower, detailed in Appendix G, Air Quality Technical Memo.

Construction equipment and manpower requirements were based on the data contained in 2003 RSMeans Facilities Construction Cost Data (RSMeans 2002) and 2011 RSMeans Facilities Construction Cost Data (RSMeans 2010). It was assumed for emission estimating purposes that construction activities would start in 2017 and continue through 2027.

Construction equipment emissions were calculated based on estimated hours of equipment use and the emission factor assigned to the equipment, as provided by the U.S. Environmental Protection Agency in the NONROAD emission factor model (U.S. Environmental Protection Agency 2008). National default model inputs for off-road construction equipment and vehicles, average equipment horsepower values, and equipment power load factors were also obtained from the U.S. Environmental Protection Agency model (U.S. Environmental Protection Agency 2008).

Because the operational activity data presented in RSMeans’ cost data books are generated based on the overall length of time equipment is onsite, an equipment actual running time factor (i.e., actual usage factor) was employed to estimate equipment emissions. The usage factor for each equipment type was obtained from Federal Highway Administration’s Roadway Construction Noise Model User’s Guide (Federal Highway Administration 2006). Emission factors related to construction delivery trucks were estimated using the latest version of the Motor Vehicle Emission Simulator, MOVES2010b (U.S. Environmental Protection Agency 2012). The MOVES2010b emission factor model provides a specific emission factor database for truck and commuter vehicle classifications. Because the MOVES2010b model does not contain data for the CNMI, the database for the U.S. Virgin Islands was used, based on a recommendation from the U.S. Environmental Protection Agency (Dave Brzezinski, U.S. Environmental Protection Agency, personal communication, May 30, 2013). To estimate air emissions generated during construction of the proposed Tinian and Pagan RTAs, the following prototypical elements were used to extrapolate emissions for the overall construction effort:

- General range clearing and grading
- Range automation installation
- Range equipment shed
- Base camp
- Airfield improvements
- Roadway construction
- Port improvements
4.4.1.2 Operation

Proposed operational training activities with the potential to impact air quality include:

- Aircraft flight operations during take-off and landing, cruising training, and transporting troops, weapons, and other training equipment
- Marine vessel operations
- Ground vehicle operations at ranges
- Support equipment operations
- Munitions operations
- Interim solid waste transfer/process operations

4.4.1.2.1 Aircraft Emissions

The number of annual training flight missions and flight hours within 3,000 feet (914 meters) above ground level defined for each alternative were based on information described in Chapter 2, Proposed Action and Alternatives. This altitude is defined by the U.S. Environmental Protection Agency to account for aircraft emissions within a mixing zone (see Appendix G, Air Quality Technical Memo for more details). The training data includes the number of landings and take-offs at Tinian International Airport and at various designated landing practice zones, and overall in-flight hours operating below 3,000 feet (914 meters) above ground level within Tinian and Pagan airspace. The emissions from aircraft flight operations were estimated using the methods and emission factors obtained from the following references:

- Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources (U.S. Environmental Protection Agency 1992).
- DoN aircraft engine emission factors developed by the DoN’s Aircraft Environmental Support Office (Aircraft Environmental Support Office 2000-2013).
- Air Emissions Guide for Air Force Mobile Sources (Air Force Civil Engineer Center 2013) and U.S. Federal Aviation Administration Emissions and Dispersion Modeling System (Version 5.01) for non-DoN aircraft emissions factors (Federal Aviation Administration 2014).

4.4.1.2.2 Marine Vessel Emissions

The training vessel operational data such as the engine power level for each vessel type, the operational hours per vessel per event, and the number of events per year were predicted based on the training tempo described in Chapter 2, Proposed Action and Alternatives. Vessel emissions were calculated using the methodologies, emission factors, and load factors related to diesel marine vessels obtained from Current Methodologies in Preparing Mobile Source Port-related Emission Inventories (U.S. Environmental Protection Agency 2009). Emission factors were multiplied by predicted annual running hours for each identified vessel to determine overall estimated emissions on an annual basis.
4.4.1.2.3 Ground Vehicles Emissions

Ground training vehicle exhaust emissions from trucks, high mobility multi-purpose wheeled vehicles, and buses used during training exercises were estimated with the same method used to predict construction vehicle emissions. The U.S. Environmental Protection Agency MOVES2010b emission factor model was used to predict emissions factors associated with each type of training vehicle (U.S. Environmental Protection Agency 2012). The model-established emission factors are based on the average weight and fuel type of each type of training vehicle. The emission factors were then multiplied by the annual vehicle running hours to determine overall emissions on an annual basis. In addition, because most of these training vehicles would maneuver on unpaved roads with the potential to generate fugitive dust, the U.S. Environmental Protection Agency’s AP-42, Compilation of Air Pollution Emission Factors, was also used to predict particulate matter components in fugitive dust emissions from training vehicles (U.S. Environmental Protection Agency 1995).

4.4.1.2.4 Supporting Equipment and Generator Emissions

It is anticipated that during the training exercises, mobile and portable equipment; such as water and fuel trucks; forklift; and mobile and stationary diesel generators would also be required. The supporting equipment emission factors are based on both the U.S. Environmental Protection Agency’s AP-42 (U.S. Environmental Protection Agency 1995) and the NONROAD model database (U.S. Environmental Protection Agency 2008). Relevant emission factors were multiplied by the annual equipment running hours to determine overall emissions on an annual basis.

4.4.1.2.5 Weapon Firing Emissions

Air emissions potentially occur during each weapon firing. Emission releases may occur during the launching of a projectile, from the propellant charge at firing position, and from the detonation explosion of the projectile in the target vicinity. The U.S. Environmental Protection Agency has published emission factors mostly in draft forms for various munitions in the AP-42 guidance. These emission factors for weapons firing and explosive detonation were used to predict overall munitions emissions.

4.4.1.2.6 Solid Waste Transfer Equipment Emissions

It is anticipated that solid waste generated as part of training exercises would be processed and transferred from Tinian to a regulatory compliant facility off-island. Mobile equipment (e.g., barges, loaders) would therefore be required to process and transport the waste between islands. The equipment emission factors are based on the same references described previously for barge emissions and non-road equipment.

4.4.2 Resource Management Measures

Resource management measures that are applicable to air quality include the following best management practices and standard operating procedures:

- Maintenance and operation of construction equipment in compliance with the Environmental Protection Agency’s Tier 2 engine emission standards
- Minimization of land disturbance during construction and operational periods
• Stabilization of construction site entrances
• Covering trucks when hauling soil, stone, and debris
• Utilization of water trucks to minimize dust during construction activities
• Minimization of truck idling time
• Utilization of construction equipment with emission control devices (e.g., diesel particulate filters)

A complete listing of best management practices is provided in Appendix D, Best Management Practices.

4.4.3 Tinian

4.4.3.1 Tinian Alternative 1

4.4.3.1.1 Construction Impacts

Operation of construction equipment and associated vehicles may result in short-term impacts to air quality. The total construction-related air emissions were averaged evenly over a potential 9-year build period on Tinian to obtain an annual emission average (Table 4.4-1). The average annual emissions are well below the 250 tons (227 metric tons) per year threshold. Therefore, Tinian Alternative 1 construction activities would result in less than significant direct or indirect impacts to air quality.

<table>
<thead>
<tr>
<th>Construction Year</th>
<th>Pollutant (tons per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$SO_2$</td>
</tr>
<tr>
<td>1 – 9</td>
<td>0.19</td>
</tr>
</tbody>
</table>

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

Note: 250 ton per year threshold does not apply to $CO_2$.

4.4.3.1.2 Operation Impacts

Tinian Alternative 1 would not affect the permitted operational capacity of existing utility systems as discussed in Section 4.14, Utilities. Therefore, no adverse air quality impacts from stationary sources (i.e., new or modified fixed or immobile facilities) would occur. Annual military training activities in Tinian would increase under Tinian Alternative 1. Therefore, annual emissions for criteria pollutants would increase relative to the existing conditions. Calculated emissions are summarized in Table 4.4-2.
Table 4.4-2. Operational Training Annual Emissions – Tinian Alternatives 1, 2, and 3

<table>
<thead>
<tr>
<th>Pollutant (tons per year)</th>
<th>SO₂</th>
<th>CO</th>
<th>PM₁₀</th>
<th>PM₂.₅</th>
<th>NOₓ</th>
<th>VOC</th>
<th>CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft Sorties around Tinian International Airport</td>
<td>8.12</td>
<td>256.27</td>
<td>42.69</td>
<td>42.69</td>
<td>89.02</td>
<td>75.18</td>
<td>25,048.85</td>
</tr>
<tr>
<td>Aircraft Training Exercises</td>
<td>2.74</td>
<td>3.25</td>
<td>11.29</td>
<td>11.29</td>
<td>28.70</td>
<td>0.37</td>
<td>3,740.83</td>
</tr>
<tr>
<td>Marine Vessels</td>
<td>31.61</td>
<td>8.85</td>
<td>3.75</td>
<td>3.43</td>
<td>106.28</td>
<td>4.02</td>
<td>5,144.48</td>
</tr>
<tr>
<td>Ground Vehicles</td>
<td>13.38</td>
<td>42.31</td>
<td>109.13</td>
<td>19.38</td>
<td>141.71</td>
<td>9.11</td>
<td>1,192.42</td>
</tr>
<tr>
<td>Support Equipment</td>
<td>0.17</td>
<td>3.43</td>
<td>16.48</td>
<td>2.12</td>
<td>7.50</td>
<td>0.64</td>
<td>794.05</td>
</tr>
<tr>
<td>Generators</td>
<td>0.35</td>
<td>4.71</td>
<td>0.34</td>
<td>0.29</td>
<td>20.57</td>
<td>0.60</td>
<td>994.00</td>
</tr>
<tr>
<td>Solid Waste Transfer</td>
<td>0.10</td>
<td>0.31</td>
<td>0.06</td>
<td>0.06</td>
<td>0.95</td>
<td>0.07</td>
<td>84.56</td>
</tr>
<tr>
<td>Munitions</td>
<td>0.03</td>
<td>56.01</td>
<td>38.68</td>
<td>13.80</td>
<td>1.72</td>
<td>0.01</td>
<td>82.21</td>
</tr>
<tr>
<td>Total</td>
<td>56.45</td>
<td>375.14</td>
<td>222.42</td>
<td>93.06</td>
<td>396.45</td>
<td>90.00</td>
<td>37,081.40</td>
</tr>
</tbody>
</table>

Legend: CO = carbon monoxide; CO₂ = carbon dioxide; NOₓ = nitrogen oxides; PM₁₀ = particulate matter with a particle diameter of less than or equal to 10 microns; PM₂.₅ = particulate matter with a particle diameter of less than or equal to 2.5 microns; SO₂ = sulfur dioxide; VOC = volatile organic compound.

Note: 250 ton per year threshold does not apply to CO₂.

The operational training-related emissions for Tinian Alternative 1 (Table 4.4-2) are below the comparative impact threshold of 250 tons (227 metric tons) per year for all criteria pollutants, except carbon monoxide and nitrogen oxide. The training-related carbon monoxide and nitrogen oxide emissions would occur across a large geographic area that consists of both the airspace around the airport and training facilities where aircraft would operate, the proposed RTA where training vehicles and aircraft would operate, and coastal areas where aircraft and vessels would operate.

Approximately 71% of total carbon monoxide and 56% of nitrogen oxide emissions would be generated by aircraft and seafaring vessels and would not result in impacts to air quality at ground level on land where human exposure would occur. Consequently, the total ground level carbon monoxide and nitrogen oxide emissions would be well below the 250 tons (227 metric tons) per year comparative impact threshold. Furthermore, the dominant trade winds in the region blowing from the east and northeast would quickly disperse emissions towards the ocean. Therefore, Tinian Alternative 1 operations would result in less than significant direct or indirect impacts to air quality.
4.4.3.2  Tinian Alternative 2

4.4.3.2.1  Construction Impacts

Tinian Alternative 2 would result in slightly higher construction impacts to air quality than estimated from Tinian Alternative 1. The predicted average annual construction emissions under Tinian Alternative 2 as shown in Table 4.4-3 are well below the significance threshold of 250 tons (227 metric tons) per year for criteria pollutants. Therefore, Tinian Alternative 2 construction activities would result in less than significant direct or indirect impacts to air quality.

<table>
<thead>
<tr>
<th>Year</th>
<th>SO₂</th>
<th>CO</th>
<th>PM₁₀</th>
<th>PM₂₅</th>
<th>NOₓ</th>
<th>VOC</th>
<th>CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 9</td>
<td>0.19</td>
<td>9.49</td>
<td>0.70</td>
<td>0.66</td>
<td>8.20</td>
<td>1.75</td>
<td>1,223.55</td>
</tr>
</tbody>
</table>

Legend: CO = carbon monoxide; CO₂ = carbon dioxide; NOₓ = nitrogen oxides; PM₁₀ = particulate matter with a particle diameter of less than or equal to 10 microns; PM₂₅ = particulate matter with a particle diameter of less than or equal to 2.5 microns; SO₂ = sulfur dioxide; VOC = volatile organic compound.

Note: 250 ton per year threshold does not apply to CO₂.

4.4.3.2.2  Operation Impacts

Operational training impacts to air quality resulting from Tinian Alternative 2 would be the same as those from Tinian Alternative 1 (see Table 4.4-2) because operations would be the same under both alternatives in terms of activities although the location of some of the activities would differ. See Section 4.4.3.1, Tinian Alternative 1, for a discussion of impacts. Therefore, Tinian Alternative 2 operations would result in less than significant direct or indirect impacts to air quality.

4.4.3.3  Tinian Alternative 3

4.4.3.3.1  Construction Impacts

Annual construction emissions resulting from Tinian Alternative 3 would be similar to, but slightly higher than, emissions resulting from Tinian Alternative 1 construction activities. The average annual construction emissions from Tinian Alternative 3, as shown in Table 4.4-4, are below the significance threshold of 250 tons (227 metric tons) per year for criteria pollutants. Therefore, construction activities associated with Tinian Alternative 3 would result in less than significant impacts to air quality.

<table>
<thead>
<tr>
<th>Year</th>
<th>SO₂</th>
<th>CO</th>
<th>PM₁₀</th>
<th>PM₂₅</th>
<th>NOₓ</th>
<th>VOC</th>
<th>CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 9</td>
<td>0.19</td>
<td>9.30</td>
<td>0.69</td>
<td>0.65</td>
<td>8.12</td>
<td>1.72</td>
<td>1,210.85</td>
</tr>
</tbody>
</table>

Legend: CO = carbon monoxide; CO₂ = carbon dioxide; NOₓ = nitrogen oxides; PM₁₀ = particulate matter with a particle diameter of less than or equal to 10 microns; PM₂₅ = particulate matter with a particle diameter of less than or equal to 2.5 microns; SO₂ = sulfur dioxide; VOC = volatile organic compound.

Note: 250 ton per year threshold does not apply to CO₂.
4.4.3.3.2 Operation Impacts

Tinian Alternative 3 would result in the same impacts to air quality as those resulting from Tinian Alternative 1 operations (see Table 4.4.2) because operations would be the same under both alternatives in terms of activities although the location of some of the activities would differ. See Section 4.4.3.1, Tinian Alternative 1, for a discussion of impacts. Therefore, Tinian Alternative 3 operations would also result in less than significant direct or indirect impacts to air quality.

4.4.3.4 Tinian No-Action Alternative

Under the no-action alternative for Tinian, periodic non-live-fire military training exercises would continue. Air emissions would include minor and short-term amounts of criteria pollutants related to fossil fuel combustion exhausts from ground vehicle and aircraft operations. Particulate matter in the form of dust would be emitted as vehicles and troops used unpaved road and staging areas. There would also be annual air emissions associated with the construction and subsequent operations of the four live-fire training ranges envisioned in the Guam and CNMI Military Relocation EIS (DoN 2010a). These emissions from the four ranges would be less than significant (see Table 5.2-2; DoN 2010a). Emissions under Mariana Islands Range Complex training would produce minor localized emissions and would not affect current attainment status of all criteria pollutants (see Table 3.4-8; DoN 2010b). When the combined emissions from the no-action alternative activities are considered, they would be well below the significance threshold of 250 tons (227 metric tons) per year; therefore, the no-action alternative would result in less than significant impacts to air quality on Tinian.
4.4.3.5 Summary of Impacts for Tinian Alternatives

Table 4.4-5 provides a comparison of the potential impacts to air quality resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>Air Quality</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact.
4.4.4   Pagan

4.4.4.1   Pagan Alternative 1

4.4.4.1.1   Construction Impacts

The annual emissions were conservatively estimated based on a 4-year construction period and are summarized in Table 4.4-6. As discussed in Chapter 2, Proposed Action and Alternatives, construction would occur over an 8 to 10 year period. The type and intensity of construction activities would vary across the 8 to 10 year construction period. Averaging emissions across a 4-year construction period provides a conservative estimate of annual emissions. Total emissions are below the 250 tons (227 metric tons) per year threshold. Therefore, Pagan Alternative 1 construction activities would result in less than significant direct or indirect impacts to air quality.

Table 4.4-6. Annual Construction Emissions – Pagan Alternative 1

<table>
<thead>
<tr>
<th>Construction Year</th>
<th>Pollutant (tons per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SO2</td>
</tr>
<tr>
<td>1 – 4</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Legend: CO = carbon monoxide; CO2 = carbon dioxide; NOx = nitrogen oxides; PM10 = particulate matter with a particle diameter of less than or equal to 10 microns; PM2.5 = particulate matter with a particle diameter of less than or equal to 2.5 microns; SO2 = sulfur dioxide; VOC = volatile organic compound.

Note: 250 ton per year threshold does not apply to CO2.

4.4.4.1.2   Operation Impacts

The annual emissions for the operational elements and training exercises are summarized in Table 4.4-7 and are well below the comparative impact threshold of 250 tons (227 metric tons) per year for all criteria pollutants, except for nitrogen oxide. Approximately 75% of nitrogen oxide emissions would be generated by ground training vehicles. The training would also involve explosions detonated on lava rocks that likely contain hazardous fibrous materials and would release particulates in the air. However given the lack of studies of the impact from rock detonations, the particulate emissions generated cannot be feasibly quantified. However, because no sensitive land uses are located close to the proposed RTA and the dominant trade winds in the region would quickly disperse all emissions (including nitrogen oxide or particulates from rock detonations) towards the ocean, Pagan Alternative 1 operations would result in less than significant direct or indirect impacts to air quality.
### Table 4.4-7. Operational Training Activity Annual Emissions – Pagan Alternative 1

<table>
<thead>
<tr>
<th>Pollutant (tons per year)</th>
<th>SO₂</th>
<th>CO</th>
<th>PM&lt;sub&gt;10&lt;/sub&gt;</th>
<th>PM&lt;sub&gt;2.5&lt;/sub&gt;</th>
<th>NO₂</th>
<th>VOC</th>
<th>CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft Sorties around Tinian International Airport</td>
<td>2.98</td>
<td>74.22</td>
<td>17.16</td>
<td>17.16</td>
<td>42.66</td>
<td>29.71</td>
<td>7,607.25</td>
</tr>
<tr>
<td>Aircraft Training Exercises</td>
<td>2.29</td>
<td>2.31</td>
<td>8.00</td>
<td>8.00</td>
<td>42.64</td>
<td>0.28</td>
<td>4,810.82</td>
</tr>
<tr>
<td>Marine Vessels</td>
<td>2.18</td>
<td>0.84</td>
<td>0.27</td>
<td>0.25</td>
<td>10.22</td>
<td>0.36</td>
<td>353.86</td>
</tr>
<tr>
<td>Ground Vehicles</td>
<td>32.80</td>
<td>94.12</td>
<td>155.51</td>
<td>35.46</td>
<td>335.45</td>
<td>20.41</td>
<td>1,421.42</td>
</tr>
<tr>
<td>Support Equipment</td>
<td>0.02</td>
<td>0.49</td>
<td>1.24</td>
<td>0.20</td>
<td>0.92</td>
<td>0.09</td>
<td>102.75</td>
</tr>
<tr>
<td>Generators</td>
<td>0.30</td>
<td>4.04</td>
<td>0.29</td>
<td>0.25</td>
<td>17.61</td>
<td>0.52</td>
<td>851.20</td>
</tr>
<tr>
<td>Munitions</td>
<td>0.04</td>
<td>6.63</td>
<td>24.92</td>
<td>23.05</td>
<td>0.19</td>
<td>0.06</td>
<td>315.34</td>
</tr>
<tr>
<td>Total</td>
<td>40.61</td>
<td>182.65</td>
<td>207.39</td>
<td>84.37</td>
<td>449.69</td>
<td>51.43</td>
<td>15,462.64</td>
</tr>
</tbody>
</table>

*Legend: CO = carbon monoxide; CO₂ = carbon dioxide; NOₓ = nitrogen oxides; PM<sub>10</sub> = particulate matter with a particle diameter of less than or equal to 10 microns; PM<sub>2.5</sub> = particulate matter with a particle diameter of less than or equal to 2.5 microns; SO₂ = sulfur dioxide; VOC = volatile organic compound.*

*Note: 250 ton per year threshold does not apply to CO₂.*

#### 4.4.4.1.2.1 Volcanic Impacts to Operation

Existing volcanic gases would continue to be released from volcanic eruptions as part of natural geological processes. Sulfur dioxide, a criteria pollutant, is one of the most common gases released in volcanic eruptions and is hazardous to humans. Periodic sulfur dioxide releases due to volcanic eruptions could potentially have an adverse impact to air quality. However, volcanic eruptions are natural geological processes, and the proposed action would not have an impact on the frequency of such eruptions. Therefore, Pagan Alternative 1 operations would have no impacts to air quality in regard to volcanic eruptions.

#### 4.4.4.2 Pagan Alternative 2

#### 4.4.4.2.1 Construction Impacts

Pagan Alternative 2 construction emissions would be similar but slightly less than emissions predicted to result from Pagan Alternative 1. The modeled annual construction emissions summarized in Table 4.4-8 are below the significance threshold of 250 tons (227 metric tons) per year for criteria pollutants. Therefore, Pagan Alternative 2 construction activities would result in less than significant impacts to air quality.
Table 4.4-8. Annual Construction Emissions – Pagan Alternative 2

<table>
<thead>
<tr>
<th>Construction Year</th>
<th>Pollutant (tons per year)</th>
<th>SO₂</th>
<th>CO</th>
<th>PM₁₀</th>
<th>PM₂·₅</th>
<th>NOₓ</th>
<th>VOC</th>
<th>CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 4</td>
<td></td>
<td>0.05</td>
<td>4.21</td>
<td>0.24</td>
<td>0.23</td>
<td>2.22</td>
<td>0.84</td>
<td>273.91</td>
</tr>
</tbody>
</table>

Legend: CO = carbon monoxide; CO₂ = carbon dioxide; NOₓ = nitrogen oxides; PM₁₀ = particulate matter with a particle diameter of less than or equal to 10 microns; PM₂·₅ = particulate matter with a particle diameter of less than or equal to 2.5 microns; SO₂ = sulfur dioxide; VOC = volatile organic compound.

Note: 250 ton per year threshold does not apply to CO₂.

4.4.4.2.2 Operation Impacts

Operation impacts to air quality resulting from Pagan Alternative 2 would be nearly the same as those predicted to result from Pagan Alternative 1, as the same operational activities would take place under both alternatives. See Section 4.4.4.1, Pagan Alternative 1, for a discussion of impacts. Therefore, Pagan Alternative 2 operations would also result in less than significant impacts to air quality.

4.4.4.2.2.1 Volcanic Impacts to Operation

Impacts to Pagan Alternative 2 operations resulting from volcanic activity would be the same as Alternative 1. See Section 4.4.4.1, Pagan Alternative 1, for a discussion of impacts. Therefore, Pagan Alternative 2 operations would have no impacts to air quality in regard to volcanic eruptions.

4.4.4.3 Pagan No-Action Alternative

Under the no-action alternative, air emissions associated with the proposed operations would not occur and air quality conditions would remain the same as existing conditions described in Chapter 3, Affected Environment. The continuation of a minor amount of visits to Pagan would not result in any impacts to air quality under the no-action alternative.

4.4.4.4 Summary of Impacts for Pagan Alternatives

Table 4.4-9 provides a comparison of the potential impacts to air quality resources for the two Pagan alternatives and the no-action alternative.

Table 4.4-9. Summary of Impacts for Pagan Alternatives

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Air Quality</td>
<td>LSI</td>
<td>LSI; NI (regarding volcanic activity)</td>
<td>LSI; NI (regarding volcanic activity)</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; NI = no impact.
4.5 Noise

Section 4.5 addresses the potential noise impacts to the environment from the proposed action. Potential noise impacts can be generated from construction activities and during training operations. This section focuses on the human aspect of noise generated by the proposed action. Other aspects of noise impacts are covered in Section 4.7, Land and Submerged Land Use; Section 4.8, Recreation; Section 4.9, Terrestrial Biology; Section 4.10, Marine Biology; Section 4.11, Cultural Resources; and Section 4.15, Socioeconomics.

4.5.1 Approach to Analysis

The following is a summary of the methodology used to analyze the potential noise impacts associated with the proposed action. Specific and more detailed information on methodology is presented in Appendix H, Noise Study. This noise analysis addresses changes in the noise environment resulting from the proposed action and uses modeling software to determine the breadth of impacts from audible noise (i.e., sound perceived by human hearing) generated by construction activities and training operations.

Direct impacts are those associated with elevated noise levels that can cause annoyance and/or hearing loss. Indirect noise impacts are those which occur after the noise event such as non-auditory health effects. Studies have been conducted to examine the effects of military noise exposure, focusing primarily on stress response, blood pressure, birth weight, mortality rates, and cardiovascular health. However, results of most of these cited studies are inconclusive, and it cannot be stated that a causal link exists between military noise exposure and the various type of non-auditory health effects that were studied at noise levels below 75 decibels A-weighted day-night average sound levels (Department of Defense Noise Working Group 2013).

Representative points of interest, population numbers, and acres exposed to proposed action noise levels were identified and the results compared to baseline conditions. To determine the population counts, this analysis used aerial photography to count actual houses and the U.S. Census population multiplier for Tinian (Marpo Heights) of 3.77 people per household.

Noise generated by construction and operations at the airfields, in the airspace, and at the training facilities are calculated using different modeling software because different noise metrics apply to the different activities as described in Section 3.5.1. The following summarizes the noise modeling software used for calculating proposed noise levels, and identifies the criteria applied to determine impact significance.

4.5.1.1 Construction

The Federal Highway Administration’s Road Construction Noise Model was used for vehicles and equipment to determine noise levels at user specified distances from the source. The U.S. Environmental Protection Agency recommends permissible construction noise levels for residents living adjacent to construction activities. These levels are based on noise averaged over 8- and 24-hour periods. Because daily construction durations are about 8 hours, the limit for 365 days per year exposure is 75 decibels. This 75-decibel exposure recommendation applies when ambient (i.e.,
background) noise levels outside of working hours are less than 60 decibels (as found on Tinian and Pagan); otherwise, the 24-hour standard of 70 decibels is used.

4.5.1.2 Operations

Noise zones (defined in Section 3.5.1) are used by the U.S. military as guidelines for planning on installations and as recommendations for local communities in their planning efforts. While not specifically regulatory standards, zones are used to identify land areas of compatibility and incompatibility (see Table 3.5-1) with noise generated from military activities (Army 2007). Refer to Table 3.5-2, which identifies, by noise zone, land use compatibilities for noise levels generated by military activities, and refer to Table 3.5-3 for the probabilities of risk complaints.

4.5.1.2.1 Ground-Based Operations

The following noise modeling software was used for calculating proposed noise levels for ground-based operations:

- Small Arms Range Noise Assessment Model (Version 2.6.2003-06-06) calculated live-fire small arms of .50 caliber or less.
- Blast Noise Impact Assessment modeling program (Version 1.3.2003-07-03) modeled live-fire large caliber explosives 20 millimeter or greater.
- Non-live-fire training noise was evaluated on a case-by-case basis using equipment noise data.

For munitions, the significance criterion of 62 decibels C-weighted day-night average sound level scale was applied. Although A- and C-weighted values cannot be combined, the C-weighted criterion correlates well to the A-weighted criterion for determining compatibility with land uses (DoN 2008a). To supplement the discussion of impacts for impulsive ordnance noise (a single noise event), Peak 15 (or Peak) was used to account for the increased risk of noise complaints from people exposed to Peak noise levels exceeding 115 decibels. The low frequency peak noise from large-caliber weapons can be influenced by weather to a much greater extent than other types of noise generating activities. Unfavorable weather is a condition when the wind is blowing from the noise source towards populated areas. Conversely, neutral weather conditions occur when there is little wind and/or the wind is blowing away from populated areas towards the noise source.

4.5.1.2.2 Airfield and Airspace Based Operations

The following noise modeling software was used for calculating proposed noise levels for aircraft operations:

- NOISEMAP calculated noise levels in the airfield environment at Tinian International Airport, North Field, and the Pagan airfield (Moulton 1990).
- MRNMAP modeled, aircraft-generated noise levels in Special Use Airspace (Lucas 1995).
- Rotorcraft Noise Model was used for rotary-wing Landing Zones, Drop Zones, and general hovering activities (Page et al. 2008).

For aircraft-generated noise at the airfields, landing zones, and airspace, a criterion of 65 decibels A-weighted day-night average sound level scale was used to determine significance (DoN 2008b). Impacts
would be considered significant if sensitive receptors; people living in residential areas and occupying sensitive land uses such as schools and hospitals, were exposed to noise levels in Zones II and III (see Table 3.5-1). The analysis applied herein uses the 65-decibel threshold; however, the Federal Aviation Administration considers a 1.5-decibel increase in noise sensitive areas (e.g., schools, hospitals, and places of worship) over 65 decibels as a significance criterion.

4.5.1.2.3 Traffic

The following noise modeling software was used for calculating proposed noise levels for traffic operations:

- Traffic on Tinian roads was modeled using the Federal Highway Administration’s Traffic Noise Model Version 2.5 (Federal Highway Administration 2004).
- On Pagan, noise generated by vehicles would be negligible and because of the lack of population and relatively few vehicles being proposed for use on Pagan traffic noise was not modeled.

As presented in Section 3.5.1, several noise metrics were used in the modeling and include:

- **A-weighted Scale.** Applied to noise sources such as aircraft, small-caliber weapons, and vehicles.
- **C-weighted Scale.** Measured the low-frequency components of noise and applied to impulsive noise and vibrations generated by explosive charges and large-caliber weapons.
- **Peak 15.** Measured impulsive sounds generated by munitions, explosions, and sonic booms. It represents a single event where the Peak noise level is likely to be exceeded 15% of the time. Peak was also used to gauge the potential risk for receiving complaints and hereafter referred to as Peak.

4.5.1.2.4 Supplemental Noise Metrics

Supplemental metrics identify potential noise effects from aircraft overflights. These impacts include potential hearing loss, speech interference, classroom interruptions, and sleep disturbance. This approach is taken because noise levels generated by aircraft operations are most likely to affect receptors. According to U.S. Environmental Protection Agency (1974), changes in the hearing level of less than 5 decibels would not be considered noticeable or significant (see Appendix H, Noise Study for further explanation). For classroom interruption analysis, a threshold for the indoor background, equivalent noise level of 40 decibels was applied. The equivalent noise level, averaged over the 9 hours of normal school hours (i.e., 8:00 a.m. to 5:00 p.m.) was used for determining classroom disruption. Refer to Appendix H, Noise Study, for detailed information on these supplemental noise metrics.

4.5.1.2.5 Occupational Noise

For occupational noise, the significance level derives from a National Institute for Occupational Safety and Health (Institute) criteria document published in the early 1970s. It recommended an exposure limit of 85 decibels as an 8-hour time-weighted average. This exposure limit was reevaluated in 1998, when the Institute made recommendations that went beyond conserving hearing, by focusing on the prevention of occupational hearing loss. Using a then new risk assessment technique, the Institute published another criteria document which reaffirmed the 85 decibel recommended exposure limit (National Institute for Occupational Safety and Health 1998).
4.5.1.2.6 Underwater Noise

For underwater noise, there is no set significance level for human receptors. See Section 4.10, *Marine Biology* for significance criteria for marine biological resources.

4.5.2 Resource Management Measures

These resource management measures apply to Tinian because there is a permanent population on Tinian. Pagan does not have a permanent population; therefore, resource management measures to reduce impacts of noise on human populations are not necessary except those for worker safety.

4.5.2.1 Construction

4.5.2.1.1 Avoidance and Minimization Measures

- Minimizing night time construction activities to the extent practical.
- A construction perimeter could be set up to prevent recreational divers from being in the vicinity during pile driving activities at Unai Chulu.
- Sequencing work to minimize the number of loud construction equipment when working near residences.

4.5.2.1.2 Best Management Practices and Standard Operating Procedures

- Assuring all noise muffling equipment is installed and working properly.
- Shutting off idling equipment when not in use.
- Adhering to all Occupational Safety and Health Act noise reduction and hearing protection requirements and regulations.

4.5.2.2 Operation

4.5.2.2.1 Avoidance and Minimization Measures

- Limiting night time expenditures of large-caliber weapons use to only 4% of the total planned expenditures.
- Shifting some large-caliber operations from the southernmost firing points to points farther away from Tinian receptors.
- On Tinian, limiting normal departure and arrival procedures to areas over the Military Lease Area to the north of the runway. On occasion, infrequent exceptions may occur and flights may be directed to south of the runway.
- Assuring that operations to the south would occur only in case of a missed approach or during the rare westerly winds when take-offs and landings are oriented to the west.

4.5.2.2.2 Best Management Practices and Standard Operating Procedures

- Adhering to all Occupational Safety and Health Act noise reduction and hearing protection requirements and regulations.
4.5.3 Tinian

Noise-generating activities associated with the proposed action include construction of support facilities and operation of the RTA. Specifically, operations include training within the Military Lease Area; aircraft activities at Tinian International Airport, North Field, landing zones, and in Special Use Airspace and local airspace; waterborne operations at the port, designated beaches in the Military Lease Area, and in adjacent waters; and heavy- and light-vehicle traffic between the port and airport and the Military Lease Area.

Construction, aircraft noise, waterborne noise, traffic, and occupational noise impacts are similar among the three alternatives. Noise generated by live-fire weapons varies by alternative because of the different locations of some training facilities (e.g., Battle Area Complexes). The following is a synopsis of the impact analysis; refer to Appendix H, Noise Study, for the specific data input used and the results generated by the noise modeling.

4.5.3.1 Tinian Alternative 1

4.5.3.1.1 Construction Impacts

4.5.3.1.1.1 On Land

Noise modeling from construction activities used the A-weighted scale, and determined the noise levels by identifying the type of equipment and how long it would run. Earth-moving equipment (e.g., graders, excavators, dozers) and impact devices (e.g., pile drivers and jackhammers) are examples of heavy (large) equipment that would be used for construction. Smaller construction equipment includes generators, concrete saws, and compressors. Equipment and other construction activities typically generate noise levels ranging from 70 to 90 decibels at a distance of 50 feet (15 meters), see Appendix H, Noise Study (see Table 2.4-1) for specific equipment noise levels (U.S. Department of Transportation 2006). Noise modeling of construction activities averaged noise levels over 1 hour, assumed consistent equipment numbers throughout the workday, and that the equipment operated in the same location.

RTA construction and improvement activities within the Military Lease Area are too distant to generate elevated noise levels outside of its boundaries. Therefore, construction noise levels would not be detectable in any residential areas on Tinian.

At Tinian International Airport, noise generated from military airport facilities and infrastructure construction and improvement activities may be perceptible to residents of San Jose. Assuming 20 pieces of construction equipment would be active in one general location and at the same time, noise levels of 82 decibels at 100 to 500 feet (30 to 152 meters) from the airport construction site would be generated. The nearest point of interest is Tinian Middle/High School, located about 6,400 feet (1,950 meters) from the proposed construction area. Noise levels at the school would be 49 decibels, far below the significance criterion of 65 decibels.
At the Port of Tinian, proposed improvement activities would occur closer to San Jose, thereby increasing the potential to expose the population to construction-related noise; however, port improvement activities could generate noise levels no greater than 65.6 decibels at the nearest residents in the port area, still within acceptable levels of noise. Construction noise impacts would be compatible with residential areas, and would not affect schools, places of worship, or hospitals (i.e., sensitive receptors). Therefore, construction noise levels on land would be less than significant.

4.5.3.1.2 Underwater

Noise would be caused by shore-based construction equipment dredging the nearshore substrate at Unai Chulu to construct an in-water landing ramp for Amphibious Assault Vehicles. The dredging would require the use of a crane dredge and an excavator. Sheet piles would be driven to create a causeway for access and steel piles would be driven to build a temporary trestle for the dredging equipment. No blasting would be required. The duration for the proposed construction could take approximately 8 months.

Comparative operations that measured dredging noise with a limestone bottom were used to estimate dredging noise levels. The highest typical in-water noise levels for excavation dredging of limestone material measured a root mean squared noise at 179 decibels referenced to 1 micro Pascal at 3 feet (1 meter) (Reine et al. 2014). Underwater noise is based upon sound pressure levels with a base reference pressure of 1 micro Pascal. This differs from airborne noise that references 20 micro Pascal, thus in-water noise is expressed as “decibels referenced to 1 micro Pascal.” Estimated noise levels for either a 24 inch (0.6 meter) steel pipe or 24 inch (0.6 meter) sheet pile using recent measurements from other projects for impact pile diving indicate Sound Exposure Levels of approximately 190 decibels referenced to 1 micro Pascal at 33 feet (10 meters) and approximately 177 decibels referenced 1 micro Pascal root mean squared (Illinworth and Rodkin 2007). Vibratory pile driving of steel sheet piles yielded noise level results 25-30 decibels quieter than impact pile driving.

Underwater noise would not affect human receptors and a perimeter would be established to prevent recreational divers from entering areas of high in-water noise levels. Therefore, noise impacts to human receptors due to in-water construction would be less than significant.

Refer to Section 4.10, Marine Biology for information on noise effects to marine biological resources.

4.5.3.1.2 Operation Impacts

Training operations generate two different noise types: higher frequency from small-caliber munitions and lower frequency from large-caliber ordnance, explosives, and artillery blasts. For small-caliber weapons use, as well as aircraft and vehicle operations, the A-weighted scale was applied. The C-weighted scale was used to model impulsive noise generated by explosions and large-caliber weapons. Peak was applied to single-event percussive events generated by small- and large-caliber weapons. As noted in Section 3.5 and in Appendix H, Noise Study, a 10-decibel penalty was applied to operations occurring during nighttime hours, between 10:00 p.m. and 7:00 a.m.
4.5.3.1.2.1 Ground-Based Operations

Small-caliber Weapons

The small-caliber weapons proposed for use include .50 caliber and smaller caliber. Training facilities supporting small-caliber weapons would generate 5,049,643 rounds fired annually (see Appendix H, Noise Study; Table 6.2-1). Figure 4.5-1 presents Tinian Alternatives 1, 2, and 3 A-weighted day-night average sound level contours and Figure 4.5-2 illustrates Peak sound levels generated by small arms (Army Public Health Command 2014).

Table 4.5-1 provides the area and population affected by small-caliber weapons noise in A-weighted day-night average sound levels and Table 4.5-2 provides Peak noise levels. All three alternatives generate similar average noise levels, and are presented together for easy comparison of acres and population affected. However, single-event noise levels at representative points of interest can still vary among the alternatives. Representative points of interest exposed to small-caliber weapons noise levels because of Tinian Alternative 1 operations are presented in Table 4.5-3. Schools were identified to evaluate potential effects to children and non-school points of interest were identified to evaluate noise effects to people and locations.

For Tinian Alternative 1, small-caliber (A-weighted) noise generated within the Military Lease Area would potentially expose 5,553 acres (2,247 hectares) in Zones II and III, but no residential population would be affected. Also within the Military Lease Area, two points of interest would be exposed to Noise Zone II or III levels: Mount Lasso Overlook and the Bateha Isolated Wetlands. However, the public would not be exposed to these noise levels because public access would be prohibited when the RTA is operational. Noise levels outside the Military Lease Area would be less than 50 decibels A-weighted, compatible with land uses.

For Peak noise exposure from Tinian Alternative 1, six points of interest within the Military Lease Area would be exposed to Noise Zone III, but exposure would be considered compatible with exposed land uses because these points are military facilities, other non-human resources, or are recreational sites where access during RTA training operations would be restricted. Therefore, the public would not be exposed to Noise Zone III levels. Outside the Military Lease Area, noise generated by small-caliber weapons from Tinian Alternative 1 operations would affect neither people nor lands on Tinian or Saipan.

Outside of the Military Lease Area, land uses exposed to A-weighted day-night average sound levels would be considered compatible. Small-caliber Peak noise levels would also be considered compatible. Therefore, Tinian Alternative 1 operations would result in less than significant direct and indirect noise impacts from small-caliber weapons use.
### Table 4.5-1. Area and Population on Tinian Affected by Small-caliber Weapons Noise for All Tinian Alternatives (A-weighted)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Noise Levels (in decibels)</th>
<th>Acres/Hectares</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Within the Military Lease Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>65 – 69</td>
<td>2,532/1,025</td>
<td>2,696/1,091</td>
<td>2,914/1,179</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70 – 74</td>
<td>1,459/590</td>
<td>1,769/716</td>
<td>1,645/666</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>75 – 79</td>
<td>693/280</td>
<td>862/349</td>
<td>810/328</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80 – 84</td>
<td>444/180</td>
<td>570/231</td>
<td>533/216</td>
</tr>
<tr>
<td></td>
<td></td>
<td>85+</td>
<td>425/172</td>
<td>530/214</td>
<td>548/222</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>5,553/2,247</td>
<td>6,427/2,601</td>
<td>6,444/2,610</td>
</tr>
<tr>
<td></td>
<td>Area and Population Outside the Military Lease Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>65 – 69</td>
<td>0/0 and 0 population all alternatives</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>70 – 74</td>
<td>0/0 and 0 population all alternatives</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>III</td>
<td>75 – 79</td>
<td>0/0 and 0 population all alternatives</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>80 – 84</td>
<td>0/0 and 0 population all alternatives</td>
<td></td>
<td></td>
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<td>85+</td>
<td>0/0 and 0 population all alternatives</td>
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<tr>
<td></td>
<td>Total</td>
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<td>0/0</td>
<td>0/0</td>
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<td></td>
<td>Off Shore</td>
<td>65 – 69</td>
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<td>15/6</td>
<td>15/6</td>
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<tr>
<td></td>
<td></td>
<td>70 – 74</td>
<td>12/5</td>
<td>12/5</td>
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<td></td>
<td></td>
<td>75 – 79</td>
<td>5/2</td>
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<td></td>
<td>80 – 84</td>
<td>2/1</td>
<td>2/1</td>
<td>2/1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>85+</td>
<td>2/1</td>
<td>2/1</td>
<td>2/1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>36/15</td>
<td>36/15</td>
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</table>

### Table 4.5-2. Area and Population on Tinian Affected by Small-caliber Weapons Noise for All Tinian Alternatives (Peak)

<table>
<thead>
<tr>
<th>Noise Levels (in decibels)</th>
<th>Acres/Hectares</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Within the Military Lease Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>87-104</td>
<td>Zone II</td>
<td>7,897/3,196</td>
<td>6,010/2,432</td>
<td>6,422/2,599</td>
</tr>
<tr>
<td></td>
<td>Zone III</td>
<td>6,898/2,792</td>
<td>9,032/3,655</td>
<td>8,623/3,490</td>
</tr>
<tr>
<td></td>
<td>Total Zones II and III</td>
<td>14,795/5,988</td>
<td>15,042/6,087</td>
<td>15,045/6,089</td>
</tr>
<tr>
<td></td>
<td>Area and Population Outside the Military Lease Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zone II</td>
<td>411/166</td>
<td>600/243</td>
<td>600/243</td>
</tr>
<tr>
<td></td>
<td>Zone III</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>Total Zones II and III</td>
<td>411/166</td>
<td>600/243</td>
<td>600/243</td>
</tr>
<tr>
<td></td>
<td>Off Shore</td>
<td>87-104</td>
<td>26,025/10,532</td>
<td>28,362/11,478</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 population</td>
<td>0 population</td>
<td>0 population</td>
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<tr>
<td></td>
<td>&gt;=104</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>Total Zones II and III</td>
<td>411/166</td>
<td>600/243</td>
<td>600/243</td>
</tr>
<tr>
<td></td>
<td></td>
<td>87-104</td>
<td>607/246</td>
<td>492/199</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>26,632/10,788</td>
<td>28,854/11,677</td>
<td>27,988/11,326</td>
</tr>
</tbody>
</table>
Figure 4.5-1. All Tinian Alternatives Small-Caliber Weapons Noise Levels (A-weighted)
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Figure 4.5-2. All Tinian Alternatives Small-Caliber Weapons Noise Levels (Peak)
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Table 4.5-3. Tinian Alternative 1 Representative Points of Interest on Tinian Affected by Small-caliber Weapons Noise (A-weighted and Peak)

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Description</th>
<th>Type</th>
<th>Decibel</th>
<th>Zone</th>
<th>POI Conflict</th>
<th>Decibel</th>
<th>Zone</th>
<th>POI Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Tinian High School</td>
<td>School</td>
<td>&lt; 50</td>
<td>I</td>
<td>No</td>
<td>&lt; 80</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>T2</td>
<td>Lake Hagoi</td>
<td>Other</td>
<td>63</td>
<td>I</td>
<td>NA</td>
<td>108</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T3</td>
<td>Mahalang Ephemeral Ponds</td>
<td>Other</td>
<td>63</td>
<td>I</td>
<td>NA</td>
<td>102</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>T4</td>
<td>Marpo Heights</td>
<td>Residential</td>
<td>&lt; 50</td>
<td>I</td>
<td>No</td>
<td>&lt; 80</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>T5</td>
<td>Mount Lasso Overlook Area</td>
<td>Other</td>
<td>71</td>
<td>II</td>
<td>NA</td>
<td>106</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T6</td>
<td>Bateha 1 - Isolated Wetlands</td>
<td>Other</td>
<td>63</td>
<td>I</td>
<td>NA</td>
<td>105</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T7</td>
<td>Northeast of Marpo Heights</td>
<td>Residential</td>
<td>&lt; 50</td>
<td>I</td>
<td>No</td>
<td>83</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>T8</td>
<td>Bateha 2 - Isolated Wetlands</td>
<td>Other</td>
<td>75</td>
<td>III</td>
<td>NA</td>
<td>108</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T9</td>
<td>San Jose</td>
<td>Residential</td>
<td>&lt; 50</td>
<td>I</td>
<td>No</td>
<td>&lt; 80</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>T10</td>
<td>San Jose Catholic Church</td>
<td>Church</td>
<td>&lt; 50</td>
<td>I</td>
<td>No</td>
<td>&lt; 80</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>T11</td>
<td>Tinian Elementary School</td>
<td>School</td>
<td>&lt; 50</td>
<td>I</td>
<td>No</td>
<td>&lt; 80</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>T12</td>
<td>Unai Chiget</td>
<td>Other</td>
<td>60</td>
<td>I</td>
<td>NA</td>
<td>96</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>T13</td>
<td>Unai Chulu</td>
<td>Other</td>
<td>61</td>
<td>I</td>
<td>NA</td>
<td>106</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T14</td>
<td>Unai Dankulo</td>
<td>Other</td>
<td>64</td>
<td>I</td>
<td>NA</td>
<td>104</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T15</td>
<td>Unai Masalok</td>
<td>Other</td>
<td>55</td>
<td>I</td>
<td>NA</td>
<td>96</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>T16</td>
<td>North Field National Historic Landmark</td>
<td>Other</td>
<td>55</td>
<td>I</td>
<td>NA</td>
<td>98</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>T17</td>
<td>International Broadcasting Bureau</td>
<td>Administrative</td>
<td>57</td>
<td>I</td>
<td>NA</td>
<td>95</td>
<td>II</td>
<td>No</td>
</tr>
<tr>
<td>T18</td>
<td>Proposed Base Camp (Old West Field)</td>
<td>Transient Lodging</td>
<td>54</td>
<td>I</td>
<td>NA</td>
<td>92</td>
<td>II</td>
<td>No</td>
</tr>
<tr>
<td>T19</td>
<td>Northern Marianas College</td>
<td>School</td>
<td>&lt; 50</td>
<td>I</td>
<td>No</td>
<td>&lt; 80</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>T20</td>
<td>Ushi Point</td>
<td>Other</td>
<td>&lt; 50</td>
<td>I</td>
<td>NA</td>
<td>97</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>T21</td>
<td>Native Limestone Forest</td>
<td>Other</td>
<td>&lt; 50</td>
<td>I</td>
<td>NA</td>
<td>91</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>T22</td>
<td>Unai Lam Lam</td>
<td>Other</td>
<td>54</td>
<td>I</td>
<td>NA</td>
<td>95</td>
<td>II</td>
<td>NA</td>
</tr>
</tbody>
</table>

Notes: Shading denotes POIs inside the Military Lease Area
1. Other includes sites with cultural, biological, historical, or recreational concerns that are not related to human factors such as health or annoyance and will be addressed in the applicable resource section of this EIS/OEIS.
2. Noise level threshold is 50 decibels A-weighted day-night average sound level (or decibel ADNL).
3. U.S. military small-caliber decibel ADNL Noise Zones defined as: Zone III (75-79 decibel ADNL; 80-84 decibel ADNL; > 85 ADNL), Zone II (65-69 decibel ADNL; 70-74 decibel ADNL), and Zone I (< 55 decibel ADNL; 55-64 decibel ADNL).

Legend: NA = not applicable, see annotation number 1.

Large-caliber Weapons

Large-caliber weapons proposed under Tinian Alternative 1 include: live hand grenades, mortars, howitzers, tanks, and amphibious assault vehicles. Under Tinian Alternative 1, 101,135 large-caliber rounds of ground-delivered munitions and an additional 50,000 large-caliber rounds of air-delivered...
munitions would be fired in an average year. Large-caliber weapons use during the nighttime hours of 10:00 p.m. to 7:00 a.m. constitutes only 4% of total munitions expended. Large-caliber artillery firing points would be located primarily at the north end of the Military Lease Area and near the proposed base camp (i.e., away from populated areas outside the Military Lease Area). As presented in Table 4.5-4 and illustrated in Figure 4.5-3, while three alternatives are proposed, C-weighted noise results would be identical for population affected, but vary slightly in the number of acres impacted. On Tinian, the acreage differences lie completely within the Military Lease Area or off shore. No areas on Saipan would be exposed to C-weighted day-night average sound levels in Noise Zones II or III.

Table 4.5-4. Area and Population on Tinian and Saipan Affected by Large-caliber Weapons Noise for All Tinian Alternatives (C-weighted)

<table>
<thead>
<tr>
<th>Noise Levels (in decibels)</th>
<th>Tinian Military Lease Area</th>
<th>Tinian Non-Military Lease Area</th>
<th>Off Shore</th>
<th>Saipan</th>
<th>Tinian</th>
<th>Saipan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinian Alternative 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise Zone II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-70</td>
<td>5,644/2,284</td>
<td>1,300/526</td>
<td>27,681/11,202</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>Noise Zone III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;70</td>
<td>8,861/3,586</td>
<td>0/0</td>
<td>2,557/1,035</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>Total</td>
<td>14,505/5,870</td>
<td>1,300/526</td>
<td>30,238/12,237</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>Tinian Alternative 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise Zone II</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-70</td>
<td>6,045/2,446</td>
<td>1,267/513</td>
<td>26,369/10,671</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>Noise Zone III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;70</td>
<td>8,599/3,480</td>
<td>0/0</td>
<td>2,322/940</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>Total</td>
<td>14,644/5,870</td>
<td>1,267/513</td>
<td>28,691/11,611</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>Tinian Alternative 3</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Noise Zone II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-70</td>
<td>5,986/2,422</td>
<td>1,300/526</td>
<td>26,559/10,748</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>Noise Zone III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;70</td>
<td>8,680/3,513</td>
<td>0/0</td>
<td>2,338/946</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td>Total</td>
<td>14,666/5,935</td>
<td>1,300/526</td>
<td>28,897/11,694</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
</tbody>
</table>

Note: 1Population on Tinian is outside Military Lease Area on Non-Military Lease Area lands.

In terms of risk of complaints, large-caliber Peak noise levels, when neutral weather conditions persist (as illustrated on Figure 4.5-4 and shown in Table 4.5-5), would expose 521 acres (211 hectares) outside of Military Lease Area boundaries to Peak noise conditions of 115 decibels. This would have the potential for increased risk of complaints (i.e., people may be annoyed and complain about noise generated within the RTA). No areas on Saipan would be exposed under neutral weather conditions. However, under unfavorable weather conditions (as illustrated in Figure 4.5-5 and listed in Table 4.5-6), population and areas exposed to increased risk of complaints increases to 1,223 people (80 on Tinian and 1,143 on Saipan) exposed to Peak noise levels of 115 decibels under Tinian Alternative 1. Although the affected population would be the same for all alternatives, the acres affected under Tinian Alternatives 2 and 3 vary slightly.
Alternative 1

Pacific Ocean

Philippine Sea

Legend
- Points of Interest
- Mount Lasso
- Range Areas
- Military Lease Area (MLA)
- International Broadcasting Bureau (IBB)

C-weighted Day-Night Average Sound Level
- 57 (LUPZ)
- 62 (Zone II)
- 70 (Zone III)

Figure 4.5-3. All Tinian Alternatives Large-Caliber Weapons Noise Levels (C-weighted)
Figure 4.5-4. All Tinian Alternatives Large-Caliber Peak Noise Levels under Neutral Weather Conditions (Peak)
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Figure 4.5-5. All Tinian Alternatives Large-Caliber Peak Noise under Unfavorable Weather Conditions (Peak)
## Table 4.5-5. Area and Population on Tinian and Saipan Affected by Large-caliber Weapons Noise - Risk Complaint Neutral Weather for All Tinian Alternatives (Peak)

<table>
<thead>
<tr>
<th>Peak Noise Levels (in decibels)</th>
<th>Acres/Hectares</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative 1</td>
<td>Alternative 2</td>
</tr>
<tr>
<td></td>
<td>Tinian</td>
<td>Saipan</td>
</tr>
<tr>
<td>Off shore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>11,582/4,687</td>
<td>15,115/2,070</td>
</tr>
<tr>
<td>130</td>
<td>408/165</td>
<td>552/223</td>
</tr>
<tr>
<td>Total</td>
<td>11,990/4,852</td>
<td>15,667/2,293</td>
</tr>
<tr>
<td>On Shore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within the Military Lease Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>8,592/3,477</td>
<td>10,157/4,110</td>
</tr>
<tr>
<td>130</td>
<td>3,669/1,485</td>
<td>3,838/1,594</td>
</tr>
<tr>
<td>Total</td>
<td>12,261/4,962</td>
<td>13,840/5,601</td>
</tr>
<tr>
<td>Outside the Military Lease Area</td>
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<td></td>
</tr>
<tr>
<td>115</td>
<td>521/211</td>
<td>519/210</td>
</tr>
<tr>
<td>130</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Subtotal</td>
<td>521/211</td>
<td>519/210</td>
</tr>
<tr>
<td>Total</td>
<td>12,782/5,173</td>
<td>14,361/5,812</td>
</tr>
</tbody>
</table>

## Table 4.5-6. Area and Population on Tinian and Saipan Affected by Large-caliber Weapons Noise - Risk Complaint Unfavorable Weather for All Tinian Alternatives (Peak)

<table>
<thead>
<tr>
<th>Peak Noise Levels (in decibels)</th>
<th>Acres/Hectares</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alternative 1</td>
<td>Alternative 2</td>
</tr>
<tr>
<td></td>
<td>Tinian</td>
<td>Saipan</td>
</tr>
<tr>
<td>Off shore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>105,272/42,602</td>
<td>111,014/44,926</td>
</tr>
<tr>
<td>130</td>
<td>4,518/1,828</td>
<td>5,233/2,118</td>
</tr>
<tr>
<td>Total</td>
<td>109,790/44,430</td>
<td>116,247/47,044</td>
</tr>
<tr>
<td>On Shore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within the Military Lease Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>4,884/1,976</td>
<td>5,032/2,036</td>
</tr>
<tr>
<td>130</td>
<td>9,879/3,998</td>
<td>10,201/4,128</td>
</tr>
<tr>
<td>Total</td>
<td>14,763/5,974</td>
<td>15,233/6,164</td>
</tr>
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<td>Outside the Military Lease Area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>2,297/930</td>
<td>2,399/970</td>
</tr>
<tr>
<td>130</td>
<td>130/53</td>
<td>130/53</td>
</tr>
<tr>
<td>Subtotal</td>
<td>2,427/983</td>
<td>2,529/1,023</td>
</tr>
<tr>
<td>Total</td>
<td>18,742/7,585</td>
<td>19,314/7,816</td>
</tr>
</tbody>
</table>

Table 4.5-7 presents the Tinian points of interest exposed to large-caliber C-weighted day-night average sound levels and Table 4.5-8 presents the same information for Saipan. No incompatibilities with residential land uses or other points of interest outside the Military Lease Area on Tinian or Saipan would be exposed to C-weighted day-night average sound levels exceeding 65 decibels. Several points of interest within the Military Lease Area would be exposed to Noise Zone III levels; however, these levels would be considered compatible with exposed land uses because these points are military tactical training facilities, other non-human resources, or recreational areas where public access would be
restricted during those times that large-caliber weapon noise would be generated. Under Alternative 1, the International Broadcast Bureau facility would be exposed to noise levels of 72 decibels C-weighted day-night average sound level. These levels would not pose risks to workers because they are below Occupational Safety and Health standards. They are outdoor levels and most employees work indoors. In addition, the facility is considered industrial and would be compatible with these noise levels.

Table 4.5-7. Representative Points of Interest on Tinian Affected by Large-caliber Weapons Noise under All Tinian Alternatives (C-weighted)

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Description</th>
<th>Type¹</th>
<th>Decibel</th>
<th>Zone²</th>
<th>POI Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Tinian High School</td>
<td>School</td>
<td>58</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>T2</td>
<td>Lake Hagoi</td>
<td>Other</td>
<td>77</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T3</td>
<td>Mahalang Ephemeral Ponds</td>
<td>Other</td>
<td>89</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T4</td>
<td>Marpo Heights</td>
<td>Residential</td>
<td>59</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>T5</td>
<td>Mount Lasso Overlook Area</td>
<td>Other</td>
<td>85</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T6</td>
<td>Bateha 1 - Isolated Wetlands</td>
<td>Other</td>
<td>70</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T7</td>
<td>Northeast of Marpo Heights</td>
<td>Residential</td>
<td>61</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>T8</td>
<td>Bateha 2 - Isolated Wetlands</td>
<td>Other</td>
<td>71</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T9</td>
<td>San Jose</td>
<td>Residential</td>
<td>58</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>T10</td>
<td>San Jose Catholic Church</td>
<td>Church</td>
<td>58</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>T11</td>
<td>Tinian Elementary School</td>
<td>School</td>
<td>58</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>T12</td>
<td>Unai Chiget</td>
<td>Other</td>
<td>72</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T13</td>
<td>Unai Chulu</td>
<td>Other</td>
<td>71</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T14</td>
<td>Unai Dankulo</td>
<td>Other</td>
<td>78</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T15</td>
<td>Unai Masalok</td>
<td>Other</td>
<td>66</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>T16</td>
<td>North Field National Historic Landmark</td>
<td>Other</td>
<td>68</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>T17</td>
<td>International Broadcasting Bureau</td>
<td>Administrative</td>
<td>72</td>
<td>III</td>
<td>No³</td>
</tr>
<tr>
<td>T18</td>
<td>Proposed Base Camp (Old West Field)</td>
<td>Transient Lodging</td>
<td>70</td>
<td>III</td>
<td>No⁴</td>
</tr>
<tr>
<td>T19</td>
<td>Northern Marianas College - Tinian</td>
<td>School</td>
<td>58</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>T20</td>
<td>Ushi Point</td>
<td>Other</td>
<td>73</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>T21</td>
<td>Native Limestone Forest</td>
<td>Other</td>
<td>67</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>T22</td>
<td>Unai Lam Lam</td>
<td>Other</td>
<td>67</td>
<td>II</td>
<td>NA</td>
</tr>
</tbody>
</table>

Notes: Shading denotes POIs inside the Military Lease Area
Noise levels are similar for all three alternatives only T8 and T18 varied by 1 decibel.
¹Other includes sites with cultural, biological, historical, or recreational concerns that are not related to human factors such as health or annoyance and will be addressed in the applicable resource section of this EIS.
²Demolition and large caliber Noise Zones defined as: Land Use Planning Zone (LUPZ) (57-62 decibel CDNL); Zone I (<62 decibel CDNL); Zone II (62-70 decibel CDNL); and Zone III (>70 decibel CDNL). See Section 3.5.1 for more details on Land Use noise zones.
³No = This is not classified as a noise-sensitive land use because it is of an industrial nature.
⁴No = This is not classified as a noise-sensitive land use because it is considered a tactical training location.

Legend: NA = not applicable, see annotation number 1.
Table 4.5-8. Representative Points of Interest on Saipan

Affected by Large-caliber Weapons Noise under All Tinian Alternatives (C-weighted)

<table>
<thead>
<tr>
<th>Point of Interest (POI)</th>
<th>Type</th>
<th>Decibel</th>
<th>Zone</th>
<th>POI Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agingan</td>
<td>Residential</td>
<td>59</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>Coral Ocean Point Resort</td>
<td>Resort</td>
<td>59</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>Cornerstone Christian Church</td>
<td>Church</td>
<td>56</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>Obyan</td>
<td>Residential</td>
<td>59</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>Saipan Southern High School</td>
<td>School</td>
<td>58</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>San Antonio</td>
<td>Residential</td>
<td>58</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>Koblerville Elementary School</td>
<td>School</td>
<td>59</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>Susupe</td>
<td>Residential</td>
<td>55</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>American Memorial Park</td>
<td>Other</td>
<td>51</td>
<td>I</td>
<td>NA</td>
</tr>
<tr>
<td>Agingan Point</td>
<td>Other</td>
<td>60</td>
<td>LUPZ</td>
<td>NA</td>
</tr>
<tr>
<td>San Antonio Elementary School</td>
<td>School</td>
<td>58</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>Saipan International School</td>
<td>School</td>
<td>55</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>Dandam Elementary School</td>
<td>School</td>
<td>54</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>Hopwood Junior High School</td>
<td>School</td>
<td>57</td>
<td>LUPZ</td>
<td>No</td>
</tr>
<tr>
<td>William S. Reyes Elementary School</td>
<td>School</td>
<td>56</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>Mount Carmel School</td>
<td>School</td>
<td>56</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>Saipan World Resort</td>
<td>Transient Lodging</td>
<td>56</td>
<td>I</td>
<td>No</td>
</tr>
<tr>
<td>Northern Marianas College - Saipan</td>
<td>School</td>
<td>54</td>
<td>I</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes: The POI noise levels are the same for all three alternatives.

1 Other includes sites with cultural, biological, historical, or recreational concerns that are not related to human factors such as health or annoyance and will be addressed in the applicable resource section of the EIS.

2 Demolition and large caliber Noise Zones defined as: Land Use Planning Zone (LUPZ) (57-62 decibel CDNL); Zone I (<62 decibel CDNL); Zone II (62-70 decibel CDNL); Zone III (>70 decibel CDNL). See Section 3.5.1 for more details on Land Use noise zones.

Legend: NA = not applicable, see annotation number 1.


Peak noise levels under neutral and unfavorable weather conditions are presented in Table 4.5-9 for Tinian and in Table 4.5-10 for Saipan. Peak noise levels and their associated complaint risk are provided to assist the reader to understand noise levels better and provide the answer to “how loud is it?” However, no established significance criteria are associated with large-caliber weapons Peak noise levels. Munitions containing the greatest amount of explosives generate the loudest Peak noise levels and generate the greatest risk of noise complaints. On Tinian, the largest munitions proposed for use are the 155 millimeter high explosive artillery rounds.

Under neutral weather conditions and within the Military Lease Area (Table 4.5-9), 12 points of interest would be exposed to Peak levels of 115 decibels or greater. These areas would only be open to the public when the training facilities would not be in use; therefore, human receptors would not be present when noise-producing activities are occurring. On Saipan, no points of interest would be exposed to elevated Peak noise levels when weather conditions are neutral.
### Table 4.5-9. Representative Points of Interest on Tinian Affected by Large-caliber Weapons Noise for All Tinian Alternatives (Peak)

<table>
<thead>
<tr>
<th>Point of Interest (POI)</th>
<th>Neutral Weather</th>
<th>Unfavorable Weather</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type</td>
<td>Decibel&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>T1</strong> Tinian High School</td>
<td>School</td>
<td>&lt; 110</td>
</tr>
<tr>
<td><strong>T2</strong> Lake Hagoi</td>
<td>Other</td>
<td>124</td>
</tr>
<tr>
<td><strong>T3</strong> Mahalang Ephemeral Ponds</td>
<td>Other</td>
<td>138</td>
</tr>
<tr>
<td><strong>T4</strong> Marpo Heights</td>
<td>Residential</td>
<td>100</td>
</tr>
<tr>
<td><strong>T5</strong> Mount Lasso Overlook Area</td>
<td>Other</td>
<td>134</td>
</tr>
<tr>
<td><strong>T6</strong> Bateha 1 - Isolated Wetlands</td>
<td>Other</td>
<td>117</td>
</tr>
<tr>
<td><strong>T7</strong> Northeast of Marpo Heights</td>
<td>Residential</td>
<td>112</td>
</tr>
<tr>
<td><strong>T8</strong> Bateha 2 - Isolated Wetlands</td>
<td>Other</td>
<td>119</td>
</tr>
<tr>
<td><strong>T9</strong> San Jose</td>
<td>Residential</td>
<td>&lt; 110</td>
</tr>
<tr>
<td><strong>T10</strong> San Jose Catholic Church</td>
<td>Church</td>
<td>&lt; 110</td>
</tr>
<tr>
<td><strong>T11</strong> Tinian Elementary School</td>
<td>School</td>
<td>&lt; 110</td>
</tr>
<tr>
<td><strong>T12</strong> Unai Chiget</td>
<td>Other</td>
<td>119</td>
</tr>
<tr>
<td><strong>T13</strong> Unai Chulu</td>
<td>Other</td>
<td>116</td>
</tr>
<tr>
<td><strong>T14</strong> Unai Dankulo</td>
<td>Other</td>
<td>127</td>
</tr>
<tr>
<td><strong>T15</strong> Unai Masalok</td>
<td>Other</td>
<td>116</td>
</tr>
<tr>
<td><strong>T16</strong> North Field National Historic Landmark</td>
<td>Other</td>
<td>112</td>
</tr>
<tr>
<td><strong>T17</strong> International Broadcasting Bureau&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Administrative</td>
<td>118</td>
</tr>
<tr>
<td><strong>T18</strong> Proposed Base Camp (Old West Field)</td>
<td>Transient Lodging</td>
<td>121</td>
</tr>
<tr>
<td><strong>T19</strong> Northern Marianas College - Tinian</td>
<td>School</td>
<td>&lt; 110</td>
</tr>
<tr>
<td><strong>T20</strong> Ushi Point</td>
<td>Other</td>
<td>129</td>
</tr>
<tr>
<td><strong>T21</strong> Native Limestone Forest</td>
<td>Other</td>
<td>123</td>
</tr>
<tr>
<td><strong>T22</strong> Unai Lam Lam</td>
<td>Other</td>
<td>110</td>
</tr>
</tbody>
</table>

**Notes:**
- Shading denotes POIs inside the Military Lease Area.
- The POI noise levels are nearly identical for all three alternatives, only POI T6 varied (126 decibels for both Alternatives 2 and 3).
- Under Alternatives 2 and 3 the International Broadcasting Bureau mission is relocated.
- Other includes sites with cultural, biological, historical, or recreational concerns that are not related to human factors such as health or annoyance and will be addressed in the applicable resource section of this EIS/OEIS.
- Noise level threshold is 110 decibels Peak (or decibel Peak).
- Complaint risk areas defined as: low risk of complaints <115 decibel Peak; moderate risk of complaints 115-130 decibels Peak; high risk of complaints > 130 decibels Peak.
- POI is considered a Tactical Training location and complaint risk correlation does not apply.

**Legend:**
- NA = not applicable, see annotation number 2.

**Source:** Army Public Health Command 2014.
### Table 4.5-10. Representative Points of Interest on Saipan Affected by Large-caliber Weapons Noise for All Tinian Alternatives (Peak)

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Description</th>
<th>Type</th>
<th>Neutral Weather Decibel</th>
<th>Unfavorable Weather (\text{POI Conflict}) Decibel</th>
<th>Neutral Weather Zone</th>
<th>Unfavorable Weather (\text{POI Conflict}) Zone</th>
<th>Neutral Weather Conflict</th>
<th>Unfavorable Weather Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Agingan Residential</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>&lt; 110</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S2</td>
<td>Coral Ocean Point Resort Resort</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>&lt; 110</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S3</td>
<td>Cornerstone Christian Church Church</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>&lt; 110</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S4</td>
<td>Obyan Residential</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>117</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>S5</td>
<td>Saipan Southern High School School</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>113</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S6</td>
<td>San Antonio Residential</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>114</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S7</td>
<td>Koblerville Elementary School School</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>115</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>S8</td>
<td>Susupe Residential</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>&lt; 110</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S9</td>
<td>American Memorial Park Other</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>&lt; 110</td>
<td>Low</td>
<td>Low</td>
<td>NA</td>
</tr>
<tr>
<td>S10</td>
<td>Agingan Point Other</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>NA</td>
<td>117</td>
<td>Moderate</td>
<td>NA</td>
</tr>
<tr>
<td>S11</td>
<td>San Antonio Elementary School School</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>115</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>S12</td>
<td>Saipan International School School</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>&lt; 110</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S13</td>
<td>Dandan Elementary School School</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>&lt; 110</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S14</td>
<td>Hopwood Junior High School School</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>112</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S15</td>
<td>William S. Reyes Elementary School School</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>&lt; 110</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S16</td>
<td>Mount Carmel School School</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>112</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S17</td>
<td>Saipan World Resort Transient Lodging</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>111</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>S18</td>
<td>Northern Marianas College – Saipan School</td>
<td></td>
<td>&lt; 110</td>
<td>Low</td>
<td>&lt; 110</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Notes:**
- The POI noise levels are the same for all three alternatives.
- 1 Other includes sites with cultural, biological, historical, or recreational concerns that are not related to human factors such as health or annoyance and will be addressed in the applicable resource section of this EIS/OEIS.
- 2 Noise level threshold is 110 decibels Peak (or decibel Peak).
- 3 Complaint risk areas defined as low risk of complaints <115 decibel Peak; moderate risk of complaints 115-130 decibel Peak; high risk of complaints > 130 decibel Peak.

**Legend:**
- NA = not applicable, see annotation number 1.

**Source:** Army Public Health Command 2014.

Unfavorable weather conditions occur when the wind blows in the opposite direction of normal trade winds. It was estimated that this condition would occur a maximum of 10-15% of the total training time, equaling about 2-3 weeks per year. Under any of the three alternatives, numerous points of interest would be impacted by elevated Peak noise levels within the Military Lease Area. However, these locations are military training facilities, other non-human resources, or sites where public access would be restricted during munitions operations producing these Peak noise levels. Outside of the Military Lease Area, one Tinian point of interest (T7) would have a moderate potential for risk of complaints when weather conditions are unfavorable (see Table 4.5-9). On Saipan (see Table 4.5-10), five points of interest (S1, S2, S4, S7, and S11) would be exposed to elevated Peak noise levels and thus have the potential for increased risk of noise complaints.
Tinian Alternative 1 large-caliber weapons operations would have less than significant direct and indirect impacts on the noise environment and would be compatible with sensitive land uses and points of interest.

4.5.3.1.2.2 Airfield and Airspace Based Operations

Table 4.5-11 presents the proposed number of annual military operations at Tinian International Airport and North Field under all Tinian alternatives. At the airfields and Landing Zones, an operation consists of either a take-off or a landing, each of which counts as one operation. Within the airspace, a flight through one unit of Special Use Airspace is considered an operation. These projected operations would be in addition to those flown under baseline at Tinian International Airport. As described in Section 3.5, Noise, the baseline is represented by total aircraft operations flown in 2012. Based on the 2014 to 2040 year-over-year growth rate estimated by the Federal Aviation Administration Terminal Area Forecast (Federal Aviation Administration 2013), air traffic operations for Tinian International Airport would not be expected to change (see also Appendix O, Transportation Study). Aircraft operations occurring during the nighttime hours, between 10:00 p.m. and 7:00 a.m., are identified because they receive a 10-decibel penalty. This penalty is applied to A-weighted day-night average sound level. Of the 11,664 annual operations, 75% occur during the day and 25% during the night.

Table 4.5-11. Annual Airfield Operations\(^1\) at Tinian International Airport and North Field for All Tinian Alternatives

<table>
<thead>
<tr>
<th>Aircraft Type(^2)</th>
<th>Tinian International Airport</th>
<th>North Field</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
<td>Night</td>
<td>Total</td>
</tr>
<tr>
<td>Transport Tilt-rotor</td>
<td>720</td>
<td>280</td>
<td>1,000</td>
</tr>
<tr>
<td>Transport Rotary Wing</td>
<td>680</td>
<td>280</td>
<td>960</td>
</tr>
<tr>
<td>Attack Helicopter</td>
<td>520</td>
<td>240</td>
<td>760</td>
</tr>
<tr>
<td>Transport Fixed Wing</td>
<td>800</td>
<td>400</td>
<td>1,200</td>
</tr>
<tr>
<td>Unmanned</td>
<td>200</td>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td>Fighter</td>
<td>1,600</td>
<td>400</td>
<td>2,000</td>
</tr>
<tr>
<td>Heavy commercial</td>
<td>24</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Fighter – Field Carrier Landing Practice</td>
<td>2,500</td>
<td>500</td>
<td>3,000</td>
</tr>
<tr>
<td>Total</td>
<td>7,044</td>
<td>2,200</td>
<td>9,244</td>
</tr>
</tbody>
</table>

Notes: \(^1\)Operations include a takeoff or a landing.

\(^2\)Examples of aircraft types: Transport Tilt-rotor = MV-22, Transport Rotary Wing, CH-53, Attack Helicopter = AH-1, AH-64, Transport Fixed Wing = C-130, KC-135, C-17, Unmanned = RQ-7, Fighter = FA-18, AV-8, and F-35.

Legend: NA = not applicable.

Noise contour bands for baseline and all Tinian alternatives are illustrated in Figure 4.5-6. These noise contours include both the projected operations listed above and the baseline operations that would continue at Tinian International Airport. Also included are noise levels generated from operations at North Field, at the Landing Zones, and by aircraft flying overhead in the proposed Tinian Military Operations Area and Restricted Areas, R-7203 A/B/C/X/Y/Z.
Figure 4.5-6. Airfield and Airspace Noise Levels for All Tinian Alternatives (A-weighted)
Table 4.5-12 presents the acres and population affected by proposed noise levels for areas within the Military Lease Area, outside the Military Lease Area, and offshore exposed to A-weighted day-night average sound levels equal to or greater than 65 decibels. Most of the acreage exposed to 65 decibels or greater outside the Military Lease Area is on Tinian International Airport property (see Figure 4.5-6). However, a small portion borders the edge of Marpo Heights (see point of interest T4 on Figure 4.5-6). Similar to the ground-based weapons noise calculations, to determine the population by contour band, this analysis used aerial photography and counted actual houses.

Table 4.5-12. Noise Area and Population Generated by Aircraft Operations for All Tinian Alternatives Compared to Baseline (2012) Levels (A-weighted)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Noise Levels (in decibels)</th>
<th>Baseline</th>
<th>Alternatives 1, 2, and 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Acres/Hectares</td>
<td>Population</td>
</tr>
<tr>
<td><strong>Within the Military Lease Area</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>65 – 69</td>
<td>59/24 NA</td>
<td>2,733/1,106 NA</td>
</tr>
<tr>
<td></td>
<td>70 – 74</td>
<td>0/0 NA</td>
<td>2,775/1,123 NA</td>
</tr>
<tr>
<td>III</td>
<td>75 – 79</td>
<td>0/0 NA</td>
<td>1,636/662 NA</td>
</tr>
<tr>
<td></td>
<td>80 – 84</td>
<td>0/0 NA</td>
<td>334/135 NA</td>
</tr>
<tr>
<td></td>
<td>&gt;85</td>
<td>0/0 NA</td>
<td>3/1 NA</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>59/24 NA</td>
<td>7,481/3,029 NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area and Population Outside the Military Lease Area</th>
<th>Baseline</th>
<th>Alternatives 1, 2, and 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>65 - 69</td>
<td>361/146 0</td>
</tr>
<tr>
<td></td>
<td>70 - 74</td>
<td>194/79 0</td>
</tr>
<tr>
<td>III</td>
<td>75 - 79</td>
<td>133/54 0</td>
</tr>
<tr>
<td></td>
<td>80 - 84</td>
<td>31/13 0</td>
</tr>
<tr>
<td></td>
<td>&gt;85</td>
<td>0/0 0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>719/291 0</td>
<td>2,937/1,189 40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Off Shore</th>
<th>Baseline</th>
<th>Alternatives 1, 2, and 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>65 - 69</td>
<td>0 NA</td>
</tr>
<tr>
<td></td>
<td>70 - 74</td>
<td>0 NA</td>
</tr>
<tr>
<td></td>
<td>75 - 79</td>
<td>0 NA</td>
</tr>
<tr>
<td></td>
<td>80 - 84</td>
<td>0 NA</td>
</tr>
<tr>
<td></td>
<td>&gt;85</td>
<td>0 NA</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0</td>
<td>3,227/1,306 NA</td>
</tr>
</tbody>
</table>

Legend: NA = not applicable.

When compared to baseline conditions, A-weighted noise levels of 65 decibels or greater would increase and potentially affect 2,937 acres (1,189 hectares) outside the Military Lease Area. Review of aerial photography revealed that approximately 10 households and 40 people in Marpo Heights (see point of interest T4 on Figure 4.5-6) would be affected by aircraft noise levels 65 decibels and greater. This represents 1.3% of the total population of Tinian. Noise exposure to these residences would also exceed the Federal Aviation Administration criterion of 1.5-decibel increase in areas over 65 decibels. The Federal Aviation Administration requires reporting 3 decibel increases between 60 and 65 decibels, and 5 decibel increases from 45 to 60 decibels for residential areas. Residents in the area northeast of Marpo Heights and in San Jose would have noise increases above these criteria but would remain below 65 decibels.
Under Tinian Alternative 1, most flight operations would be directed to flight tracks along a path in line with the runway or north of the runway that correspond to operations occurring while normal trade winds persist. However, operations causing the impacts to the 10 residences in Marpo Heights would occur when wind blows counter to the normal trade winds. This opposite wind condition causes aircraft to fly to the south upon approach to the Tinian International Airport and to conduct missed aircraft approaches to the south. Opposite wind conditions were modeled to occur as often as 15% of the time but actual operations would be expected to be less than 15%. A missed approach occurs during a low-visibility, instrument procedure when the pilot does not have the runway lined up correctly, or is traveling at the incorrect speed, or does not have the proper approach altitude. If any of these occur, the pilot flies to a known point at a radio direction transmitter and sets up specific control points back to the runway. One of the points would be south of the airport to safely turn the aircraft in the correct direction. Missed approaches would be very infrequent considering the reliability of the trade winds, the good visibility that normally occurs on Tinian, and training involves experienced pilots.

Table 4.5-13 shows A-weighted noise levels for representative points of interest on Tinian potentially affected by aircraft operations. Of the 22 points of interest affected, six would experience increases of noise levels above 65 decibels when compared to baseline conditions. These six include one residential receptor (T4), four non-residential receptors (T3, T7, T8, and T21), and the proposed base camp (T18). All receptors would see an increase of over 15 decibels except Ushi Point (T20). While there would be increases in noise levels for residential areas (T4, T7, and T9), they would still be at or below 65 decibels and be considered compatible land uses. However, because the increases over baseline conditions exceed Federal Aviation Administration reportable changes in exposure limits, noise increases would be considered significant.

Tinian Alternative 1 aircraft operations would introduce significant direct noise impacts to ten residences housing about 40 people in the Marpo Heights area because the increase would result in noise levels greater than 65 decibels and have an increase of almost 20 decibels above baseline conditions. While this represents a significant change from baseline conditions, operations causing these impacts would rarely occur. No indirect noise impacts to human receptors would result from airfield or airspace operations.
Table 4.5-13. All Tinian Alternatives Points of Interest Noise Level Exposure Generated by Aircraft Operations (A-weighted)

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Description</th>
<th>Type</th>
<th>Baseline</th>
<th>Proposed</th>
<th>Change from Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Tinian High School</td>
<td>School</td>
<td>37.6</td>
<td>55.6</td>
<td>18.0</td>
</tr>
<tr>
<td>T2</td>
<td>Lake Hagoi</td>
<td>Other</td>
<td>44.1</td>
<td>63.4</td>
<td>19.3</td>
</tr>
<tr>
<td>T3</td>
<td>Mahalang Ephemeral Ponds</td>
<td>Other</td>
<td>39.5</td>
<td>65.4</td>
<td>25.9</td>
</tr>
<tr>
<td>T4</td>
<td>Marpo Heights</td>
<td>Residential</td>
<td>45.4</td>
<td>65.2</td>
<td>19.8</td>
</tr>
<tr>
<td>T5</td>
<td>Mount Lasso Overlook Area</td>
<td>Other</td>
<td>40.7</td>
<td>63.9</td>
<td>23.2</td>
</tr>
<tr>
<td>T6</td>
<td>Bateha 1 - Isolated Wetlands</td>
<td>Other</td>
<td>38.8</td>
<td>61.9</td>
<td>23.1</td>
</tr>
<tr>
<td>T7</td>
<td>Northeast of Marpo Heights</td>
<td>Residential</td>
<td>48.5</td>
<td>64.8</td>
<td>16.3</td>
</tr>
<tr>
<td>T8</td>
<td>Bateha 2 - Isolated Wetlands</td>
<td>Other</td>
<td>45.6</td>
<td>66.6</td>
<td>21.0</td>
</tr>
<tr>
<td>T9</td>
<td>San Jose</td>
<td>Residential</td>
<td>37.3</td>
<td>54.1</td>
<td>16.8</td>
</tr>
<tr>
<td>T10</td>
<td>San Jose Catholic Church</td>
<td>Church</td>
<td>37.1</td>
<td>54.3</td>
<td>17.2</td>
</tr>
<tr>
<td>T11</td>
<td>Tinian Elementary School</td>
<td>School</td>
<td>36.9</td>
<td>54.8</td>
<td>17.9</td>
</tr>
<tr>
<td>T12</td>
<td>Unai Chiget</td>
<td>Other</td>
<td>35.4</td>
<td>57.8</td>
<td>22.4</td>
</tr>
<tr>
<td>T13</td>
<td>Unai Chulu</td>
<td>Other</td>
<td>44.0</td>
<td>63.4</td>
<td>19.4</td>
</tr>
<tr>
<td>T14</td>
<td>Unai Dankulo</td>
<td>Other</td>
<td>47.0</td>
<td>64.0</td>
<td>17.0</td>
</tr>
<tr>
<td>T15</td>
<td>Unai Masalok</td>
<td>Other</td>
<td>48.8</td>
<td>66.0</td>
<td>17.2</td>
</tr>
<tr>
<td>T16</td>
<td>North Field National Historic Landmark</td>
<td>Other</td>
<td>41.2</td>
<td>57.9</td>
<td>16.7</td>
</tr>
<tr>
<td>T17</td>
<td>International Broadcasting Bureau</td>
<td>Administrative</td>
<td>41.8</td>
<td>60.8</td>
<td>19.0</td>
</tr>
<tr>
<td>T18</td>
<td>Proposed Base Camp (Old West Field)</td>
<td>Transient Lodging</td>
<td>54.6</td>
<td>72.4</td>
<td>17.8</td>
</tr>
<tr>
<td>T19</td>
<td>Northern Marianas College – Tinian</td>
<td>School</td>
<td>37.2</td>
<td>58.0</td>
<td>20.8</td>
</tr>
<tr>
<td>T20</td>
<td>Ushi Point</td>
<td>Other</td>
<td>36.3</td>
<td>49.6</td>
<td>13.3</td>
</tr>
<tr>
<td>T21</td>
<td>Native Limestone Forest</td>
<td>Other</td>
<td>50.0</td>
<td>65.5</td>
<td>15.5</td>
</tr>
<tr>
<td>T22</td>
<td>Unai Lam Lam</td>
<td>Other</td>
<td>39.0</td>
<td>56.7</td>
<td>17.7</td>
</tr>
</tbody>
</table>

Notes: Bold indicates human receptor.

1 Access to sites would only occur when adjacent ranges are not in use and noise levels would be lower during human occupation.

2 Point of interest is human but would be considered a Tactical Training location and not incompatible.

4.5.3.1.2.3 Supplemental Noise Metrics

Under the three Tinian alternatives, no population would be exposed to the 24-hour equivalent noise level of 80 decibels or greater noise contour. There would be no potential for hearing loss.

Speech interference, classroom interruptions, and sleep disturbance noise analyses are provided to assist the reader in understanding noise impacts from experiences that are more common rather than a rare annoyance. Although aircraft noise would create significant impacts, the noise levels would be generally compatible and the supplemental analyses reveal only a few events per training day where noise events could be intrusive for speech interference, classroom interruptions, and sleep disturbance. Specific details regarding the supplemental analyses are provided in Appendix H, Noise Study.

4.5.3.1.2.4 Traffic

Vehicular traffic associated with the proposed action would include permanently based vehicles and trips between the port and base camp by units arriving for training. Table 4.5-14 shows the
representative number of vehicles a generic Marine expeditionary unit and battalion landing team requires and Table 4.5-15 shows the proposed unit permanently based vehicles.

**Table 4.5-14. Representative Unit Level Vehicle Requirements**

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Generic Marine Expeditionary Unit</th>
<th>Generic Battalion Landing Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMMWV (Humvee)</td>
<td>63</td>
<td>78 (8 with TOW Missile mounts)</td>
</tr>
<tr>
<td>Light Armored Vehicles</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>MTVR 7-ton Trucks</td>
<td>30</td>
<td>12</td>
</tr>
<tr>
<td>Amphibious Assault Vehicles (on Trailers)</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Logistic Vehicle Systems</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>M77 155mm Howitzers (on Tow Trailers)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>D7 Bulldozer</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>MTVR Dump Truck</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>124</td>
<td>122</td>
</tr>
</tbody>
</table>

*Notes:* Generic Marine Expeditionary Unit with 1,214 personnel. Generic Battalion Landing Team with 1,257 personnel.

*Legend:* HMMWV = High Mobility Multi-purpose Wheeled Vehicles; mm = millimeter; MTVR = Medium Tactical Vehicle Replacements; TOW = Tube-launched, Optically-tracked, Wire-guided.


**Table 4.5-15. All Tinian Alternatives Proposed Base Vehicles**

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Number of Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buses (for troop transport)</td>
<td>8</td>
</tr>
<tr>
<td>Sedans (for use by permanent staff)</td>
<td>2</td>
</tr>
<tr>
<td>4-Wheel Drive Trucks (Light) - Service pick-ups for use by permanent staff (facilities and range maintenance)</td>
<td>15</td>
</tr>
<tr>
<td>Medium Tactical Vehicle Replacement 7-ton Trucks (range maintenance)</td>
<td>5</td>
</tr>
<tr>
<td>Commercial Flat Bed Trucks</td>
<td>5</td>
</tr>
<tr>
<td>D7 Bulldozer</td>
<td>2</td>
</tr>
<tr>
<td>Front End Loader</td>
<td>2</td>
</tr>
<tr>
<td>Medium Tactical Vehicle Replacement 7-ton Dump Truck</td>
<td>2</td>
</tr>
<tr>
<td>Rough Terrain Forklift</td>
<td>1</td>
</tr>
<tr>
<td>(Rough Terrain) Material Handling Equipment (for port and airfield use)</td>
<td>1</td>
</tr>
<tr>
<td>Extended Boom Forklift</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>44</strong></td>
</tr>
</tbody>
</table>


Most vehicle traffic outside the Military Lease Area would be prior to and at the end of a 2-week training cycle, with occasional trips by Amphibious Assault Vehicles conducting training within the port. Vehicles would be required to pass biosecurity inspection at the proposed military biosecurity and wash-down facility at the port. As a result, vehicle traffic would be light and dispersed throughout the training period and each day. The only instance that vehicles would be moved in a concentrated period of time would be at the end of the training cycle when all vehicles and personnel are transported from base camp to the port for loading onto the High Speed Vessel or other marine transport.

Including round trips by buses and autos, the hourly maximum would be approximately 237 vehicles. This would result in hourly equivalent noise levels of 64, 59, 56, and 54 decibels at 50, 100, 150, and 200 feet, respectively, from the roadway. Along the planned roadway, there are only a few homes within 100 feet (30 meters) from the roadway. Noise levels would be below Federal Highway Administration level guidelines and U.S. Environmental Protection Agency guidelines and would potentially occur at these levels once every 2 weeks for a limited time. The most likely scenario would be for a more
dispersed movement from base camp lasting most of the day and noise levels would be appreciably lower.

Traffic-generated noise resulting from Tinian Alternative 1 operations would have less than significant direct and indirect noise impacts to land uses and people.

4.5.3.1.2.5 Waterborne Operations

Waterborne activities would include Amphibious Assault Vehicles, Landing Craft Air Cushion, and Landing Craft Utility. In addition, large vessel operations of ships, a High Speed Vessel, and a barge would occur for transporting personnel and equipment to Tinian.

**Landing Craft Air Cushion Operations**

Of all the vessels planned for use, the Landing Craft Air Cushion operations would be the loudest. These vessels ride on a cushion of air generated by powerful engines, driving fans that elevate the vessel above the water. Landing Craft Air Cushions generate maximum noise levels of 98 decibels at 200 feet (61 meters) during ground run-up conditions, and sound exposure levels up to 104 A-weighted decibels at 40 knots (74 kilometers per hour) on water (DoN 2009). For safety purposes, visitors would not have access to beach when training exercises are occurring. However, visitors may be allowed to have access to adjacent beaches. Under any of the Tinian alternatives, Landing Craft Air Cushion vehicles that would operate at one of the amphibious landing beaches and near shore of the Military Lease Area would generate noise audible at the nearest adjacent beach. For example, Landing Craft Air Cushion vehicles operating at Unai Babui would generate noise levels of about 74 decibels during ground run-up conditions and 80 decibels at 40 knots (74 kilometers per hour) at Unai Chulu. However, the public would not have access to the amphibious landing beach training areas when these vessels are operating and, therefore, they would not be exposed to elevated noise levels created by these activities. Noise for Landing Craft Air Cushion vessels could be audible to visitors, but noise impacts to the public would be less than significant.

Amphibious Assault Vehicles have sound exposure levels of about 87-88 decibels moving on water or land, and around 72 decibels at a distance of 100 feet (30 meters) while at idle. Amphibious Assault Vehicles could come ashore four at a time. Therefore, noise levels in these situations would be higher, approximately 96 decibels at 100 feet (30 meters). Landing Craft Utility and Light Armored Vehicles would be used but are smaller and have less horsepower. This would result in noise levels lower than either the Landing Craft Air Cushion or the Amphibious Assault Vehicles. For safety purposes, visitors would not have access to beach or nearby areas when training exercises are occurring, and therefore no noise impacts to the public would occur.

**Tinian Port Operations**

Operations would primarily occur prior to and at the end of a 2-week training cycle period, as one of the potential transportation options for marine personnel and equipment embarkation/debarkation points. Harbor operations would include one Joint High Speed Vessel, other ships, a barge, and Landing Craft Utility that could be in port simultaneously. Port arrivals and departures would occur at low-engine speeds of 5 knots or less. Noise from visiting vessels would be consistent with normal port vessels and persist when loading and unloading for a day or two. Amphibious Assault Vehicles would also use the port and generate noise levels of 72 decibels at 100 feet (30 meters). The nearest residence would be
over 200 feet (60 meters) from the planned route for the vehicle to transit from the port to the training area and the noise levels would be less than 66 decibels.

**Underwater**

Underwater operational noise generated by sea-going vessels’ engines would not create noise levels affecting people or sensitive land uses.

Tinian Alternative 1 waterborne operations would generate less than significant direct and indirect noise impacts to land uses and people.

### 4.5.3.2 Tinian Alternative 2

#### 4.5.3.2.1 Construction Impacts

Construction noise levels from implementation of Tinian Alternative 2 would be similar to those described for Tinian Alternative 1 because differences between the construction activities for the Tinian Alternatives would occur away from sensitive receptors. Activities sufficiently close to receptors that can have a potential noise impact are identical for each alternative. The North and South Battle Area Complexes and five additional Convoy Engagement Areas would be established and the mission of the International Broadcasting Bureau would be moved when compared to Tinian Alternative 1. Construction noise would not fall outside military boundaries; therefore, impacts would be compatible with residential areas, and not affect schools, places of worship, or hospitals (i.e., sensitive receptors).

Tinian Alternative 2 construction activities would result in less than significant direct or indirect noise impacts on land and underwater.

#### 4.5.3.2.2 Operation Impacts

##### 4.5.3.2.2.1 Ground Based Operations

**Small-caliber Weapons**

Noise generated from Tinian Alternative 2 small-caliber weapons operations would be similar to Tinian Alternative 1. Acreage and population affected by small-caliber weapons were presented in Table 4.5-1 and illustrated in Figure 4.5-1 for A-weighted day-night average sound levels. The analysis indicated that no acreage or population outside of the Military Lease Area would be affected by A-weighted noise levels 65 decibels or greater (or Noise Zones II and III). Table 4.5-2 and Figure 4.5-2 presented Peak noise levels and indicated that while no population would be exposed to elevated Peak noise levels, about 200 more acres (81 hectares) would be exposed to 87-104-decibel Peak noise levels when compared to Tinian Alternative 1. Potential A-weighted and Peak noise effects at points of interest under Tinian Alternative 2 are listed in Table 4.5-16 and shown in Figure 4.5-1 and Figure 4.5-2. Noise levels would not be perceptibly different from those modeled under Tinian Alternative 1.

Small-caliber weapons operations associated with Tinian Alternative 2 would result in less than significant direct and indirect noise impacts. Neither A-weighted nor Peak noise levels would be incompatible with the points of interest.
Table 4.5-16. Tinian Alternative 2 Representative Points of Interest Affected by Small-caliber Weapons Noise on Tinian (A-weighted and Peak)

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Point of Interest</th>
<th>Type</th>
<th>A-weighted Day-Night Average Sound Levels (ADNL)</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Decibel</td>
<td>Zone</td>
</tr>
<tr>
<td>T1</td>
<td>Tinian High School</td>
<td>School</td>
<td>&lt; 50</td>
<td>I</td>
</tr>
<tr>
<td>T2</td>
<td>Lake Hagoi</td>
<td>Other</td>
<td>63</td>
<td>I</td>
</tr>
<tr>
<td>T3</td>
<td>Mahalang Ephemeral Ponds</td>
<td>Other</td>
<td>67</td>
<td>II</td>
</tr>
<tr>
<td>T4</td>
<td>Marpo Heights</td>
<td>Residential</td>
<td>&lt; 50</td>
<td>I</td>
</tr>
<tr>
<td>T5</td>
<td>Mount Lasso Overlook Area</td>
<td>Other</td>
<td>71</td>
<td>II</td>
</tr>
<tr>
<td>T6</td>
<td>Bateha 1 - Isolated Wetlands</td>
<td>Other</td>
<td>65</td>
<td>II</td>
</tr>
<tr>
<td>T7</td>
<td>Northeast of Marpo Heights</td>
<td>Residential</td>
<td>&lt; 50</td>
<td>I</td>
</tr>
<tr>
<td>T8</td>
<td>Bateha 2 - Isolated Wetlands</td>
<td>Other</td>
<td>75</td>
<td>III</td>
</tr>
<tr>
<td>T9</td>
<td>San Jose</td>
<td>Residential</td>
<td>&lt; 50</td>
<td>I</td>
</tr>
<tr>
<td>T10</td>
<td>San Jose Catholic Church</td>
<td>Church</td>
<td>&lt; 50</td>
<td>I</td>
</tr>
<tr>
<td>T11</td>
<td>Tinian Elementary School</td>
<td>School</td>
<td>&lt; 50</td>
<td>I</td>
</tr>
<tr>
<td>T12</td>
<td>Unai Chiget</td>
<td>Other</td>
<td>59</td>
<td>I</td>
</tr>
<tr>
<td>T13</td>
<td>Unai Chulu</td>
<td>Other</td>
<td>61</td>
<td>I</td>
</tr>
<tr>
<td>T14</td>
<td>Unai Dankulo</td>
<td>Other</td>
<td>64</td>
<td>I</td>
</tr>
<tr>
<td>T15</td>
<td>Unai Masalok</td>
<td>Other</td>
<td>55</td>
<td>I</td>
</tr>
<tr>
<td>T16</td>
<td>North Field National Historic Landmark</td>
<td>Other</td>
<td>55</td>
<td>I</td>
</tr>
<tr>
<td>T17</td>
<td>International Broadcasting Bureau</td>
<td>Administrative</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>T18</td>
<td>Proposed Base Camp (Old West Field)</td>
<td>Transient Lodging</td>
<td>54</td>
<td>I</td>
</tr>
<tr>
<td>T19</td>
<td>Northern Marianas College</td>
<td>School</td>
<td>&lt; 50</td>
<td>I</td>
</tr>
<tr>
<td>T20</td>
<td>Ushi Point</td>
<td>Other</td>
<td>&lt; 50</td>
<td>I</td>
</tr>
<tr>
<td>T21</td>
<td>Native Limestone Forest</td>
<td>Other</td>
<td>&lt; 50</td>
<td>I</td>
</tr>
<tr>
<td>T22</td>
<td>Unai Lam Lam</td>
<td>Other</td>
<td>54</td>
<td>I</td>
</tr>
</tbody>
</table>

Notes: NA – not applicable, see annotation number 1 and shading denotes points of interest inside the Military Lease Area.

***Under Alternatives 2 and 3 the International Broadcasting Bureau mission is relocated.

1 Other includes sites with cultural, biological, recreational, or other concerns that are unrelated to human factors and are addressed in the applicable resource sections of the CJMT EIS/OEIS.

2 Noise level threshold is 50 decibel ADNL and 80 decibel Peak.

3 Small-caliber Peak Noise Zones defined as: Zone I (< 55 decibel ADNL; 55-64 decibel ADNL); Zone II (65-69 decibel ADNL; 70-74 decibel ADNL); and Zone III (75-79 decibel ADNL; 80-84 decibel ADNL; > 85 decibel ADNL).

Large-caliber Weapons

Noise impacts on acres and population would be similar to Tinian Alternative 1 (see Table 4.5-4); however, outside the Military Lease Area boundaries, Tinian Alternative 2 would affect 33 fewer acres (13 hectares) exposed to Noise Zone II and III levels (62-70 decibels C-weighted) when compared to Tinian Alternative 1. However, as with Tinian Alternative 1, people would not be impacted by either Noise Zone II or III C-weighted noise levels on Tinian. On Saipan, neither acreage nor people would be impacted by C-weighted day-night average sound levels under Tinian Alternative 2 (see Table 4.5-4). Peak noise levels under Tinian Alternative 2 (see Table 4.5-5), when weather conditions are neutral, would affect the same number of acres on Tinian as found under Tinian Alternative 1 (521 acres/211 hectares). On Saipan, no acres or people would be affected by Peak noise levels when weather conditions are neutral. When weather conditions are unfavorable, however, Peak noise impacts (see Table 4.5-6) on Tinian would affect 102 more acres (41 hectares) when compared to Tinian Alternative 1. On Saipan, the same 1,552 acres (628 hectares) would be exposed to Peak noise levels of 115 decibels. Under Tinian Alternative 2, 80 people on Tinian and 1,143 on Saipan would be exposed to elevated Peak noise levels. Table 4.5-7 and Table 4.5-8 presented C-weighted day-night average sound levels to points of interest on Tinian and Saipan, respectively. Table 4.5-9 and Table 4.5-10 presented the Peak noise levels under neutral and unfavorable weather conditions at points of interest on Tinian and Saipan. Figures 4.5-3, 4.5-4, and 4.5-5 illustrate these potential noise levels. As found with Tinian Alternative 1, one Tinian point of interest (T7) would have a moderate potential for risk of complaints when weather conditions are unfavorable (see Table 4.5-9). On Saipan (see Table 4.5-10), five points of interest (S1, S2, S4, S7, and S11) would be exposed to elevated Peak noise levels and thus have the potential for increased risk of noise complaints.

Large-caliber weapons use associated with Tinian Alternative 2 operations would result in less than significant direct or indirect noise impacts and noise levels would be considered compatible with land uses and sensitive receptors.

4.5.3.2.2 Airfield and Airspace Based Operations

Tinian Alternative 2 aircraft and airspace operations are the same as Tinian Alternative 1. Proposed annual military operations at Tinian International Airport and North Field were presented in Table 4.5-11 and noise contour bands illustrated in Figure 4.5-6. When compared to baseline conditions, A-weighted noise levels of 65 decibels and greater would potentially affect 2,937 acres (1,189 hectares) outside the Military Lease Area under Tinian Alternative 2. Review of aerial photography revealed that approximately 10 residences and 40 people in Marpo Heights (see point of interest T4 on Figure 4.5-6) would be affected by aircraft noise levels of 65 decibels and greater.

Identical to Tinian Alternative 1, Tinian Alternative 2 aircraft operations would introduce significant direct noise impacts to approximately 40 people residing in 10 residences in the Marpo Heights area. While this represents a significant change from baseline conditions, operations causing these impacts would occur infrequently. No indirect noise impacts to human receptors would result from airfield or airspace operations.
4.5.3.2.2.3 Waterborne Operations

Noise generated by waterborne activities would be the same as Tinian Alternative 1 operations. Therefore, Tinian Alternative 2 waterborne operations would generate less than significant direct and indirect impacts to land uses and receptors (e.g., people, residential areas, hospitals, and schools).

4.5.3.2.2.4 Traffic

Traffic noise generated by operations would be similar to Tinian Alternative 1 because vehicle operations that have the potential to cause noise that can be heard by San Jose residents would be nearly identical to Alternative 1. Under this alternative there would be slightly less trips by International Broadcasting Bureau employees, but that would have negligible effects of traffic noise. There would be less than significant direct and indirect noise impacts to land uses and receptors with Tinian Alternative 2.

4.5.3.3 Tinian Alternative 3

4.5.3.3.1 Construction Impacts

Construction noise levels under Tinian Alternative 3 would be similar to those described for Tinian Alternatives 1 and 2 because differences between the construction activities for the Tinian Alternatives would occur away from sensitive receptors. Activities sufficiently close to receptors that can have a potential noise impact are identical for each alternative. When compared to Tinian Alternative 1, the southern Battle Area Complex and five additional Convoy Course Engagement Areas would be established and the mission of the International Broadcasting Bureau would move. There would be less than significant direct or indirect construction noise impacts on land or underwater resulting from RTA, airport, or port construction and improvements under Tinian Alternative 3.

4.5.3.3.2 Operation Impacts

4.5.3.3.2.1 Ground Based Operations

Small-caliber Weapons

Noise generated under Tinian Alternative 3 would be similar to Tinian Alternative 1. Acreage and population affected by small-caliber weapons were presented in Table 4.5-1 and illustrated in Figure 4.5-1 for A-weighted day-night average sound levels. The analysis indicated that no acreage or population outside of the Military Lease Area would be affected by A-weighted noise levels 65 decibels or greater (or Noise Zones II and III). Table 4.5-2 and Figure 4.5-2 presented potential Peak noise levels and indicated that while no population would be exposed to elevated Peak noise levels, about 200 more acres (81 hectares) would be exposed to 87-104 Peak noise levels when compared to Tinian Alternative 1. Potential A-weighted and Peak noise effects at points of interest for Tinian Alternative 3 are listed in Table 4.5-17 and shown in Figure 4.5-1 and Figure 4.5-2. Noise would not be perceptibly different when compared to Tinian Alternative 1.

Tinian Alternative 3 would have less than significant direct and indirect operations noise impacts resulting from small-caliber weapons use, and these noise levels would be considered compatible with sensitive receptors. Small-caliber A-weighted noise levels would not be incompatible to any points of interest.
### Table 4.5-17. Tinian Alternative 3 Representative Points of Interest Affected by Small-caliber Weapons Noise on Tinian (A-weighted and Peak)

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Description</th>
<th>Type</th>
<th>A-weighted Day-Night Average Sound Levels</th>
<th>Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Tinian High School</td>
<td>School</td>
<td>&lt; 50</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>T2</td>
<td>Lake Hagoi</td>
<td>Other</td>
<td>62</td>
<td>100</td>
</tr>
<tr>
<td>T3</td>
<td>Mahalang Ephemeral Ponds</td>
<td>Other</td>
<td>66</td>
<td>105</td>
</tr>
<tr>
<td>T4</td>
<td>Marpo Heights</td>
<td>Residential</td>
<td>&lt; 50</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>T5</td>
<td>Mount Lasso Overlook Area</td>
<td>Other</td>
<td>71</td>
<td>106</td>
</tr>
<tr>
<td>T6</td>
<td>Bateha 1 - Isolated Wetlands</td>
<td>Other</td>
<td>67</td>
<td>106</td>
</tr>
<tr>
<td>T7</td>
<td>Northeast of Marpo Heights</td>
<td>Residential</td>
<td>&lt; 50</td>
<td>83</td>
</tr>
<tr>
<td>T8</td>
<td>Bateha 2 - Isolated Wetlands</td>
<td>Other</td>
<td>75</td>
<td>108</td>
</tr>
<tr>
<td>T9</td>
<td>San Jose</td>
<td>Residential</td>
<td>&lt; 50</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>T10</td>
<td>San Jose Catholic Church</td>
<td>Church</td>
<td>&lt; 50</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>T11</td>
<td>Tinian Elementary School</td>
<td>School</td>
<td>&lt; 50</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>T12</td>
<td>Unai Chiget</td>
<td>Other</td>
<td>58</td>
<td>96</td>
</tr>
<tr>
<td>T13</td>
<td>Unai Chulu</td>
<td>Other</td>
<td>61</td>
<td>103</td>
</tr>
<tr>
<td>T14</td>
<td>Unai Dankulo</td>
<td>Other</td>
<td>64</td>
<td>104</td>
</tr>
<tr>
<td>T15</td>
<td>Unai Masalok</td>
<td>Other</td>
<td>55</td>
<td>96</td>
</tr>
<tr>
<td>T16</td>
<td>North Field National Historic Landmark</td>
<td>Other</td>
<td>55</td>
<td>98</td>
</tr>
<tr>
<td>T17</td>
<td>International Broadcasting Bureau</td>
<td>Administrative</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>T18</td>
<td>Proposed Base Camp (Old West Field)</td>
<td>Base Camp</td>
<td>54</td>
<td>95</td>
</tr>
<tr>
<td>T19</td>
<td>Northern Marianas College</td>
<td>School</td>
<td>&lt; 50</td>
<td>&lt; 80</td>
</tr>
<tr>
<td>T20</td>
<td>Ushi Point</td>
<td>Other</td>
<td>&lt; 50</td>
<td>97</td>
</tr>
<tr>
<td>T21</td>
<td>Native Limestone Forest</td>
<td>Other</td>
<td>&lt; 50</td>
<td>91</td>
</tr>
<tr>
<td>T22</td>
<td>Unai Lam Lam</td>
<td>Other</td>
<td>57</td>
<td>95</td>
</tr>
</tbody>
</table>

**Notes:**
- NA – not applicable, see annotation number 1 and shading denotes points of interest inside the Military Lease Area.
- **Under Alternatives 2 and 3 the International Broadcasting Bureau mission is relocated.**
- Other includes sites with cultural, biological, recreational, or other concerns that are unrelated to human factors and are addressed in the applicable resource sections of the CJMT EIS/OEIS.
- Noise level threshold is 50 decibels A-weighted day-night average sound level (or decibel ADNL).
- Small-caliber ADNL Noise Zones defined as: Zone I (< 55 decibel ADNL; 55-64 decibel ADNL); Zone II (65-69 decibel ADNL; 70-74 decibel ADNL); and Zone III (75-79 decibel ADNL; 80-84 decibel ADNL; > 85 decibel ADNL).

*Source: Army Public Health Command 2014.*
Large-caliber Weapons

Noise impacts from large-caliber weapons to acres and population would be similar to Tinian Alternative 1 (see Table 4.5-4). For Tinian Alternative 3, outside the Military Lease Area boundaries, there would be the same amount of area (1,300 acres/526 hectares) exposed to Noise Zone II and III levels (62-70 decibels C-weighted) on Tinian as found under Tinian Alternative 1. Additionally, as with Tinian Alternative 1, no people would be impacted by either Noise Zone II or III C-weighted noise levels on Tinian. On Saipan, neither acreage nor people would be impacted by C-weighted day-night average sound levels under Tinian Alternative 3 (see Table 4.5-4). Peak noise levels (see Table 4.5-5), when weather conditions are neutral, would affect a slightly lesser amount of area—519 acres (210 hectares)—on Tinian when compared to Tinian Alternative 1 (521 acres/211 hectares). On Saipan, no acres or people would be affected by Peak noise levels when weather conditions are neutral. When weather conditions are unfavorable; however, Peak noise levels of 115 decibels (see Table 4.5-6) would affect 101 more acres (a little less than 41 hectares) on Tinian when compared to Tinian Alternative 1. The same 80 people would be exposed to Peak noise levels under Tinian Alternative 3 operations as found with the other alternatives. On Saipan, 1,552 acres (628 hectares) and 1,143 people would be exposed to Peak noise levels of 115 decibels as found under the other two alternatives. Similar to Tinian Alternative 1, one Tinian point of interest (T7) would have a moderate potential for risk of complaints when weather conditions are unfavorable (see Table 4.5-9) for Tinian Alternative 3. On Saipan (see Table 4.5-10), five points of interest (S1, S2, S4, S7, and S11) would be exposed to elevated Peak noise levels and thus have the potential for increased risk of noise complaints.

Large-caliber weapons operations associated with Tinian Alternative 3 would result in less than significant direct and indirect noise impacts, and noise levels would be considered compatible with land uses and sensitive receptors.

4.5.3.3.2.2 Airfield and Airspace Based Operations

Tinian Alternative 3 aircraft operations would be identical to Tinian Alternative 1. Proposed annual military operations at Tinian International Airport and North Field are presented in Table 4.5-11 and noise contour bands illustrated in Figure 4.5-6. Under Tinian Alternative 3, A-weighted noise levels of 65 decibels and greater would potentially affect 2,937 acres (1,189 hectares) outside the Military Lease Area. As found under the other two alternatives, approximately 10 residences and 40 people in Marpo Heights (see point of interest T4 on Figure 4.5-6) would be infrequently affected by aircraft noise levels exceeding 65 decibels A-weighted. Because airfield and airspace operations are identical to Tinian Alternative 1, Tinian Alternative 3 aircraft operations would introduce significant direct noise impacts to 10 residences and 40 people in the Marpo Heights area (the same as found under Tinian Alternatives 1 and 2). While this represents a significant change from baseline conditions, operations causing these impacts would occur infrequently. No indirect noise impacts to human receptors would result from airfield or airspace operations.
4.5.3.3.2.3  Waterborne Operations

Noise generated by waterborne activities would be the same as Tinian Alternative 1. Therefore, Tinian Alternative 3 waterborne operations would generate less than significant direct and indirect impacts to land uses and receptors (e.g., people, residential areas, hospitals, and schools).

4.5.3.3.2.4  Traffic

Tinian Alternative 3 operations generating traffic noise would be the same as Tinian Alternative 2. There would be less than significant direct and indirect noise impacts to land uses and receptors.

4.5.3.4  Tinian No-Action Alternative

The periodic non-live-fire military training exercises that occur in the Military Lease Area on Tinian generate noise in association with troop maneuvering, ground vehicles, helicopter and fixed-wing aircraft operations. These military exercises are of short duration (1 to 2 weeks) and have only occurred four times in the past 3 years. If implemented, the four live-fire training ranges included in the Guam and CNMI Military Relocation EIS (DoN 2010a) would produce noise. Military activities on the four ranges would generate less than significant noise levels near existing sensitive receptors (i.e., below 65 decibels A-weighted day-night average sound level) (see Table 6.2-7; DoN 2010a). Similarly, noise generated by aircraft operations within the Mariana Islands Range Complex are not anticipated to elevate noise levels above the established threshold 65 decibels A-weighted day-night average sound level near existing sensitive receptors (see Table 3.5-4; DoN 2010b). Therefore, the Tinian no-action alternative would result in less than significant noise impacts.
### 4.5.3.5 Summary of Impacts for Tinian Alternatives

Table 4.5-18 provides a comparison of the potential impacts to noise resources for the three Tinian alternatives and the no-action alternative.

**Table 4.5-18. Summary of Impacts for Tinian Alternatives**

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>On Land</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
</tr>
<tr>
<td>In-water</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Ground-Based Operation</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Airfield and Airspace Based Operations</td>
<td>Not applicable</td>
<td>SI</td>
<td>Not applicable</td>
<td>SI</td>
</tr>
<tr>
<td>Waterborne Operation</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Traffic</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Occupational Noise</td>
<td>Not applicable</td>
<td>NI</td>
<td>Not applicable</td>
<td>NI</td>
</tr>
</tbody>
</table>

*Legend: NI = no impact; LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.*
4.5.4 Pagan

4.5.4.1 Pagan Alternative 1

4.5.4.1.1 Construction Impacts

Construction activities and airfield improvements would not affect any residential properties or noise-sensitive receptors such as schools, and hospitals because none currently exist on Pagan. Construction activities would generate noise due to heavy construction machinery, such as graders, excavators, and some explosive blasting of lava rock. Visitors would be allowed on Pagan but noise levels generated by construction activities at the airfield would be approximately 55-60 decibels at Red Beach and about 68 decibels at Green Beach. No underwater construction is proposed. Pagan Alternative 1 would have less than significant direct or indirect noise impacts generated by construction.

4.5.4.1.2 Operation Impacts

4.5.4.1.2.1 Ground Based Operations

*Small-caliber Weapons*

The small-caliber weapons proposed for both Pagan alternatives include 9 millimeter and .45 caliber pistols, M16/M4 rifles, and M240 and M249 machine guns. Small caliber weapons expenditures under Pagan Alternative 1 would generate 665,455 rounds fired annually. Figure 4.5-7 and Figure 4.5-8 present the small-caliber A-weighted day-night average sound level contours and the Peak noise levels, respectively. Table 4.5-19 provides the acres affected by small arms noise in Noise Zones II and III. Both alternatives are presented together because they generate very similar noise levels and for easy comparison of area affected.

Pagan Alternative 1, small-caliber munitions expenditures would have the potential to expose, onshore, 1,813 acres (732 hectares) to 65 decibels and greater A-weighted day-night average sound levels. Peak noise levels would affect 8,536 acres (3,456 hectares).

Small-caliber weapons operations would result in no direct or indirect impacts for Pagan Alternative 1. No noise-sensitive land uses (e.g., residences, schools) or people would be affected by A-weighted and Peak noise levels.
Figure 4.5-7. All Pagan Alternatives Small-Caliber Weapons Noise Levels (A-weighted)
Figure 4.5-8. All Pagan Alternatives Small-Caliber Weapons Noise Levels (Peak)
Table 4.5-19. All Pagan Alternatives Affected by Small-caliber Weapons Noise
(A-weighted and Peak)

| Noise Levels (in decibels) | On Shore |  |  |
|----------------------------|----------|  |  |
| A-weighted Day-Night Sound Levels | Acres/Hectares | Peak Noise Levels | Acres/Hectares |
| Alternative 1 | Alternative 2 | Alternative 1 | Alternative 2 |
| 65 – 69 | 819/331 | 961/398 | 87-104 | 2,112/855 | 2,152/871 |
| 70 – 74 | 530/214 | 605/245 | | |
| Total Zone II | 1,349/545 | 1,566/634 | Peak Total Zone II | 2,112/855 | 2,152/871 |
| Zone III |  |  |  |  |  |
| 75 – 79 | 302/122 | 318/128 | > 104 | 6,424/2,601 | 6,384/2,585 |
| 80 – 84 | 142/57 | 152/62 | | |
| >85 | 220/8 | 31/13 | | |
| Total Zone III | 464/187 | 500/203 | Total Zone III | 6,424/2,601 | 6,384/2,585 |
| Total On shore | 1,813/732 | 2,066/837 | Total On shore | 8,536/3,456 | 8,536/3,456 |

Off shore

| Zone II |  |  |  |
| 65 – 69 | 4/2 | 4/2 | 87-104 | 10,745/4,350 | 10,802/4,373 |
| 70 – 74 | 0 | 0 | | |
| Total Zone II | 4/2 | 4/2 | Peak Total Zone II | 10,745/4,350 | 10,802/4,373 |

Zone III

|  |  |  |  |
| 75 – 79 | 0 | 0 | > 104 | 893 | 837/339 |
| 80 – 84 | 0 | 0 | | |
| >85 | 0 | 0 | | |
| Total Zone III | 0 | 0 | Total Zone III | 893/362 | 837/339 |
| Total Off shore | 4/2 | 4/2 | Total Off shore | 11,638/4,712 | 11,639/4,712 |

Large-caliber Weapons

Large-caliber weapons include live hand grenades, mortars, artillery, and aviation ordnance. Under Pagan Alternative 1, 13,748 large-caliber rounds of ground-delivered ordnance and an additional 13,670 large-caliber rounds of air- and naval-delivered ordnance would be fired in an average year. Table 4.5-20 presents noise generated from Pagan Alternative 1 for C-weighted and Peak (neutral and unfavorable weather conditions); again, both Pagan alternatives are presented. Illustrated in Figure 4.5-9 are the C-weighted day-night average sound level noise contour bands. Figure 4.5-10 illustrates Peak noise levels under neutral weather conditions and Figure 4.5-11 shows Peak noise contours under unfavorable weather conditions. Under Pagan Alternative 1, large-caliber expenditures would expose 8,883 acres (3,595 hectares) of land to noise levels exceeding 62 decibels C-weighted. Visitors may be on Pagan outside of surface danger zones during training activities; however, there would not be any permanent noise-sensitive land uses (e.g., residences, schools) to be affected by C-weighted and Peak noise levels.
# Table 4.5-20. All Pagan Alternatives Area Affected by Large-caliber Weapons Noise (C-weighted and Peak)

<table>
<thead>
<tr>
<th>Noise Zone</th>
<th>Acres/Hectares</th>
<th>C-Weighted Day-Night Average Sound Level</th>
<th>Peak Neutral</th>
<th>Peak Unfavorable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On Shore</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone II/Moderate Complaint Risk</td>
<td>1,120/453</td>
<td>744/301</td>
<td>2,655/1,075</td>
<td></td>
</tr>
<tr>
<td>Zone III/High Complaint Risk</td>
<td>7,763/3,142</td>
<td>8,749/3,542</td>
<td>9,138/3,700</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8,883/3,595</td>
<td>9,493/3,843</td>
<td>11,793/4,774</td>
<td></td>
</tr>
<tr>
<td>Off Shore</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone II/Moderate Complaint Risk</td>
<td>17,846/7,222</td>
<td>17,357/7,027</td>
<td>108,855/44,071</td>
<td></td>
</tr>
<tr>
<td>Zone III/High Complaint Risk</td>
<td>1,880/761</td>
<td>100,315/40,613</td>
<td>112,072/45,373</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19,726/7,983</td>
<td>117,672/47,640</td>
<td>220,927/89,444</td>
<td></td>
</tr>
<tr>
<td>Alternative 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On Shore</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone II/Moderate Complaint Risk</td>
<td>943/382</td>
<td>1,069/433</td>
<td>3,521/1,426</td>
<td></td>
</tr>
<tr>
<td>Zone III/High Complaint Risk</td>
<td>7,401/2,995</td>
<td>7,393/2,993</td>
<td>8,272/3,349</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8,344/3,377</td>
<td>8,462/3,426</td>
<td>11,793/4,774</td>
<td></td>
</tr>
<tr>
<td>Off Shore</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone II/Moderate Complaint Risk</td>
<td>16,618/6,725</td>
<td>19,127/7,744</td>
<td>119,492/48,377</td>
<td></td>
</tr>
<tr>
<td>Zone III/High Complaint Risk</td>
<td>1,822/737</td>
<td>88,996/36,031</td>
<td>101,436/41,067</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18,440/7,462</td>
<td>108,123/43,774</td>
<td>220,928/89,445</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
- Zone II = 62-70 decibels, Zone III >70 decibels for C-Weighted day-night average sound level.
- Moderate Complaint Risk = 115-130 decibels, High Complaint Risk is >130 decibels for Peak Noise Level.

### Source:
Figure 4.5-9. All Pagan Alternatives Large-Caliber Weapons Noise Levels (C-weighted)
Figure 4.5-10. All Pagan Alternatives Large-Caliber Noise Levels Under Neutral Weather Conditions (Peak)
Figure 4.5-11. All Pagan Alternatives Large-Caliber Noise Levels under Unfavorable Weather Conditions (Peak)
Table 4.5-21 presents the C-weighted day-night average sound levels and Table 4.5-22 lists peak noise levels, respectively, at representative points of interest on Pagan. All points of interest would be exposed to Noise Zones II and III. However, these C-weighted noise levels would be compatible because there are no residences, schools, or hospitals on the island. While there may be visitors on Pagan, the number of visitors is unknown, they would be present for short periods of time, and they are not present outside of southern Pagan during training events. Therefore, estimates for affected population were not included.

Large-caliber weapons operations associated with Pagan Alternative 1 would result in no direct or indirect noise impacts that would cause incompatibilities to sensitive land uses (i.e., residences or schools) or points of interest.

### Table 4.5-21. All Pagan Alternatives Points of Interest from Large-caliber Weapon Activity (C-weighted)

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Point of Interest (POI)</th>
<th>Type of POI</th>
<th>Decibels</th>
<th>Noise Zone</th>
<th>Noise-Sensitive POI Conflict</th>
<th>Decibels</th>
<th>Noise Zone</th>
<th>Noise-Sensitive POI Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Fruit Bat Colony 1</td>
<td>Other</td>
<td>55</td>
<td>I</td>
<td>NA</td>
<td>55</td>
<td>I</td>
<td>NA</td>
</tr>
<tr>
<td>P2</td>
<td>Fruit Bat Colony 2</td>
<td>Other</td>
<td>62</td>
<td>II</td>
<td>NA</td>
<td>58</td>
<td>I</td>
<td>NA</td>
</tr>
<tr>
<td>P3</td>
<td>Fruit Bat Colony 3</td>
<td>Other</td>
<td>74</td>
<td>III</td>
<td>NA</td>
<td>74</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>P4</td>
<td>Main Camp/Airstrip Area</td>
<td>Transient</td>
<td>70</td>
<td>III</td>
<td>No³</td>
<td>70</td>
<td>III</td>
<td>No³</td>
</tr>
<tr>
<td>P5</td>
<td>Upper Lake</td>
<td>Other</td>
<td>76</td>
<td>III</td>
<td>NA</td>
<td>77</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>P6</td>
<td>Southern Pagan</td>
<td>Other</td>
<td>56</td>
<td>I</td>
<td>NA</td>
<td>55</td>
<td>I</td>
<td>NA</td>
</tr>
<tr>
<td>P7</td>
<td>South Beach</td>
<td>Other</td>
<td>69</td>
<td>II</td>
<td>NA</td>
<td>69</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>P8</td>
<td>Lower Lake</td>
<td>Other</td>
<td>74</td>
<td>III</td>
<td>NA</td>
<td>74</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>P9</td>
<td>Cultural Location 1</td>
<td>Other</td>
<td>69</td>
<td>II</td>
<td>NA</td>
<td>69</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>P10</td>
<td>Cultural Location 2</td>
<td>Other</td>
<td>69</td>
<td>II</td>
<td>NA</td>
<td>69</td>
<td>II</td>
<td>NA</td>
</tr>
<tr>
<td>P11</td>
<td>Cultural Location 3</td>
<td>Other</td>
<td>56</td>
<td>I</td>
<td>NA</td>
<td>56</td>
<td>I</td>
<td>NA</td>
</tr>
<tr>
<td>P12</td>
<td>Cultural Location 4</td>
<td>Other</td>
<td>55</td>
<td>I</td>
<td>NA</td>
<td>54</td>
<td>I</td>
<td>NA</td>
</tr>
<tr>
<td>P13</td>
<td>Gold Beach</td>
<td>Other</td>
<td>74</td>
<td>III</td>
<td>NA</td>
<td>74</td>
<td>III</td>
<td>NA</td>
</tr>
<tr>
<td>P14</td>
<td>North Beach</td>
<td>Other</td>
<td>78</td>
<td>III</td>
<td>NA</td>
<td>79</td>
<td>III</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Notes:**
- NA – not applicable, see annotation number 1.
- Other includes sites with biological, cultural, recreational, or other concerns that are not related to human factors and are addressed in the applicable resource sections of the CJMT EIS/OEIS.
- Demolition and large-caliber Noise Zones defined as: LUPZ (57-62 decibel CDNL); Zone I (<57 decibel CDNL); Zone II (62-70 decibel CDNL); and Zone III (>70 decibel CDNL).
- POI is human but is a tactical training location and, therefore, considered compatible with these noise levels.

**Source:** Army Public Health Command 2014.
Table 4.5-22. All Pagan Alternatives Representative Points of Interest Affected by Large-caliber Weapons Noise (Peak)

<table>
<thead>
<tr>
<th>Point of Interest (POI)</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unfavorable Weather Conditions</td>
<td>Neutral Weather Conditions</td>
</tr>
<tr>
<td>Identification Number</td>
<td>Decibel(^1)</td>
<td>Decibel(^2)</td>
</tr>
<tr>
<td>P1 Fruit Bat Colony 1</td>
<td>120</td>
<td>&lt; 110</td>
</tr>
<tr>
<td>P2 Fruit Bat Colony 2</td>
<td>136</td>
<td>125</td>
</tr>
<tr>
<td>P3 Fruit Bat Colony 3</td>
<td>&gt; 150</td>
<td>147</td>
</tr>
<tr>
<td>P4 Main Camp/Airstrip Area</td>
<td>139(^2)</td>
<td>131(^2)</td>
</tr>
<tr>
<td>P5 Upper Lake</td>
<td>&gt; 150</td>
<td>&gt; 150</td>
</tr>
<tr>
<td>P6 Southern Pagan</td>
<td>121</td>
<td>&lt; 110</td>
</tr>
<tr>
<td>P7 South Beach</td>
<td>137</td>
<td>134</td>
</tr>
<tr>
<td>P8 Lower Lake</td>
<td>&gt; 150</td>
<td>146</td>
</tr>
<tr>
<td>P9 Cultural Location 1</td>
<td>139</td>
<td>134</td>
</tr>
<tr>
<td>P10 Cultural Location 2</td>
<td>145</td>
<td>134</td>
</tr>
<tr>
<td>P11 Cultural Location 3</td>
<td>121</td>
<td>&lt; 110</td>
</tr>
<tr>
<td>P12 Cultural Location 4</td>
<td>119</td>
<td>&lt; 110</td>
</tr>
<tr>
<td>P13 Gold Beach</td>
<td>&gt; 150</td>
<td>145</td>
</tr>
<tr>
<td>P14 North Beach</td>
<td>&gt; 150</td>
<td>&gt; 150</td>
</tr>
</tbody>
</table>

Notes: 1. Other includes sites with cultural, biological, recreational, or other concerns that are unrelated to human factors and are addressed in the applicable resource sections of the CJMT EIS/OEIS.
2. Noise level threshold is 110 decibel Peak.
3. Complaint risk areas defined as: low risk of complaints <115 decibel Peak; moderate risk of complaints 115-130 decibels Peak; and high risk of complaints > 130 decibel Peak.
4. POI is considered a tactical training location and complaint risk correlation does not apply.


4.5.4.1.2.2 Airfield and Airspace Based Operations

Acres exposed to noise levels exceeding 65 decibels (A-weighted) at and around the airfield are presented in Table 4.5-23 for Pagan Alternatives 1 and 2. Figure 4.5-12 illustrates the noise contour bands. While there are visitors on Pagan, they are not permanent residents, and therefore estimates for affected population were not included.

Table 4.5-23. All Pagan Alternatives Noise Exposure Area at and Around the Airfield (A-weighted)

<table>
<thead>
<tr>
<th>Contour Band (in decibels)</th>
<th>Acres/Hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>On Shore</td>
</tr>
<tr>
<td>65 – 70</td>
<td>4,608/1,866</td>
</tr>
<tr>
<td>70 – 75</td>
<td>153/62</td>
</tr>
<tr>
<td>75 – 80</td>
<td>0</td>
</tr>
<tr>
<td>80 – 85</td>
<td>0</td>
</tr>
<tr>
<td>85+</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>4,761/1,928</td>
</tr>
</tbody>
</table>
Figure 4.5-12. All Pagan Alternatives Airfield and Airspace Noise Levels (A-weighted)
Under Pagan Alternative 1, 4,761 acres (1,928 hectares) would be exposed to noise levels between 65 and 75 decibels, A-weighted day-night average sound levels generated by airfield activities. Subsonic (i.e., aircraft flying slower than the speed of sound) noise levels resulting from overland aircraft training is depicted in Figure 4.5-12. No sensitive receptors (e.g., schools or hospitals) would be affected and no people live permanently on the island. Supersonic activities (i.e., aircraft flying faster than the speed of sound) would be allowed immediately above and in Special Use Airspace around Pagan. Supersonic activities would be infrequent, occurring about 30 times per year, for approximately 1 minute each time, and above 10,000 feet (3,048 meters) MSL.

Pagan Alternative 1 aircraft operations would result in no direct or indirect noise impacts. No sensitive receptors (e.g., schools or hospitals) or people would be exposed to subsonic or supersonic noise levels.

### 4.5.4.1.2.3 Waterborne Operations

Waterborne activities would include Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, and Landing Craft Utility for transporting personnel and equipment to Pagan. Of all the vessels planned for use, the Landing Craft Air Cushion operations would be the loudest. During ground run-up conditions Landing Craft Air Cushions generate maximum noise levels of 98 decibels at 200 feet (61 meters), and on water sound exposure levels could be up to 104 A-weighted decibels at 40 knots (74 kilometers per hour) (DoN 2009).

Landing Craft Air Cushion vessels would operate at amphibious landing beaches and near shore of Pagan and generate noise levels of about 74 decibels during ground run-up conditions and 80 decibels at 40 knots (74 kilometers per hour). Amphibious Assault Vehicles would be the next loudest vessels, with sound exposure levels of about 87-88 decibels moving on water or land, and around 72 decibels at a distance of 100 feet (30 meters) while at idle. Landing Craft Utility and Light Armored Vehicles would be used but are smaller and have less horsepower. This would result in noise levels lower than either the Landing Craft Air Cushion or the Amphibious Assault Vehicles.

Underwater operational noise generated by sea-going vessels’ engines would not create noise levels affecting people or sensitive land uses.

Waterborne operations would generate no direct and indirect noise impacts for Pagan Alternative 1 because there are no residences, schools, or hospitals to affect. While there are visitors on Pagan, they do not permanently reside there at the time of this study, and therefore estimates for affected population were not included.

### 4.5.4.1.2.4 Traffic

Vehicular traffic associated with Pagan Alternative 1 would include movement across the island on equipment brought by the training units, such as wheeled and tracked vehicles.

Pagan Alternative 1 traffic operations would result in no direct or indirect noise impacts because there are neither sensitive receptors (e.g., schools or hospitals) nor people that permanently reside on Pagan at the time of this study who could be affected.
4.5.4.2 Pagan Alternative 2

4.5.4.2.1 Construction Impacts

Noise impacts associated with Pagan Alternative 2 construction activities and airfield improvements would be similar to Pagan Alternative 1. The only differences, which would not change any construction activities identified in Pagan Alternative 1, are that the High Hazard Impact Area on the isthmus would not be established and the northern High Hazard Impact Area would be smaller. Construction activities (including all training and support facilities) and airfield improvements would not affect any permanent residential properties or noise-sensitive receptors such as schools, places of worship, and hospitals, and no underwater construction is proposed as of the time of this study.

Pagan Alternative 2 would result in no direct or indirect noise impacts generated by construction activities.

4.5.4.2.2 Operation Impacts

4.5.4.2.2.1 Ground Based Operations

Small-caliber Weapons

Pagan Alternative 2 small-caliber weapons expenditures would be the same as Pagan Alternative 1. Table 4.5-19 provides the acres affected by small-caliber weapons noise in Noise Zones II and III. Figure 4.5-7 and Figure 4.5-8 present the small-caliber A-weighted day-night average sound level contours and Peak noise levels, respectively. Pagan Alternative 2, A-weighted noise levels would affect 2,066 acres (837 hectares) on shore, an increase of the 253 acres (102 hectares) when compared to Pagan Alternative 1. Peak noise levels would be the same as Pagan Alternative 1 and affect 8,536 acres (3,456 hectares). No permanent noise-sensitive land uses (e.g., residences, schools) or people permanently reside on Pagan at the time of this study that would be affected.

Pagan Alternative 2 small-caliber weapons operations would result in no direct or indirect significant noise impacts. No permanent noise-sensitive land uses (e.g., residences, schools) or people permanently reside on Pagan at the time of this study that would be affected by A-weighted and Peak noise levels.

Large-caliber Weapons

Pagan Alternative 2 large-caliber weapons expenditures would be the same as Pagan Alternative 1. Table 4.5-20 presents noise generated from Pagan Alternative 2 for C-weighted and Peak (neutral and unfavorable weather conditions). Figure 4.5-9 shows the C-weighted day-night average sound level contours, Figure 4.5-10 depicts the Peak noise levels under neutral weather conditions, and Figure 4.5-11 shows the Peak noise contours under unfavorable weather conditions. Under Pagan Alternative 2, large-caliber expenditures would expose 8,344 acres (3,377 hectares) of land to noise levels exceeding 62 decibels C-weighted. When compared to Pagan Alternative 1, this is a decrease of 539 acres (218 hectares). No noise-sensitive land uses (e.g., residences, schools) or people would be impacted by these C-weighted and Peak noise levels. In respect to points of interest (see Table 4.5-21), all would be exposed to Noise Zones II and III. However, these C-weighted noise levels would be considered compatible because there are no permanent residences, schools, or hospitals to affect, and no people
permanently reside on Pagan at the time of this study that are present to impose increased risks of complaints from elevated Peak noise levels.

Large-caliber weapons operations would result in no direct or indirect noise impacts for Pagan Alternative 2. No permanent noise-sensitive land uses (e.g., residences, schools) or people permanently reside on Pagan at the time of this study that would be affected by C-weighted and Peak noise levels.

4.5.4.2.2.2 Airfield and Airspace Based Operations

Pagan Alternative 2 aircraft operations would be the same as Pagan Alternative 1. For Pagan Alternative 2, the acres exposed to noise levels exceeding 65 decibels A-weighted, at and around the airfield, are presented in Table 4.5-23; Figure 4.5-12 illustrates the noise contour bands. Pagan Alternative 2 A-weighted day-night average sound levels generated by airfield activities would expose 4,761 acres (1,928 hectares) to noise levels between 65 and 75 decibels, the same as Pagan Alternative 1.

Pagan Alternative 2 aircraft operations would result in no direct or indirect noise impacts. No permanent sensitive receptors (e.g., schools or hospitals) or people permanently reside on Pagan at the time of this study that would be exposed to subsonic or supersonic noise levels.

4.5.4.2.2.3 Waterborne Operations

Underwater operational noise generated by sea-going vessels’ engines would not create noise levels affecting people or noise-sensitive land uses.

Pagan Alternative 2 waterborne operations would not generate any direct or indirect noise impacts because there are no permanent residences, schools, or hospitals to affect, and no people permanently reside on Pagan at the time of this study that are present.

4.5.4.2.2.4 Traffic

Vehicular traffic associated with Pagan Alternative 2 would be the same as Pagan Alternative 1. Vehicular traffic would include travel and training across the island by training personnel and their associated equipment.

Pagan Alternative 2 traffic operations would have no direct or indirect noise impacts. There are neither permanent sensitive receptors (e.g., schools or hospitals) nor people permanently reside on Pagan at the time of this study that would be affected.

4.5.4.3 Pagan No-Action Alternative

The Pagan no-action alternative assumes non-live-fire training on Pagan. Only infrequent visitation of eco-tourism customers or scientific survey personnel would be expected to continue. Military personnel have periodically visited Pagan for search and rescue training and this activity would be expected to continue. The no-action alternative would consist of short term and infrequent activities and would have no noise impacts.
### 4.5.4.4 Summary of Impacts for Pagan Alternatives

Table 4.5-24 provides a comparison of the potential impacts to noise resources for the two Pagan alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>On Land</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NI</td>
</tr>
<tr>
<td>In Water</td>
<td>NI</td>
<td>Not applicable</td>
<td>NI</td>
</tr>
<tr>
<td>Ground-Based Operation</td>
<td>Not applicable</td>
<td>NI</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Airfield and Airspace Based Operations</td>
<td>Not applicable</td>
<td>NI</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Waterborne Operation</td>
<td>Not applicable</td>
<td>NI</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Traffic</td>
<td>Not applicable</td>
<td>NI</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Occupational Noise</td>
<td>Not applicable</td>
<td>NI</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

**Legend:** LSI = less than significant impact; NI = no impact.
Section 4.6 describes the impacts that could potentially occur to the existing airspace environment from the proposed action. Potential impacts would stem from the establishment of new Special Use Airspace, including restricted areas, a military operations area, and a warning area. Establishment of these requires rulemaking (restricted areas) and non-rulemaking (military operations and warning areas) actions by the Federal Aviation Administration, per Joint Order 7400.2K. Procedures for Handling Airspace Matters (Federal Aviation Administration 2014a). Additional details, including the geographic coordinates, altitudes, and times of use for each proposed area, can be found in Appendix I, Airspace Technical Memo.

The analysis of potential impacts to airspace addresses: (1) en route operations, (2) access to public airports, (3) air traffic control services, and (4) measures to mitigate or lessen any impacts. Other potential impacts associated with airspace use are covered in Section 4.5, Noise; Section 4.9, Terrestrial Biology; and Section 4.15, Socioeconomics and Environmental Justice. Impacts to air transportation and airports are addressed in Section 4.13, Transportation. In accordance with Federal Aviation Administration, Joint Order 7400.2K, Section 6, paragraph 21-6-1, Aeronautical Study, an aeronautical study is required for all restricted areas, military operations areas and warning area proposals (Federal Aviation Administration 2014a). For this EIS/OEIS, the Federal Aviation Administration is preparing two separate aeronautical studies, one for Tinian and one for Pagan. Each aeronautical study will identify impacts of the proposed Special Use Airspace on the safe and efficient use of airspace and air traffic control procedures. Phase I of the study will include an in-depth analysis of aircraft operations and existing flight routes based on radar track data and flight plan information recorded by the Performance Data Analysis and Recording System. Other sources deemed necessary to ensure a comprehensive study will also be used. Phase II of the study will be completed by a team that specializes in airspace use, including representatives of the Federal Aviation Administration, U.S. military, and the CNMI. The aircraft operational data gathered during Phase I will be used to design any new approaches required to minimize effects to airport traffic and define the final airspace configurations and the procedures necessary to meet military mission needs while ensuring the safe and efficient use of the airspace by all users.

4.6.1 Approach to Analysis

The methodology for identifying and evaluating impacts to airspace involves defining the existing controlled and uncontrolled airspace used to manage air traffic operations in the CNMI and the amount of air traffic needing access to the airspace. The airspace used to support airport arrivals and departures as well as existing aviation routes used to transit the CNMI set the stage for defining impacts. Available aircraft operations are used as a gauge for competing aviation interests and in identifying airspace requirements specific to the region. Figure 4.6-1 illustrates the region of influence for airspace impacts.

The analysis of potential impacts to airspace considers both direct and indirect impacts. Impacts are based on the existing environment and representative examples of how training missions would use the proposed airspace (see Appendix H, Noise Study).
Figure 4.6-1
Airspace Region of Influence

Legend
- Aviation Route
- Proposed Special Use Airspace - Tinian
- Proposed Special Use Airspace - Pagan
- Existing Airspace Designated for Military Use
- Air Traffic Control Assigned Airspace
- Restricted Area (R-7201)
- Warning Area
- Tinian MOA / ATCAA
- Military Training Route (Instrument)

Source: NAVFAC Pacific 2013
For this EIS/OEIS impacts are identified for the local region of influence and based on the best information available. Therefore, significance was determined qualitatively based on the degree of change as well as regulatory standards where applicable. Direct impacts would be expected to result if use of the proposed airspace would interfere with the safe and efficient use of the airspace or interference with the safe, orderly, and expeditious flow of air traffic. Indirect impacts are based on potential economic impacts (i.e., fuel consumption, additional time needed to transit the airspace) that could occur as a result of changes to published aviation routes, instrument approach procedures, standard instrument departure procedures, or a requirement for visual flight rule air traffic to change from a regular flight course or altitude.

The analysis in this EIS/OEIS is based on the following factors.

- Each airspace unit would be activated as needed for live-fire training.
- The proposed Restricted Areas 7203A/B/C would be charted for use daily from 7:00 a.m. to 10:00 p.m. except for periods with Saipan International Airport flight (large passenger jet or jetliner) activity. The airspace would be activated at other times through Notices to Airmen.
- The proposed Restricted Areas 7203X/Y/Z would be charted for use daily from 7:00 a.m. to 10:00 p.m. with activation at other times through a Notice to Airmen.
- The proposed Restricted Areas 7203E/W, and Tinian Military Operations Area would be charted for use and activated as needed through Notices to Airmen. Tinian Air Traffic Control Assigned Airspace would be requested as needed to extend the Tinian Military Operations Area.
- Restricted Area 7204A/B/C/D, and Warning Areas 14 High and 14 Low would be charted for use and activated as needed through Notices to Airmen.
- Each Restricted Area would be activated as needed from the surface to altitudes between 4,000 feet (1,219 meters) and 18,000 feet (5,182 meters) MSL based on the ranges and weapons to be used and the intent to train with participating aircraft (see Appendix I, Airspace Technical Memo for additional detail).
- As depicted in Figure 2.4-18, proposed restricted area 7203 has been segmented into eight individual airspace units, Restricted Area 7203A/B/C/X/Y/Z/E and W. Each restricted area’s configuration is based on RTA locations and the distance (both vertical and horizontal) needed to ensure safe separation of military activities from non-participating aircraft. The division of Restricted Area 7203 into eight segments would support optimal management of the ranges and airspace and accommodate airport air traffic and smaller inter-island commuter aircraft travelling between Tinian and Saipan. The segmented airspace was specifically designed to provide for airspace activation of those areas and those altitudes necessary to complete training while minimizing any potential effects on air traffic. The segmentation would ensure that provisions can be made for access to Tinian and Saipan International Airports with minimum delay as required by Federal Aviation Administration Joint Order 7400.2K, paragraph 23-1-4.
Additionally, the segmented airspace supports the current requirement for the fleet of single engine airplanes operating between Tinian and Saipan to remain within glide distance to shore.

- The floor of the proposed Tinian Military Operations Areas was raised from 1,500 feet (457 meters) above ground level to 3,000 feet (914 meters) to accommodate air traffic and eliminate penetration of Saipan International Airport’s Class D airspace.
- Individual airspace units on Tinian (Restricted Areas 7203A/B/C/X/Y/Z/E/W) and the Tinian Military Operations Area/Air Traffic Control Assigned Airspace (see Chapter 2, Proposed Action and Alternatives, Figure 2.4-14a) would be used either individually or in conjunction with each other depending on the training being conducted. Similarly, Pagan (Restricted Areas 7204A/B/C and Warning Areas 14 High and 14 Low) would be used either individually or in conjunction with each other.
- Training periods on Tinian and Pagan could overlap with each other or be independent of each other.
- The operations estimates are based on the optimum number of mission events required by air and ground forces to maintain combat readiness proficiency levels. Due to variations in missions and pilot tactics, the operational information presented in Appendix H, Noise Study, to define altitude distributions and times of day are representative examples of how missions would be flown.

In accordance with Federal Aviation Administration Joint Order 7400.2k, paragraph 23-1-4, the restricted area must exclude the airspace 1,500 feet (457 meters) above ground level and below within a 3 nautical mile (5.6 kilometer) radius of airports available for public use. For this EIS/OEIS it is assumed that Change 2 to Federal Aviation Administration Joint Order 7400.2K, publicized and opened for public comment in November 2014, will be approved as requested by the DoN, in part, to support this proposed action. The order states that a reduction to the 3-nautical mile (5.6-kilometer) exclusionary airspace surrounding Tinian International Airport, may be approved by the Federal Aviation Administration on a case-by-case basis after a risk based analysis is accomplished in accordance with the safety risk management process, and development of a risk resolution implementation plan (Federal Aviation Administration 2015).

### 4.6.2 Resource Management Measures

The Federal Aviation Administration has regulatory authority over the National Airspace System and all airspace is governed by Federal Aviation Administration policies and procedures; therefore, best management practices and standard operating procedures do not apply to airspace. The U.S. military is, however, committed to limiting impacts to other users of the airspace and is working closely with the Federal Aviation Administration with regards to the establishment of this proposed airspace. The potential mitigation measures identified in this section are currently being coordinated with the Federal Aviation Administration and could be modified during the coordination process. A mitigation plan will be prepared in coordination with Federal Aviation Administration as part of the EIS process. The Department of Defense will continue working with the Federal Aviation Administration to minimize potential impacts and define required mitigation measures.
4.6.3 Tinian

The potential impacts analyzed herein are based on establishment and use of the proposed Restricted Areas 7203A/B/C/X/Y/Z/E and W and the Tinian Military Operations Area as they relate to civilian aircraft operations needing access to the airspace associated with use of the Tinian and Saipan International Airports. Impacts to commercial air traffic on published aviation routes are discussed based on potential interaction with the Tinian Military Operations Area/Air Traffic Control Assigned Airspace. Impacts to navigable airspace as a result of proposed construction projects are addressed as airspace obstructions. Discussion of airspace obstructions includes only the effect of proposed construction projects that would place restrictions on the use of the airspace and that require Federal Aviation Administration review and approval. Details regarding construction and airport improvements are included in Section 4.13, Transportation.

The Marine Corps Guam Range Management Division would have the overall responsibility for safety functions during all training events within the RTA on Tinian. These functions would include airspace management, access, aircraft movement, and Special Use Airspace de-confliction surveillance. They are described in detail in Appendix C, Unconstrained Training Concept for Tinian and Pagan.

Continued coordination during the Federal Aviation Administration’s aeronautical process will include development of the procedures needed to accommodate arrivals, departures and missed approaches to the Saipan and Tinian International Airports. The procedures would set forth appropriate measures to assure the safe passage of all commercial and private aircraft and provide for commercial large passenger jets and jetliners approaching Saipan to be given priority access to the airspace needed to land.

4.6.3.1 Tinian Alternative 1

Tinian Alternative 1 has the potential of impacting the airspace associated with aircraft operations at Tinian and Saipan International Airports, the airspace associated with the transition between Tinian and Saipan, and published commercial routes in the region of influence. The impacts based on the proposed increase in aircraft operations at the Tinian International Airport and establishment of a new military operations area, air traffic control assigned airspace, and restricted area follow.

4.6.3.1.1 Tinian

4.6.3.1.1.1 Increased Operations at Tinian International Airport

The increase in aircraft operations at Tinian International Airport would have direct effects on civilian air traffic. As indicated in Table 4.6-1, there were 48,640 non-military operations at Tinian International Airport in 2013. Approximately 18,656 (i.e., annual average day operations multiplied by 140 days) of the non-military operations could be impacted by the proposed action. These operations would continue to require access to the Tinian International Airport as well as the airspace needed to transit between Tinian and Saipan. This could be expected for some part of each day for up to 20 weeks per year based on the training being conducted.
Table 4.6-1. Change in Tinian International Airport Annual Airport Operations\(^1,2\)

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Existing Airport Operations</th>
<th>Proposed Airport Operations</th>
<th>Change in Airport Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military</td>
<td>476</td>
<td>9,244</td>
<td>+8,768</td>
</tr>
<tr>
<td>GA Single Engine(^3)</td>
<td>48,640</td>
<td>48,640</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>49,116</td>
<td>57,884</td>
<td>+8,768</td>
</tr>
</tbody>
</table>

Notes:  
1 Operations include departures, arrivals and closed patterns. Closed patterns count as two airport operations, one approach and one departure.  
2 Based on the 2014 to 2040 year-over-year growth rate estimated by the Federal Aviation Administration Terminal Area Forecast (Federal Aviation Administration 2013), air traffic operations for Tinian International Airport would not be expected to change (see also Appendix O, Transportation Study).  
3 Air traffic between Saipan International Airport, Tinian International Airport, and Rota International Airport.

As shown in Table 4.6-1, annual operations at Tinian International Airport would be expected to increase by 8,768 operations or an average of approximately 62 operations per day (31 approaches and 31 departures) during some portion of the 20 weeks of training (non-consecutive), although the tempo would fluctuate during the training period. Approximately 45% of the operations (3,898 annual/28 daily) would be related to field carrier landing practice and other practice approaches by fighter aircraft (3,000 annual/21 daily), helicopters (598 annual/4 daily), and MV-22’s (300 annual/2 daily). Each airframe would practice multiple approaches during a single flight. The number of approaches is dependent on pilot proficiency requirements. Table 4.5-11, (see Section 4.5, Noise), provides detailed information on proposed military operations.

The increase in military air traffic would not restrict access to Tinian International Airport, but civilian flights could experience delays in departures and arrivals during the time when military aircraft are practicing approaches to the runway. Aircraft arrivals and departures would continue to occur on a first come, first serve basis with pilots notifying each other of their intentions via the common traffic advisory frequency or as directed by Air Traffic Control. Pilots flying to and from Saipan would be expected to continue to land and depart using visual flight rules. Guam Combined Center/Radar Approach Control would continue to be responsible for departures and arrivals on published approaches above 3,500 feet (1,067 meters) MSL.

Without mitigation, there is a potential for significant impacts to aircraft needing access to the Tinian International Airport at times when military are practicing field carrier landings. The following potential mitigation measures would minimize direct and indirect impacts to Tinian International Airport arrivals and departures.

Potential mitigation measures include:

- Establish a Letter of Procedure or Joint Use Agreement to accommodate civilian arrivals and departures into the airport.
- Establish communication procedures between Tinian Range Control and Saipan International Airport Air Traffic Control to ensure priority access to Tinian International Airport for life-flight and other emergency-related activities.
- Add positive control measures (e.g., air traffic control tower at Tinian, short-range radar on Tinian or Saipan that would allow air traffic controllers to see aircraft operating below 2,000 feet [609 meters]), and communications capability at Saipan or Tinian to ensure non-participating aircraft are advised of military operations.
Implementation of the above measures and others identified through coordination with the Federal Aviation Administration would reduce impacts to less than significant. The Letter of Procedure and communications procedures would include the procedures necessary to ensure the safe and efficient use of airspace by all users. The addition of a Tactical Air Navigational System and positive control measures would benefit all users of the airspace as air traffic control services would be available to aircraft operating below 2,000 feet (609 meters) MSL.

### 4.6.3.1.1.2 Tinian Military Operations Area

Activation of the Tinian Military Operations Area independent of the restricted airspace would not be expected to impact commuter flight routes or the departures or approaches to Tinian International Airport.

Pilots transiting between Saipan and Tinian would be expected to fly below 3,000 feet (914 meters) MSL, the floor of the Tinian Military Operations Area. Pilots desiring to fly above 3,000 feet (914 meters) MSL (military and non-military) would need to follow see-and-avoid procedures as they do today to ensure safe separation of aircraft. Pilots desiring not to transit through the active military operations area would need to remain below 3,000 feet (914 meters) MSL.

Aircraft arriving on published approaches into Tinian International Airport would be at or above 2,600 feet (792 meters) MSL within 11 nautical miles (20 kilometers) of the runway and would be descending when they reach the Tinian Military Operations Area boundary (Skyvector 2013). Missed approaches to the runway would climb to 2,800 feet (853 meters) and hold or return for another approach. Aircraft departures would need to remain below 3,000 feet (914 meters) until clear of the military operations area. Air traffic would be expected to remain below 3,000 feet (914 meters) MSL.

The proposed Tinian Military Operations Area would have less than significant impacts to aircraft operations needing access to the airspace to transit between Saipan and Tinian.

### 4.6.3.1.1.3 Restricted Area 7203

As can be seen in Figure 4.6-2, when active, Restricted Area 7203 would directly impact the existing Tinian commuter aircraft flight path. As non-participating aircraft, civilian aircraft would not be permitted to use the existing flight path while the restricted areas are active without permission of the controlling agency. Although chartered and private flights between islands would continue to be flown under visual flight rules using the most direct route possible, they would need to fly outside of the restricted area or obtain permission from the controlling agency to transit the area. The two major airspace units that would have the most impact to this type of transit are Restricted Area 7203W (west of Tinian) and Restricted Area 7203E (east of Tinian). If only one of these is activated together with the airspace units overlying Tinian (Restricted Area 7203A/B/C/X/Y/Z), civilian aircraft can continue flights on the other side of the island. Rerouting around the west end of the island would increase distance and add time to the flights, while rerouting around the east of the island would not (see more detailed discussion below).
Figure 4.6-2
Commuter Flight Routes
All Action Alternatives
When all airspace units (i.e., Restricted Areas 7203A/B/C/X/Y/Z/E/W) are activated, civilian aircraft could not transit on either side. However, activation of all airspace units at the same time would typically occur only one or two times per week during the 20 weeks of training, and the duration would be two hours or less. With advance notice and coordination, chartered and private flights would be able to plan for these events. Furthermore, the Department of Defense would coordinate with commercial air taxi and charter services to minimize disruptions to their service to the extent possible.

Based on the notional flight paths presented in Figure 4.6-2, it is possible for civilian aircraft to be routed around the airspace when Restricted Areas 7203E and 7203W are not activated together while staying within the minimum safety glide slope. For example, using a 10:1 glide ratio (i.e., for every 10 feet [3 meters] travelled horizontally, 1 foot [0.3 meter] of altitude is lost), the glide distance of a single engine aircraft such as the Piper Cherokee traveling 3,000 feet (914 meters) above ground level at 100 miles per hour (185 kilometers) would be approximately 5 nautical miles (9 kilometers). Under the proposed configuration, aircraft could fly around the active restricted airspace and remain within 2 nautical miles (3.7 kilometers) of shore except for periods when Restricted Areas 7203E and W are activated together. Traveling around Restricted Areas-7203E or 7203W would require aircraft to be more than 10 nautical miles (18 kilometers) from shore. Based on the above safety glide slope example, when the entire restricted area (i.e., Restricted Areas 7203A/B/C/X/Y/Z/E/W) is activated, single engine aircraft used to transit to and from Saipan and Tinian International Airports would not be able to meet the minimum safety glide slope requirements and flight delays would be expected. This could occur for brief periods during the 1-2 hours per day for up to 135 days per year that Restricted Area 7203E is activated for use.

When Restricted Areas 7203E and 7203W are not in use, civilian aircraft could still transit between Saipan and Tinian even if Restricted Areas 7203A/B/C/X/Y/Z are in use. Aircraft could either fly around the east side or the west side. As can be seen in Table 4.6-2, there would be no change in the distance when aircraft can be routed to the east around the restricted areas. Aircraft would experience the greatest change in distance (10 to 12 nautical miles [18 to 22 kilometers, respectively]) when they need to be routed to the west of the restricted areas. This could be required for some portion of the 1-2 hours per day up to 135 days per year when Restricted Area 7203E is active.

### Table 4.6.2 Distances between Saipan and Tinian

<table>
<thead>
<tr>
<th>Runway in Use</th>
<th>Distance (Nautical Miles)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing Flight Path</td>
</tr>
<tr>
<td>Saipan 25</td>
<td>11</td>
</tr>
<tr>
<td>Saipan 07</td>
<td>17</td>
</tr>
<tr>
<td>Tinian 26</td>
<td>17</td>
</tr>
<tr>
<td>Tinian 08</td>
<td>11</td>
</tr>
</tbody>
</table>

*Distances based on notional flight patterns presented in Figure 4.6-2.

When Restricted Area 7203A/B/C/X/Y/Z and E are activated independently of Restricted Area 7203W and aircraft are routed to the west of the airspace, additional time and fuel would be needed. However, less than significant impacts would be expected as this would only occur up to two hours per day for up to 135 days per year. No impacts would be expected with activation of Restricted Area 7203A/B/C/X/Y/Z/W independent of Restricted Area 7203E as aircraft could fly to the east of Tinian without adding time or distance between locations.
Aircraft needing to be routed to the west around the active airspace would experience indirect effects such as additional travel distances, time en route, and fuel consumption. As mentioned earlier, with advance notice and coordination, chartered and private flights would be able to plan for these events. Furthermore, the Department of Defense would coordinate with commercial air taxi and charter services to minimize to the extent possible disruptions to their service.

Activating all Restricted Area-7203 segments together would rarely occur. However, when it does occur, single engine commuter aircraft would not be able to transit the area as they would not meet the minimum safety glide slope requirements. Without mitigation, commuter aircraft needing access to the airspace during the time (up to two hours per day for up to 135 days per year) would be directly and significantly impacted.

Potential mitigation measures include:

- Establish communication procedures to provide immediate feedback between air traffic controllers and range control to accommodate smaller inter-island commuter aircraft travelling between Saipan and Tinian when needed.
- Add positive control measures (e.g., air traffic control tower at Tinian, short-range radar on Tinian or Saipan that would allow air traffic controllers to see aircraft operating below 2,000 feet [609 meters]), and communications capability at Saipan or Tinian to ensure non-participating aircraft are properly separated from restricted area activities.

Once the U.S. military’s coordination with the Federal Aviation Administration is complete, less than significant impacts would be expected. The procedures necessary to ensure the safe and efficient use of airspace by all users would be in place. The addition of positive control measures would benefit all users of the airspace as air traffic control services would be available to aircraft operating below 2,000 feet (609 meters) MSL.

4.6.3.1.1.4 Airspace Obstructions

The proposed construction of a Munitions Storage Area is within 3,600 feet (183 meters) of the approach end of Tinian International Airport’s Runway 08. The Munitions Storage Area safety arcs are located to the north of the Runway Protection Zone. Federal Aviation Administration regulations and Unified Facilities Criteria prohibiting flights below 500 feet (152 meters) above ground level over ammunition magazines and staging areas while ammunition is being staged or handled would be in place. When Runway 08 is in use, aircraft arriving on published approaches would be expected to be aligned with the runway and outside of the safety arcs. Commuter aircraft approaching the Tinian International Airport would need to fly around the munitions storage area or be at altitudes greater than 500 feet (152 meters) above ground level and implement a circling approach to land. This would occur up to 20 weeks per year that the area is in use. During the times when the military is not training, live munitions would not be stored in the staging area and no restrictions would be required. Runway 26 departures would experience the same restrictions.

Construction of new towers and use of cranes, etc. during construction of base camp facilities requires notification to the Federal Aviation Administration. The Federal Aviation Administration would complete an obstruction evaluation/airport airspace analysis to determine the marking and lighting requirements
necessary to ensure flight safety in accordance with Federal Aviation Administration’s Advisory Circular 70/7460-1K, Obstruction Marking and Lighting (see also Section 4.13.2, Transportation).

The International Broadcasting Bureau (see Photo 3.6-2) presents an obstruction to aircraft operating at low altitudes (i.e., below 500 feet [152 meters] above ground level) within Restricted Areas 7203X and 7203A. Strobe lighting marks the antenna array to ensure the antennas are visible to aircraft.

Marking and lighting the proposed communication towers in accordance with Federal Aviation Administration requirements, and publishing an avoidance area around the munitions storage area would minimize potential long-term impacts. Therefore, under Tinian Alternative 1, less than significant impacts to airspace and aircraft safety would occur from the additional airspace obstructions.

4.6.3.1.2 Saipan

Tinian Alternative 1 has the potential of impacting the airspace associated with aircraft operations at Saipan International Airport. No additional air traffic is proposed for Saipan International Airport. Impacts could result from an increase in operations at Tinian North Field, and establishment of the proposed Restricted Areas 7203A/B/C/W and the Tinian Military Operations Area. Impacts to commuter flights between Tinian and Saipan are discussed in Section 4.6.3.1.2.3, Restricted Area 7203.

4.6.3.1.2.1 Increased Operations at Tinian North Field

Tinian North Field is located under the Saipan International Airport’s approach corridor to Runway 07. Under Tinian Alternative 1, there would be an increase of 2,222 annual operations (Table 4.6-3) at North Field for a total of 2,420 operations (an average of 17 per day during the 20 weeks of live-fire training). Approximately 25% (700 annual or five per night during the 140 days of training) of the operations would be expected to occur during the hours of 10:00 p.m. to 7:00 a.m., the primary time when commercial large passenger jet or jetliners are arriving and departing Saipan International Airport. Section 4.5, Noise, Table 4.5-11, provides detailed information on proposed military operations and the type of aircraft proposed for use at Tinian North Field.

Table 4.6-3. North Field Annual Operations

<table>
<thead>
<tr>
<th>Existing Operations</th>
<th>Proposed Operations</th>
<th>Change in Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>198</td>
<td>2,420</td>
<td>+2,222</td>
</tr>
</tbody>
</table>

Note: Operations include departures, arrivals and closed patterns. Closed patterns count as two airport operations, one approach and one departure.

As indicated in Section 3.6.4.3, Saipan International Airport, there are approximately 175 operations on an average annual day at Saipan International Airport. Nine flights are the result of scheduled daily international arrivals and departures. Major airlines scheduled arrivals typically occur between the hours of 1:00 a.m. and 9:00 a.m. local time with the majority arriving before 5:00 a.m. Departures occur between the hours of 2:00 a.m. and 6:00 p.m. with approximately half occurring before 6:00 a.m. (FlightStats 2014). The remaining operations are the result of air taxi, general aviation and military operations, primarily those transitioning between Saipan and Tinian (discussed above). The 2014 to 2040 year-over-year growth rate estimated by the Federal Aviation Administration’s Terminal Area Forecast civilian aircraft indicates operations at Saipan International Airport are projected to increase by approximately 1% each year until 2040 when they project 110,348 annual operations (302 operations per day) for arrivals and departures (Federal Aviation Administration 2014). A 1% increase would not be expected to change the results of this analysis.
Existing procedures used to manage aircraft operations and deconflict military and civilian aircraft would be expected to continue. Arrivals and departures would be within Saipan International Airport’s Class E airspace where Saipan Air Traffic Control would be responsible for coordinating the movement of air traffic to ensure that aircraft maintain minimum separation for safety. Aircraft performing local training at North Field would continue to maintain radio contact with Saipan Air Traffic Control to ensure de-confliction with civilian carriers’ en route to Saipan International Airport. Unscheduled large commercial jets and jetliners requiring access to Saipan International Airport would have priority over military training. Saipan Air Traffic Control would continue to advise civilian aircraft flying under visual flight rules between islands about activity in the area, and all pilots (military and civilian) would be responsible for following see-and-avoid procedures. The addition of 17 aircraft operations per day at North Field during the 140 days of live-fire training and the need to maintain contact with Saipan Air Traffic Control would result in a minimal increase in the number of aircraft requiring handling by Saipan Air Traffic Controllers. Scheduling of aircraft arrivals and departures to deconflict with Saipan commercial large passenger jets and jetliners would minimize any impacts and result in less than significant impacts to Saipan Air Traffic Control as a result of increased operations at Tinian North Field.

4.6.3.1.2.2 Tinian Military Operations Area

Saipan International Airport is located beneath the Tinian Military Operations Area. Their Class D airspace would not intersect with the proposed Tinian Military Operations Area. Class E airspace extends the Saipan Class D airspace by approximately 8 nautical miles (15 kilometers) to the southwest and approximately 5 nautical miles (9 kilometers) to the northeast as shown in Figure 3.6-5 (Section 3.6, Airspace). The Class E extension airspace begins at 700 feet (213 meters) MSL and extends up to 4,500 feet (1,372 meters) MSL. The Class E airspace to the north and southwest intersects with the Tinian Military Operations Area.

Saipan’s Class E airspace is used to support published approaches and standard instrument departures for Saipan International Airport by major airlines and large commercial jets. It is not used to support commuter aircraft flying under visual flight rules between Islands. As indicated above, there are nine scheduled daily international arrivals and departures with scheduled arrivals typically occurring between the hours of 1:00 a.m. and 9:00 a.m. local time with the majority arriving before 5:00 a.m. Departures occur between the hours of 2:00 a.m. and 6:00 p.m. with approximately half occurring before 6:00 a.m. The Tinian Military Operations Area would not be activated during periods with Saipan International Airport International flight activity and less than significant impacts would be expected. Impacts to commuter aircraft would be the same as discussed above for Tinian.

4.6.3.1.2.3 Restricted Area 7203

Saipan International Airport and their Class D airspace are located outside of proposed Restricted Area 7203. The Class E airspace that extends the Saipan Class D airspace to the southwest and all published approaches to runway 07 intersect with Restricted Areas 7203A/B/C and W. Restricted Area 7203A/B/C would not be activated during times with scheduled Saipan International Airport commercial large passenger jet and jetliner activity. Restricted Area 7203 W would be activated by Notices to Airmen as needed and would not be activated when it would interfere with scheduled commercial large passenger jet or jetliner activity. Published approaches to Runway 25 would not intersect with Restricted Area 7203. Impacts to commuter aircraft would be the same as discussed above for Tinian.
It is anticipated that proper range scheduling procedures would be in place to ensure no significant disruption of unscheduled commercial large passenger jet and jetliners into and out of Saipan International Airport. However, without mitigation, air and ground activities would have the potential to significantly impact current airspace procedures during the 140 days per year that the Restricted Areas 7203A/B/C and W are scheduled and activated for use.

Potential mitigation measures include:

- Establish a Letter of Procedure between the Federal Aviation Administration and the U.S. military that contains the procedures for access to the airspace and gives priority to large commercial aircraft. The agreement would ensure proper range scheduling procedures are in place to ensure no significant disruption of normal flights into and out of Saipan International Airport.

- Electronically monitor each training event through the use of radar and other surveillance equipment such as an expeditionary control tower (Photo 4.6-1) that would continually monitor the airspace to ensure the safety of the flying public during times when training is occurring.

- Schedule and coordinate training events with Saipan International Airport arrivals and departures as to not conflict.

- Establish procedures and communications that allow for air traffic controllers and range controllers to simultaneously see the airspace and ensure priority is given to any aircraft heading to or from Saipan International Airport. In the event of an unforeseen incursion into an active restricted airspace, the simultaneous ability to monitor activities on the ground and in the air should provide the ability to stop any training in seconds.

Once the U.S. military’s coordination with the Federal Aviation Administration is complete, less than significant impacts to airspace management and airport operations at Saipan would be expected. Mitigations developed during the coordination process would include the procedures necessary to ensure safe and timely access to Saipan International Airport.

4.6.3.1.2.4 Tinian Air Traffic Control Assigned Airspace

There are four commercial aviation routes (G205, A337, A221, and W21) that could be impacted by the proposed Tinian Air Traffic Control Assigned Airspace (see Figure 4.6-1). No effects to these routes would be expected when Restricted Area 7203 and/or the Tinian Military Operations Area are activated for use. There would be no effects to aircraft operating on A221 independent of impacts to the arrivals and departures to Saipan International Airport.

Airway W21 lies approximately 10 nautical miles (19 kilometers) to the west of Tinian and within the proposed Tinian Military Operations Area/Air Traffic Control Assigned Airspace. Commercial aircraft en route to and from Guam International Airport on W21 would be expected to be in Class A airspace at altitudes greater than 18,000 feet (5,486 meters) and no impacts to air traffic would be expected from activation of the Tinian Military Operations’ Area. Air Traffic Control Assigned Airspace 6 begins at
36,000 feet (10,973 meters) MSL. The proposed Tinian Air Traffic Control Assigned Airspace would have a ceiling of 30,000 feet (9,144 meters) MSL, leaving a 6,000-foot (1,829-meter) gap between the two that would support commercial air traffic.

Air Traffic Control Assigned Airspace 3A, 3B, and 3C are located within 30 nautical miles but do not overlap with the proposed Tinian Air Traffic Control Assigned Airspace.

Aircraft using G205 or A337 that are currently routed to the west or east around Air Traffic Control Assigned Airspace 3A/B/C could continue to be routed around the airspace and would not be affected. The gaps between the existing and proposed airspace designated for military use would provide the airspace necessary to continue to route aircraft around the proposed airspace and no changes to the existing procedures would be expected.

The Guam Combined Center/Radar Approach Control would continue to be responsible for recalling the Air Traffic Control Assigned Airspace as needed to support commercial traffic or for re-routing aircraft around or over the Air Traffic Control Assigned Airspace. Scheduling and use of Air Traffic Control Assigned Airspace would continue to be requested from the Federal Aviation Administration on an as-needed basis. The Federal Aviation Administration would continue to release the airspace for military use only when its use would not interfere with air traffic control operations.

Impacts to civilian aircraft using commercial aviation routes G205, A337, and W21 were analyzed in the Mariana Islands Range Complex Airspace EA/OEA (DoN 2013). The EA/OEA found no significant impacts to commercial tracks using any of these routes because of low traffic volumes, rerouting, and/or scheduling of aircraft (DoN 2013; see Table 3.2-1). Less than significant impacts would be expected with implementation of Tinian Alternative 1.

### 4.6.3.2 Tinian Alternative 2

Impacts to the airspace environment would be similar to those described for Tinian Alternative 1 (Section 4.6.3.1). Impacts to each area are summarized below.

Under Alternative 2, impacts to aircraft requiring use of Tinian International Airport would be the same as Alternative 1 (Section 4.6.3.1). The increase in military air traffic would not restrict access to Tinian International Airport but civilian flights could experience delays in arrivals in departures. Aircraft transiting between Saipan and Tinian could be routed around the active airspace and add up to 12 nautical miles (22 kilometers) to their trip each way when needed unless all restricted airspace is activated at the same time. When all restricted areas are activated at the same time, single engine aircraft would not meet the minimum safety glide slope requirements and flight delays would be encountered. Indirect effects including increased fuel consumption and travel time could occur.

Existing procedures used by Saipan Air Traffic Control to manage the airspace and deconflict military aircraft using Tinian North Field and civilian aircraft would continue. Indirect effects to Saipan Air Traffic Control would occur as the increase in operations at Tinian North field would result in a minor increase in the number of aircraft requiring handling by Saipan Air Traffic Controllers.

Impacts of commercial aviation routes would be the same as Tinian Alternative 1. Release of the Air Traffic Control Assigned Airspace for military use only when it would not interfere with commercial operations would ensure no significant impacts to published commercial aviation routes.
Under Alternative 2, impacts to airspace obstructions would be similar to Tinian Alternative 1 (Section 4.6.3.1) with the following exception: the International Broadcasting Bureau would be relocated, eliminating one of the airspace obstructions and resulting in a beneficial impact to airspace obstructions. The required marking and lighting on the proposed communication tower and a published avoidance area around the munitions storage area would minimize the potential for an aircraft mishap. Beneficial impacts to aircraft safety would be expected under Tinian Alternative 2.

With implementation of one or more of the potential mitigation measures described in Section 4.6.3.1, Tinian Alternative 1, and continuing coordination with the Federal Aviation Administration to mitigate potential impacts to airport air traffic that would ensure safe and timely access to the airport, less than significant impacts to airspace management or aircraft operations would be expected under Tinian Alternative 2.

### 4.6.3.3 Tinian Alternative 3

Impacts to the airspace environment would be the same as described for Tinian Alternative 1 (Section 4.6.3.1).

With implementation of one or more of the potential mitigation measures described in Section 4.6.3.1, Tinian Alternative 1, and continuing coordination with the Federal Aviation Administration to mitigate potential impacts to airport air traffic that would ensure safe and timely access to the airport, less than significant impacts to airspace management or aircraft operations would be expected under Tinian Alternative 3.

### 4.6.3.4 Tinian No-Action Alternative

Use of airspace around Tinian during the periodic times when non-live-fire military training occurs on the Military Lease Area of Tinian would include infrequent fixed-wing and helicopter use for training and transport. These activities would be coordinated with local and regional authorities. The duration and frequency of these activities, given recent experience, would be short term. Therefore, impacts to airspace would be less than significant. As documented in the Guam and CNMI Military Relocation EIS (DoN 2010a), there would be no changes in existing airspace configurations in order to accommodate the potential future operations in the planned four live-fire training ranges (see Table 7.2-4; DoN 2010a). Airspace operations within the Mariana Islands Range Complex, would remain similar to current conditions around Tinian (DoN 2010b) airspace configurations would not be altered under the no-action alternative, and when considered collectively, there would be less than significant impacts to airspace under the no-action alternative.
### 4.6.3.5 Summary of Impacts for Tinian Alternatives

Table 4.6-4 provides a comparison of the potential impacts to airspace resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airspace</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>Tinian</td>
<td>Not applicable</td>
<td>SI mitigated to LSI</td>
<td>Not applicable</td>
<td>SI mitigated to LSI</td>
</tr>
<tr>
<td>Saipan</td>
<td>Not applicable</td>
<td>SI mitigated to LSI</td>
<td>Not applicable</td>
<td>SI mitigated to LSI</td>
</tr>
</tbody>
</table>

*Legend: LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts.*
### 4.6.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives

Table 4.6-5 provides a comparison of the potential mitigation measures to airspace resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AIRSPACE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tinian</td>
<td></td>
<td>● Establish a Letter of Procedure or Joint Use Agreement to accommodate civilian arrivals and departures into the airport.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Establish communication procedures between Tinian Range Control and Saipan International Airport Air Traffic Control to ensure priority access to Tinian International Airport for life-flight and other emergency-related activities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Add positive control measures (e.g., air traffic control tower at Tinian, short-range radar on Tinian or Saipan that would allow air traffic controllers to see aircraft operating below 2,000 feet [609 meters]), and communications capability at Saipan or Tinian to ensure non-participating aircraft are advised of military operations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Establish communication procedures to provide immediate feedback between air traffic controllers and range control to accommodate smaller inter-island commuter aircraft traveling between Saipan and Tinian.</td>
</tr>
<tr>
<td>Restricted Area 7203 was segmented to minimize impacts to commuter flight traffic between Tinian and Saipan. Civilian aircraft can be routed around the restricted airspace while staying within the minimum safety glide slope except for periods when Restricted Area 7203A/B/C/X/Y/Z/E/W are activated together. Indirect effects such as increased fuel consumption and time en route could be experienced.</td>
<td>SI mitigated to LSI</td>
<td></td>
</tr>
<tr>
<td>No impacts would be expected with activation of the Tinian Military Operations Area.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Table 4.6-5. Summary of Potential Mitigation Measures for Tinian Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AIRSPACE</strong></td>
<td></td>
<td></td>
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<tr>
<td>Tinian</td>
<td></td>
<td>● Establish a Letter of Procedure or Joint Use Agreement to accommodate civilian arrivals and departures into the airport.</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>● Add positive control measures (e.g., air traffic control tower at Tinian, short-range radar on Tinian or Saipan that would allow air traffic controllers to see aircraft operating below 2,000 feet [609 meters]), and communications capability at Saipan or Tinian to ensure non-participating aircraft are advised of military operations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Establish communication procedures to provide immediate feedback between air traffic controllers and range control to accommodate smaller inter-island commuter aircraft traveling between Saipan and Tinian.</td>
</tr>
<tr>
<td>Restricted Area 7203 was segmented to minimize impacts to commuter flight traffic between Tinian and Saipan. Civilian aircraft can be routed around the restricted airspace while staying within the minimum safety glide slope except for periods when Restricted Area 7203A/B/C/X/Y/Z/E/W are activated together. Indirect effects such as increased fuel consumption and time en route could be experienced.</td>
<td>SI mitigated to LSI</td>
<td></td>
</tr>
<tr>
<td>No impacts would be expected with activation of the Tinian Military Operations Area.</td>
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</tr>
</tbody>
</table>

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4-148
### Table 4.6-5. Summary of Potential Mitigation Measures for Tinian Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>Tinian Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saipan</td>
<td>SI</td>
<td>- Establish a Letter of Procedure between the Federal Aviation Administration and the U.S. military that contains the procedures for access to the airspace and gives priority to large commercial aircraft. The agreement would ensure proper range scheduling procedures are in place to ensure no significant disruption of normal flights into and out of Saipan International Airport.</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Electronically monitor each training event through the use of radar and other surveillance equipment such as an expeditionary control tower that would continually monitor the airspace to ensure the safety of the flying public during times when training is occurring.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Schedule and coordinate training events with Saipan International Airport arrivals and departures as to not conflict. Establish procedures and communications that allow for air traffic controllers and range controllers to simultaneously see the airspace and ensure priority is given to any aircraft heading to or from Saipan International Airport. In the event of an unforeseen incursion into an active restricted airspace, the simultaneous ability to monitor activities on the ground and in the air should provide the ability to stop any training in seconds.</td>
<td></td>
</tr>
</tbody>
</table>

**Legend**: LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.
4.6.4  Pagan

There would be no differences in proposed airspace configurations and designations between the two action alternatives so the discussion below applies to both Pagan Alternatives 1 and 2. In addition to the proposed airspace, use of chaff and flares are proposed for use in offshore areas of Warning Area 14 and Restricted Areas 7204A/B/C under both alternatives.

For each Pagan Alternative, effects are discussed in the areas of airspace management (i.e., how the airspace would be managed to support all users) and the number of aircraft needing access to the airspace (operations). For the airspace designated for military use, effects are discussed based on the connection to other airspace and the ability for the Federal Aviation Administration to manage the airspace in a manner that supports all users of the airspace, additionally use of chaff and flares are discussed as it relates to flight safety. Airspace obstructions are included to cover construction of the proposed communications tower that would require Federal Aviation Administration review to ensure marking in support of airspace safety.

As shown in Chapter 2, Proposed Action and Alternatives, Figure 2.5-5, there are two types of Special Use Airspace proposed for Pagan: Warning Areas 14 Low and 14 High, and four Restricted Areas (R-7204A, R-7204B, R-7204C and R-7204D). Each individual proposed airspace segment would be activated as needed based on the training being accomplished. Joint Region Marianas, would be responsible for scheduling the airspace and ensuring Notices to Airmen are issued prior to activation.

The warning areas would be activated when needed for ship-to-shore, air-to-ground, and supersonic aircraft operations. The restricted areas would be activated either independently or together as needed when training with live munitions during ground based training, air-to-ground training, and ship-to-shore training. Maximum altitude for the restricted areas would vary from 4,000 feet (1,219 meters) above ground level to 30,000 feet (9,144 meters) MSL depending upon which systems/activities have been scheduled. Communications equipment would be in place supporting real-time communications between onsite range users, onsite range safety personnel, the Marine Corps Range Control Facility, and air traffic control facilities.

4.6.4.1  Pagan Alternative 1

4.6.4.1.1  Restricted Area

Pagan Airfield lies within Restricted Area 7204B and aircraft not participating in military activities would be prohibited from accessing the airfield when activated for military use. In 2007 there were only 10 aircraft operations recorded for Airfield (detailed information is presented in Table 3.2-1 of Appendix O, Transportation Study). Pagan Airfield is located in uncontrolled (Class G) airspace and there are no published approaches or air traffic control services for use of the airspace surrounding the airfield. Pilots of the rare civilian aircraft that might require use airfield are required to use see-and-avoid visual flight rules. Active management of the airspace by the U.S. military during times when training is occurring would minimize any potential impacts to aircraft needing access to the Pagan Airfield. Less than significant impacts would be expected for civilian aircraft desiring to use Pagan Airfield based on the low number of operations.
4.6.4.1.2 Warning Area

As shown in Figure 4.6-1, two existing commercial aviation routes cross within the proposed Warning Area 14, A337, and G205. Aviation route A337 is within 23 nautical miles (43 kilometers) of Pagan and G205 lies within 40 nautical miles (74 kilometers). Neither airway would be impacted if Restricted Area 7204 were activated independently of the warning area. When proposed Warning Area 14 High and Low are activated together, aircraft using these routes could be re-routed around the warning area or Warning Area 14 High could be recalled by air traffic control to allow aircraft to fly over the active airspace.

Air Traffic Control Assigned Airspace 3A lies approximately 60 nautical miles (111 kilometers) south of Pagan and its northern border forms the southern border of proposed Warning Area 14. Air Traffic Control Assigned Airspace 3A is scheduled for use by Joint Region Marianas and controlled by the Federal Aviation Administration Guam Combined Center/Radar Approach Control. Air Traffic Control Assigned Airspace 3 is scheduled for use approximately 160 days per year (see Table 3.6-1). If Warning Area 14 were activated at the same time as Air Traffic Control Assigned Airspace 3, aircraft flying on A337 that have been re-routed to the east around Air Traffic Control Assigned Airspace 3 could experience additional re-routing. Air Traffic Control Assigned Airspace 3 and Warning Area 14 could be scheduled for use during the same time frame or independent of each other. The ongoing coordination with the Federal Aviation Administration would be used to ensure the safe and efficient use of airspace needed to route commercial aircraft outside of the warning area in a manner that would minimize both direct and indirect impacts to commercial aircraft and aviation routes to being less than significant.

Under the proposed action, maximum use of Warning Area 14 would be up to 112 days per year and for as long as 22 hours per day (see Tables 2.5-1 and 2.5-2 for additional details on proposed aircraft operations and munitions use). As described in 3.6.4.4, Airspace Designated for Military Use, use of Air Traffic Control Assigned Airspace 3 requires at least one aircraft to continuously monitor the appropriate Guam Combined Center/Radar Approach Control frequency for immediate recall of the altitude/airspace as needed to support commercial air traffic.

Airspace management and commercial operations could be impacted as a result of multiple flight information regions (Guam Combined Center/Radar Approach to the south and Seattle Air Route Traffic Control Center around Pagan and to the north). To minimize impacts from Pagan Alternative 1, coordination with the Federal Aviation Administration is in progress to establish procedures for use, including the possibility of installing long-range radar that could be used to modify flight information region boundaries. Therefore, less than significant impacts to airspace are expected under Pagan Alternative 1.

4.6.4.1.3 Airspace Obstructions

The proposed construction of a field ammunition staging area would result in a restriction to flights arriving and departing the Pagan Airfield. Flight restrictions prohibit flights below 500 feet (152 meters) above ground level over ammunition magazines. Aircraft would need to be routed around the field ammunition staging area or be at altitudes greater than 500 feet (152 meters) above ground level. During times when the military is not training, live munitions would not be stored in the staging area and no restrictions would be required. Because live munitions would not be stored when the RTA is inactive, no impacts would be expected to the few civilian aircraft that use the Pagan airfield.
4.6.4.1.4 Use of Chaff and Flares

Under this alternative, aircraft using Warning Area 14 and Restricted Area 7204 A/B/C would train using electromagnetic countermeasures such as RR-188 Chaff and MJU-10 Flares. It is estimated that approximately 2,400 self-protection chaff and 2,400 flares would be deployed on an annual basis. Flare use would be limited to areas over water and above 500 feet (152 meters) MSL.

Modern chaff (known as “angel hair” chaff) is thinner than a fine human hair and normally ranges in length from 0.3 to 1.0 inch (7.6 to 25.4 millimeters). Chaff is made as small and light as possible so that it would disperse quickly and remain in the air long enough to confuse enemy radar. The chaff proposed for use contains fibers configured to reduce interference with radars operated by the Federal Aviation Administration throughout the National Airspace System. New Federal Aviation Administration radars are sensitive enough to detect chaff so communication of when and where aircraft are training with chaff permits the Federal Aviation Administration to identify and differentiate chaff from natural weather events (such as thunderstorms) (Air Force 2011). Chaff used for training does not interfere with radio communications.

Defensive flares are not explosive; they are magnesium pellets that, when deployed, burn for a short period (approximately 5 seconds) at approximately 1,202 degrees Fahrenheit (650 degrees Celsius). The burn temperature is hotter than the exhaust of an aircraft engine and, therefore, attracts and decoys heat-seeking weapons and sensors targeted on the aircraft. Flares would be ejected downward from altitudes greater than 500 feet (152 meters) and drop behind the aircraft. They burn out after falling approximately 500 feet (152 meters).

Use of chaff and flares would not interfere with the management of the airspace, and no cases of an aircraft being struck by a residual piece of a defensive countermeasure have ever been recorded (Air Force 2011).

No impacts to other users of the airspace would be expected from the use of chaff and flares associated with Pagan Alternative 1.

4.6.4.2 Pagan Alternative 2

Impacts to the airspace environment would be the same as described for Pagan Alternative 1 (Section 4.6.4.1). Less than significant impacts would be expected for civilian aircraft desiring to use Pagan Airfield based on the low number of operations. No impacts to other users of the airspace would be expected from the use of chaff and flares. Based on the availability of airspace in the region and the ability for Air Traffic Control to recall airspace as needed for commercial operations, less than significant impacts to commercial aviation routes would be expected with implementation of Pagan Alternative 2.

4.6.4.3 Pagan No-Action Alternative

Under the no-action alternative, no changes in existing airspace would occur. Airspace around Pagan would remain as Class G airspace. Special Use Airspace would not be needed to accommodate operations on Pagan. Commercial air traffic would not be required to deviate from published commercial aviation routes. Airspace operations within the Mariana Islands Range Complex would remain similar to current conditions. Airspace configurations would not be altered under the no-action
alternative, and when considered collectively, there would be less than significant impacts to airspace under the no-action alternative.

### 4.6.4.4 Summary of Impacts for Pagan Alternatives

Table 4.6-6 provides a comparison of the potential impacts to airspace resources for the two Pagan alternatives and the no-action alternative.

#### Table 4.6-6. Summary of Impacts for Pagan Alternatives

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Airspace</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Pagan</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

*Legend: LSI = less than significant impact; NI = no impact.*
4.7 LAND AND SUBMERGED LAND USE

Section 4.7 addresses potential impacts on land and submerged land use and jurisdictional control. As previously discussed in Chapter 3, land ownership and control include a variety of real estate instruments that convey jurisdictional authority for a given area. Associated with this are differing regulatory requirements for land-based use versus submerged land use. Another important consideration is the understanding that the U.S. federal government does not own land in the CNMI; however, the U.S. owns submerged lands. Though the U.S. federal government can own land in the CNMI, it is U.S. policy to obtain the least interest in the property that will accomplish the public purpose. To that end, jurisdictional control of land in the CNMI is acquired by the U.S. federal government via real estate agreements.

Other resource sections of this EIS/OEIS distinguish construction impacts from operation impacts. Although the actual land acquisition (real estate agreements, such as long-term leases) negotiations would occur prior to the construction, these impacts are long-term and are described as operation impacts. Therefore, construction activities associated with all proposed alternatives would result in no impacts for land and submerged land use that are not otherwise described below as operation impacts.

4.7.1 Approach to Analysis

The analysis of land use compatibility considers existing land uses that would be limited or precluded by the proposed action. The impacts of reasonably foreseeable projects and future land uses that would be precluded by the proposed action are addressed in Chapter 5, *Cumulative Impacts*. Incompatibility of the proposed action with the CNMI plans and policies are discussed in Chapter 6, *Additional Considerations Required by NEPA*. Changes in land uses and management that could directly impact other resource areas are discussed in the respective sections including: Section 4.15, *Socioeconomics and Environmental Justice*, Section 4.5, *Noise*, Section 4.8, *Recreation*, Section 4.9, *Terrestrial Biology*, and Section 4.10, *Marine Biology*. For the purposes of this EIS/OEIS, these impacts are considered indirect impacts under land use and the reader is referred to those other sections. Direct impacts are discussed in this section.

The impact assessment criteria used to evaluate impacts to land and submerged land use is as follows:

- Incompatibility with current or planned land or submerged land use, including potential noise impacts (based on compatible use thresholds)
- New restrictions on public access to land and submerged land
- Change in existing land use that is valued by the community
- Change in federal jurisdictional control of land and submerged land

The significance of impacts was determined based on the degree of change. Public scoping comments and existing CNMI government land use plans were considered in the evaluation and rationale for assigning significance levels to potential impacts. Impacts to land use were considered significant if:

- There are any incompatibilities with current or planned land or submerged land use
- Land uses outside the project area would be constrained by the proposed action
- Public access to land or submerged land that is valued by the community is restricted by the proposed action
- The proposed action reduces or eliminates an existing land use that is unique or important to the community
- Substantial increase in acreage of land or submerged land under federal jurisdictional control

4.7.2 Resource Management Measures

Resource management measures that are applicable to land and submerged land use include the following avoidance and minimization measures:

- Minimize land acquisition (acreage)
- Coordination with the Federal Aviation Administration and the Commonwealth Ports Authority to minimize potential impacts to existing operations at the Tinian International Airport
- Implementation of noise abatement measures
- RTA management
- Military traffic, specifically tracked vehicles, would be routed away from the population center of San Jose
- Preparation of an access plan to ensure that local and federal partners have continued access

4.7.3 Tinian

4.7.3.1 Tinian Alternative 1

4.7.3.1.1 Land Acquisition (Jurisdictional Control)

The U.S. currently has a real estate agreement for nearly two-thirds of Tinian (i.e., the Military Lease Area). During the planning process for the development of the alternatives on Tinian, efforts were made to minimize the acreage of land required for acquisition (see Section 2.3, Alternatives Development). However, Tinian Alternative 1 would require acquisition or re-acquisition of lands within and outside of the Military Lease Area.

4.7.3.1.1 Land Acquisition (Jurisdictional Control) Within the Military Lease Area

The International Broadcasting Bureau site is located within the Military Lease Area. The current reserved area for the International Broadcasting Bureau is 866 acres (350 hectares). However, the fenced boundary of the facility currently used by the International Broadcasting Bureau is 317 acres (128 hectares). Under Tinian Alternative 1, the International Broadcasting Bureau site would continue to operate and its operations would be limited to the 317-acre (128-hectare) fenced site. Although this reduction of the International Broadcasting Bureau reserved area is considered a change in jurisdictional control, the 549-acre (222-hectare) area that would be returned for use by the federal government is within the Military Lease Area.

As discussed in Section 2.4, Tinian Alternatives, Tinian Alternative 1 would require improvements to existing roadways within the Military Lease Area. The federal government transferred jurisdictional control of the public roadways within the Lease Back Area back to the CNMI. Improvements to the public roadways within the Military Lease Area would require a review of the 1999 amendment to the
1984 Tinian lease agreement which addresses roadway ownership and maintenance. A transfer of the public rights-of-way back to the federal government would constitute a change in jurisdictional control.

Since the areas associated with the International Broadcasting Bureau and the public rights-of-way that would be returned for use by the federal government are within the Military Lease Area, the change in jurisdictional control would not result in a significant impact. Therefore, Tinian Alternative 1 would result in a less than significant impact to land use with regard to changes in jurisdictional control.

4.7.3.1.1.2 Land Acquisition (Jurisdictional Control) Outside the Military Lease Area

As shown in Figure 4.7-1, additional lands outside of the Military Lease Area would be acquired or reacquired through long-term real estate agreements. Some of these areas were once a part of the Military Lease Area (prior to 1994). Since the 1975 Covenant and Technical Agreement (see Appendix K, Summary of Historical Land Use Agreements between the U.S. and the CNMI), some areas covered under the original lease were returned to the CNMI government through lease amendments in 1993 and 1999 (e.g., Tinian International Airport) and would need to be “reacquired” to support the proposed action (Northern Mariana Islands 1975a, 1975b). Both the Tinian International Airport (formerly known as West Field) and the Port of Tinian are public lands currently under the jurisdiction and control of the CNMI Port Authority. The federal government would reacquire management control over an estimated 460 acres (186 hectares) at the Tinian International Airport and 7 acres (3 hectares) of land (parcels) at the Port of Tinian. In total, 467 acres (189 hectares) of land would transfer to federal jurisdictional control, which is 3% of total land on Tinian. Because of the large amount of land already under federal jurisdictional control, the re-acquisition of 3% of the total land on Tinian would not represent a significant impact. Therefore, Tinian Alternative 1 would result in a less than significant impact to land use with regard to changes in jurisdictional control.

4.7.3.1.2 Submerged Land Acquisition (Jurisdictional Control)

Under Tinian Alternative 1 there would be no change in the jurisdictional control of submerged lands around Tinian. Although areas at the Port of Tinian would be added as part of the new real estate interest for military training on Tinian, the waters of the Port of Tinian (i.e., the harbor) would remain within the jurisdictional control of the CNMI government. Therefore, land acquisition under Tinian Alternative 1 would result in no impact to submerged land use with regard to changes in jurisdictional control.
Figure 4.7-1
Tinian Proposed Land Acquisition

Legend
- Existing or Proposed Boat Ramp
- Easement
- Land Acquisition Area
- Military Lease Area
- Proposed Action
  - Tracked Vehicle Training Trail
  - Base Camp
  - Munitions Storage Facility
  - Munitions Storage Area

Sources: DoN 2010, DoN 2013
4.7.3.1.3  Land Use

4.7.3.1.3.1  Land Use Within the Military Lease Area

Existing and Planned Land Use

As discussed in Section 3.7, Land and Submerged Land Use, and shown in Figure 3.7-5, there are multiple current land uses within the Military Lease Area. These include the Exclusive Military Use Area, the International Broadcasting Bureau site, the Tinian Military Retention Land for Wildlife Conservation, and the cattle grazing in the Lease Back Area.

Under Tinian Alternative 1, military training would continue to occur within the Exclusive Military Use Area (i.e., northern portion of the Military Lease Area). This would include live-fire and non-live-fire military training, which is consistent with its intended use. While the military training would increase under Tinian Alternative 1, there are no adjacent designated land uses that would be impacted by the increase in training tempo, and the base camp and other aspects of the proposed action that are proposed along the southern boundary of the Military Lease Area would be compatible with the adjacent rural homesteads and farms.

Under Tinian Alternative 1, the International Broadcasting Bureau installation would remain at its current location. As a quasi-industrial office installation, there is no direct land use conflict between the International Broadcasting Bureau installation and the proposed action under Tinian Alternative 1.

The Tinian Military Retention Land for Wildlife Conservation is a conservation area for the protection of threatened and endangered wildlife. The proposed military training under Tinian Alternative 1 would not be compatible with the existing conservation land use.

Until 2014, the Lease Back Area (i.e., southern portion of the Military Lease Area) supported approximately 2,375 acres (961 hectares) of annual agricultural grazing permits under the Leaseback Agreement between the CNMI and U.S. Although the lease back agreement expired, most of the ranchers still occupy and have been using the land on a month-to-month lease. In January 2015, the lease was extended until the summer of 2016. Under Tinian Alternative 1, land within the Military Lease Area would be removed from agricultural and cattle grazing use.

Tinian Alternative 1 operations would result in land use incompatibilities associated with the Tinian Military Retention Land for Wildlife Conservation and the agricultural and cattle grazing activities in the Lease Back Area. Therefore, Tinian Alternative 1 would result in a significant impact to land use associated with the current and planned land use within the Military Lease Area. With the following potential mitigation measures, the impact to the Tinian Military Retention Land for Wildlife Conservation and the agricultural and cattle grazing would be less than significant.

Potential Mitigation Measures include:

- Four areas are being assessed as potential conservation areas for the protection of the Tinian monarch and other wildlife species (Section 4.9, Terrestrial Biology; Figure 4.9-2). These areas may also be used for additional natural resource conservation actions such as forest enhancement and/or invasive species control. The Department of Defense is coordinating with the Federal Aviation Administration and the U.S. Fish and Wildlife Service on these potential conservation areas.
The DoN has identified and proposed a total of 2,554 acres (1,034 hectares) of land for grazing areas within the Military Lease Area. Of this total, 1,010 acres (409 hectares) would be unencumbered and 1,544 acres (625 hectares) would be encumbered by surface danger zones (Figure 4.7-2).

It is likely that the potential mitigation measure regarding conservation areas for the Tinian monarch and other wildlife species would be required as part of section 7 consultation under the Endangered Species Act. The potential mitigation measure for the impact to the Tinian Military Retention Land for Wildlife Conservation would require mitigation monitoring. The DoN would prepare a Forest Enhancement/Restoration and Monitoring Plan that would provide detailed guidance on proposed forest enhancement activities on Tinian as well as long-term monitoring of the success of the proposed forest enhancement measures.

It is likely that the potential mitigation measure identifying grazing areas would be implemented since cattle grazing is important to the local community (see Section 3.15, *Socioeconomics and Environmental Justice*). Mitigation monitoring would not be required for the proposed grazing areas.

Potential impacts to threatened and endangered wildlife associated with the Tinian Military Retention Land for Wildlife Conservation are discussed in Section 4.9, *Terrestrial Biology*. Section 4.15, *Socioeconomics and Environmental Justice*, discusses the potential socioeconomic impacts related to agriculture, including cattle grazing.

### 4.7.3.1.3.2 Public Access

The Military Lease Area southern boundary would be fenced to restrict access during training activities. Public access is currently restricted within the Military Lease Area during training exercises. Training and access restrictions tend to be limited to the Exclusive Military Use Area. The proposed action would increase the frequency and duration of the public access restrictions, and public access to certain areas (e.g., High Hazard Impact Area) would be prohibited at all times. Areas within the Military Lease Area that would be restricted, including North Field, historic and cultural sites, and beaches, are areas that are valued by the community.

International Broadcasting Bureau staff would also be subject to access restrictions. International Broadcasting Bureau staff would have to request access to the facility during training events. The DoN would work with the International Broadcasting Bureau and ensure access to the facility to minimize any impact to International Broadcasting Bureau operations.

Tinian Alternative 1 operations would result in access restrictions to areas that are valued by the community. Therefore, Tinian Alternative 1 operations would result in significant impacts to land use associated with public access within the Military Lease Area.

The impacts of public access restrictions on uses and resources, such as recreation and socioeconomics, are discussed in their respective resources sections (Section 4.8, *Recreation*, and Section 4.15, *Socioeconomics and Environmental Justice*).
Figure 4.7-2
Tinian Potential Agricultural Use in the Military Lease Area

Legend
- Proposed & Potential Grazing Areas (Unencumbered)
- Proposed & Potential Grazing Areas (Surface Danger Zones Encumbered)
- Amphibious Assault Vehicles, Landing Craft Air Cushion, Small Boat and Swimmer Training
- Landing Craft Air Cushion, Small Boat and Swimmer Training
- Small Boat and Swimmer Training
- Landing Zone
- Observation Post
- Surface Radar Site
- Indirect Artillery Firing Position
- Mortar Firing Position
- Tracked Vehicle Driver's Course
- Tracked Vehicle Transit Lane
- Proposed Firebreak Road
- Convoy Course
- Base Camp
- Munitions Storage Area (MSA)
- Vegetation Cleared Area
- Drop Zone
- Convoy Course Engagement Area
- High Hazard Impact Area
- Range Complex
- International Broadcasting Bureau
- Military Lease Area

Sources: DoN 2010, DoN 2013
Land Use Outside the Military Lease Area

Existing and Planned Land Use

As discussed in Section 4.7.3.1.1, Land Acquisition (Jurisdictional Control), Tinian Alternative 1 would require a change in jurisdictional control of 460 acres (186 hectares) at the Tinian International Airport and 7 acres (3 hectares) at the Port of Tinian.

Land at the Tinian International Airport would need to be reacquired to support proposed improvements. Federal Aviation Administration and Unified Facilities Criteria spacing requirements for airfield operations and facilities dictate the amount of land required for reacquisition. The following improvements and facilities are proposed at the Tinian International Airport:

- Tactical aircraft parking ramp
- Cargo aircraft parking ramp
- Connecting taxiways
- Ordnance arming and de-arming pads
- Hot cargo (i.e., munitions) pad/combat aircraft loading area
- Expeditionary/temporary refueling area
- Arresting gear pads
- Munitions holding pads
- Access roads connecting to the airfield
- LHD Pad (Simulated Flight Deck)
- Flight Carrier Landing Practice Pad

All proposed improvements and facilities are consistent and compatible with existing land uses at the Tinian International Airport. There would be no significant impacts to land use at the Tinian International Airport and some of the proposed improvements would be beneficial to the CNMI airport operations. As discussed in Section 4.13, Transportation, close coordination with the Federal Aviation Administration and the Commonwealth Ports Authority (who operate the airport), would ensure that the military operations have limited impacts to existing operations at the Tinian International Airport.

The Port of Tinian currently operates as the only water-based supply point to the island. Nearly all of the supplies brought to Tinian come by way of barge or boat through the Port of Tinian. The existing fuel storage area (owned by Mobil Gas) is the only fuel storage area on the island and provides fuel to the several gas stations on the island. Moving inland from the Port of Tinian (north of West Street) is the most densely populated residential area on the island. Current plans call for a large subdivision (currently platted, but not built), east of 6th Avenue and north of West Street.

Land at the Port of Tinian would need to be acquired to support the following proposed improvements and facilities:

- Biosecurity building
- Vehicle and equipment wash down area
- Vehicle inspection area
- Bulk fuel storage facility
- Parking
• Stormwater retention pond
• Cargo inspection and holding area
• Land improvements in the vicinity of the existing old public boat ramp (to facilitate egress from ramp to roadway)

All proposed improvements and facilities are consistent and compatible with existing land uses at the Port of Tinian.

The primary proposed cargo transport route and tracked vehicle transit lanes were sited to shift the military traffic away from the population center of San Jose. Based on these efforts, the proposed transit corridor for the tracked vehicles to drive from the boat ramp to the Military Lease Area is consistent and compatible with current land uses.

Operations associated with Tinian Alternative 1 would be compatible with existing land uses outside the Military Lease Area. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to land use associated with current and planned land use outside the Military Lease Area.

Public Access

Operations associated with Tinian Alternative 1 would not result in any additional public access restrictions outside the Military Lease Area. Therefore, Tinian Alternative 1 operations would result in no impact to land use associated with public access outside the Military Lease Area.

Noise

Training activities under the proposed action would result in elevated noise levels outside the Military Lease Area on Tinian and in the southwestern portion of Saipan. However, noise levels would be below the compatible use threshold. Tinian Alternative 1 aircraft operations would introduce direct noise impacts to 10 residences in the Marpo Heights area. Training that generates elevated noise levels would be discontinuous and affected land users would be notified in advance of scheduled training. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to adjacent land uses due to elevated noise levels.

See Section 4.5, Noise, for a discussion of potential noise impacts resulting from the proposed action.

4.7.3.1.4 Submerged Land Use

4.7.3.1.4.1 Current and Proposed Submerged Land Use

The proposed action would affect coastal uses and resources that are subject to Coastal Zone Management Act federal consistency requirements. The proposed action would be consistent to the maximum extent practicable with the enforceable policies of the CNMI Bureau of Environmental and Coastal Quality.

The proposed action would affect the designated Areas of Particular Concern, as defined by the CNMI Bureau of Environmental and Coastal Quality. Both of the CNMI Areas of Particular Concern and the proposed training areas are shown in Figure 4.7-3. Tinian Alternative 1 would affect the Port and Industrial, Shoreline, Coastal Hazards and Lagoon and Reef Areas of Particular Concern at the Port of Tinian and Tinian Harbor. Because Areas of Particular Concern are CNMI designations, not federal designations, they are considered during the coastal zone consistency determination.
Figure 4.7-3
Tinian All Action Alternatives
Areas of Particular Concern

Legend

- **Areas of Particular Concern (APC)**
  - Wetlands and Mangrove APC
  - Port and Industrial APC
  - Shoreline APC
  - Coastal Hazards APC
  - Lagoon and Reef APC

- **Tactical Amphibious Landing Beaches**
  - Amphibious Assault Vehicles, Landing Craft Air Cushion, Small Boat and Swimmer Training
  - Landing Craft Air Cushion, Small Boat and Swimmer Training
  - Small Boat and Swimmer Training

- **Indirect Artillery Firing Position**
- **Mortar Firing Position**
- **Tracked Vehicle Driver's Course**
- **Tracked Vehicle Transit Lane**
- **Proposed Firebreak Road**
- **Convoy Course**
- **Convoy Course Engagement Area**
- **Objective Area**
- **High Hazard Impact Area**
- **Range Complex**
- **Military Lease Area**

Data Sources: DoN 2010, DoN 2013

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

4-163
The proposed action would be consistent to the maximum extent practicable with the Coastal Zone Management Act and the enforceable policies of the CNMI Bureau of Environmental and Coastal Quality. Therefore, operation under Tinian Alternative 1 would result in less than significant impacts to submerged land uses subject to the Coastal Zone Management Act.

### 4.7.3.1.4.2 Public Access

Submerged lands adjacent to the Military Lease Area would remain under federal jurisdictional control. However, the public access to submerged lands (and the waters above) would be restricted during training events 20 weeks per year. Although there are restrictions that occur with the current level of training, the restricted access would increase in frequency and duration under the proposed action. However, the areas of submerged land that would be restricted are not unique. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to the public access of submerged lands.

The impacts of public access restrictions on uses/resources, such as recreation and marine transportation are discussed in their respective resources sections, Section 4.8, Recreation, and Section 4.13, Transportation.

### 4.7.3.2 Tinian Alternative 2

The impacts to land and submerged land use resulting from implementation of Tinian Alternative 2 would be similar to those described in Section 4.7.3.1, Tinian Alternative 1. However, land use impacts related to the International Broadcasting Bureau site would be different from those associated with Tinian Alternative 1.

Tinian Alternative 2 would be incompatible with the operation of the International Broadcasting Bureau site located within the Military Lease Area. Within the 8 to 10 year construction period after the Record of Decision and prior to the construction of the southern Battle Area Complex (Range Complex C), the International Broadcasting Bureau facility would cease operations within the Military Lease Area. As necessary, the facility would be relocated outside of the Military Lease Area. The relocation alternatives would be evaluated and would be addressed in another NEPA document (see Section 4.18, Programmatic Analysis of Future Potential Project Components). Tinian Alternative 2 would result in the elimination of an existing land use. Therefore, Tinian Alternative 2 would result in a significant impact to land use associated with current and planned uses within the Military Lease Area.

Implementation of Tinian Alternative 2 would result in less than significant impacts to land use with regard to changes in jurisdictional control, to current and planned land use outside the Military Lease Area, to adjacent land uses due to elevated noise levels, and to submerged land use subject to the Coastal Zone Management Act.

Implementation of Tinian Alternative 2 would result in significant but mitigable impacts to current and planned land use within the Military Lease Area.

Implementation of Tinian Alternative 2 would result in a less than significant impact to submerged land use associated with public access.
Implementation of Tinian Alternative 2 would result in no impact to submerged land use with regard to changes in jurisdictional control and no impact to land use outside the Military Lease Area associated with public access.

### 4.7.3.3 Tinian Alternative 3

The impacts to land and submerged land use resulting from implementation of Tinian Alternative 3 would be the same as those described in Section 4.7.3.2, Tinian Alternative 2.

Implementation of Tinian Alternative 3 would result in less than significant impacts to land use with regard to changes in jurisdictional control, associated with current and planned land use outside the Military Lease Area, to adjacent land uses due to elevated noise levels, and to submerged land use subject to the Coastal Zone Management Act.

Implementation of Tinian Alternative 3 would result in significant but mitigable impacts to current and planned land use within the Military Lease Area.

Implementation of Tinian Alternative 3 would result in a less than significant impact to submerged land use associated with public access.

Implementation of Tinian Alternative 3 would result in no impact to submerged land use with regard to changes in jurisdictional control and no impact to land use outside the Military Lease Area associated with public access.

### 4.7.3.4 Tinian No-Action Alternative

The periodic non-live-fire military training exercises that occur in the Military Lease Area on Tinian consist of troop maneuvering, ground vehicle movements, and helicopter and fixed-wing aircraft operations. This existing non-live-fire military training would continue on Tinian in the Military Lease Area. Several short term military training exercises involving troop maneuvering, vehicular movements, and helicopter/fixed-wing aircraft have occurred on Tinian in the 2012 to 2014 timeframe. There are short term restrictions on public access to the Military Lease Area during these training events. The four live-fire training ranges envisioned in the Guam and CNMI Military Relocation EIS (DoN 2010a) would be established, temporarily restrict public access, and reduce the number of agricultural permits allotted to local residents. However, no changes in land ownership would occur and lands set aside for military use would remain unchanged (see Table 8.2-4; DoN 2010a). No impacts were identified under land use in the Mariana Islands Range Complex EIS/OEIS (see Section 3.12.6; DoN 2010b). Therefore, under the no-action alternative, less than significant impacts to land and submerged land use would be anticipated.
4.7.3.5  Summary of Impacts for Tinian Alternatives

Table 4.7-1 provides a comparison of the potential impacts to land and submerged land use resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use Construction</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Acquisition (Jurisdictional Control)</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Submerged Land Acquisition (Jurisdictional Control)</td>
<td>Not applicable</td>
<td>NI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Land Use Within the Military Lease Area – Existing and Planned Land Use</td>
<td>Not applicable</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
</tr>
<tr>
<td>Land Use Within the Military Lease Area – Public Access</td>
<td>Not applicable</td>
<td>SI</td>
<td>Not applicable</td>
<td>SI</td>
</tr>
<tr>
<td>Land Use Outside the Military Lease Area – Public Access</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Land Use Outside the Military Lease Area – Noise</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Submerged Land Use – Existing and Planned Land Use</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Submerged Land Use – Public Access</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts.
### 4.7.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives

Table 4.7-2 provides a summary of the proposed mitigation measures for land and submerged land use resources for the three Tinian alternatives.

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LAND AND SUBMERGED LAND USE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Land Use Within the Military Lease Area – Existing and Planned Land Use</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| There would be land use incompatibilities associated with the Tinian Military Retention Land for Wildlife Conservation and the agricultural and cattle grazing activities in the Lease Back Area. | **SI mitigated to LSI** | • Four areas are being assessed as potential conservation areas for the protection of the Tinian monarch and other wildlife species (Section 4.9, *Terrestrial Biology*, Figure 4.9-2). These areas may also be used for additional natural resource conservation actions such as forest enhancement and/or invasive species control. The Department of Defense is coordinating with the Federal Aviation Administration and the U.S. Fish and Wildlife Service on these potential conservation areas.  
• The DoN has identified and proposed a total of 2,554 acres (1,034 hectares) of land for grazing areas within the Military Lease Area. Of this total 1,010 acres (409 hectares) would be unencumbered and 1,544 acres (625 hectares) would be encumbered by surface danger zones. | | |

**Legend:** LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.


4.7.4  Pagan

4.7.4.1  Pagan Alternative 1

4.7.4.1.1  Land Acquisition (Jurisdictional Control)

There are currently no federal lands or privately owned lands on Pagan. The CNMI government owns all of Pagan. The federal government would seek to acquire a real estate interest for the entire island of Pagan (approximately 11,794 acres [4,773 hectares]) from the CNMI government. This would result in a substantial increase of acreage under federal jurisdictional control. Therefore, implementation of Pagan Alternative 1 would result in a significant impact to land use with regard to changes in jurisdictional control.

4.7.4.1.2  Submerged Land Acquisition (Jurisdictional Control)

As discussed in Section 3.7, Land and Submerged Land Use, the Territorial Submerged Lands Act was amended to convey certain submerged lands to the CNMI government, which included submerged lands around Pagan. The submerged lands around Pagan are now owned by the CNMI government. The federal government would not acquire the submerged lands around Pagan, but would exercise control over surface water during periods of military training to ensure security and safety of the public. There would be no change in jurisdictional control over submerged land around Pagan. Therefore, Pagan Alternative 1 operations would result in less than significant impacts to submerged land use with regard to changes in jurisdictional control.

4.7.4.1.3  Land Use

4.7.4.1.3.1  Current and Planned Land Use

As described in Section 3.7, Land and Submerged Land Use, the existing land use is primarily idle (unused) public land. There is no CNMI land use designation for Pagan, so it is therefore assumed to be conservation. During Pagan Alternative 1 operations, proposed training within High Hazard Impact Area would not be compatible with the existing conservation land use. Therefore, Pagan Alternative 1 operations would result in a significant impact to existing conservation land use.

See Section 4.9, Terrestrial Biology, for the discussion of the potential impacts to terrestrial biology. See Chapter 5, Cumulative Impacts, for a discussion of potential planned land uses, including pozzolan mining and resettlement.

4.7.4.1.3.2  Public Access

Since 1981, Pagan has been largely closed to public access due to volcanic risk. Under the proposed action, the isthmus and northern portion of the island of Pagan would be placed off limits to the public during live-fire training events 16 weeks per year. The remainder of the year all areas of the island, except the High Hazard Impact Areas, would be accessible to the public. While unauthorized (i.e., no use permits obtained from the CNMI government), individual visitors use the land for subsistence. In addition, scientific research and data collection does occasionally take place. There are also some recreation uses, including a few recent ecotourism visits, as discussed in Section 3.8, Recreation.
However, current and planned visits to Pagan are infrequent. Therefore, Pagan Alternative 1 operations would result in less than significant impacts to land use associated with public access.

### 4.7.4.1.4 Submerged Land Use

#### 4.7.4.1.4.1 Current and Planned Submerged Land Use

The proposed use of submerged land by the U.S. military for amphibious training exercises would constitute a change in submerged land use from the present use, conservation. Given the military use would be for 16 weeks per year, other (non-U.S. military) uses could occur during the remainder of the year. Although proposed training would not be consistent with the existing conservation submerged land use, it would still be partially compatible given the limited time that training activities would occur. Therefore, operations associated with Pagan Alternative 1 would result in less than significant impacts to existing submerged land conservation uses.

The proposed action would affect coastal uses and resources that are subject to Coastal Zone Management Act federal consistency requirements. The proposed action would be consistent to the maximum extent practicable with the enforceable policies of the CNMI Bureau of Environmental and Coastal Quality.

The proposed action would affect the designated Areas of Particular Concern, as defined by the CNMI Bureau of Environmental and Coastal Quality. Both of the CNMI Areas of Particular Concern and the proposed training areas are shown on Figure 4.7-4. Pagan Alternative 1 would affect Shoreline and Lagoon and Reef Areas of Particular Concern. Because Areas of Particular Concern are CNMI designations, not federal designations, they are considered during the coastal zone consistency determination.

The proposed action would be consistent to the maximum extent practicable with the Coastal Zone Management Act and the enforceable policies of the CNMI Bureau of Environmental and Coastal Quality. Therefore, operation under Pagan Alternative 1 would result in less than significant impacts to submerged land uses subject to the Coastal Zone Management Act.

The impact on the corals, beaches, and the marine environment are discussed in Section 4.10, Marine Biology.

#### 4.7.4.1.4.2 Public Access

For safety reasons, public access to the waters above submerged lands would be restricted during training exercises 16 weeks per year. Danger zones would be instituted to restrict ocean areas, as described in Chapter 2, Proposed Action and Alternatives. Since Pagan and the submerged land surrounding the island are infrequently visited, Pagan Alternative 1 would result in less than significant impacts to submerged land associated with public access.
Figure 4.7-4
Pagan All Action Alternatives
Areas of Particular Concern

Legend

Areas of Particular Concern
- Shoreline (CNMI CRM0 2013)
- Lagoon and Reef (NCCOS 2005)

Proposed Action
- Field Artillery Direct Fire Range Firing Position
- Field Artillery Indirect Firing Position
- Target Area
- Helicopter Landing Zone

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

Source: USGS 2010
4.7.4.2 Pagan Alternative 2

The impacts to land and submerged land use resulting from implementation of Pagan Alternative 2 would be similar to those described under Pagan Alternative 1 (see Section 4.7.4.1, Pagan Alternative 1).

Implementation of Pagan Alternative 2 would result in significant impacts to land use associated with changes in jurisdictional control and current (i.e., conservation) and planned land use.

Implementation of Pagan Alternative 2 would result in less than significant impacts to submerged land use with regard to changes in jurisdictional control, submerged land use associated with current and planned land use, and land and submerged land use associated with public access.

4.7.4.3 Pagan No-Action Alternative

As noted in Chapter 2, the no-action alternative for Pagan would involve no live-fire military training on the island. Periodic visits for eco-tourism, scientific surveys and military use for search and rescue training would be expected to continue, have minimal disruptions to existing conditions and no impacts on the use of land or submerged land on Pagan.

4.7.4.4 Summary of Impacts for Pagan Alternatives

Table 4.7-3 provides a comparison of the potential impacts to land and submerged land use resources for the two Pagan alternatives and the no-action alternative.

Table 4.7-3. Summary of Impacts for Pagan Alternatives

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<thead>
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</thead>
<tbody>
<tr>
<td>Land Acquisition (Jurisdictional Control)</td>
<td>Not applicable</td>
<td>SI</td>
<td>SI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submerged Land Acquisition (Jurisdictional Control)</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Use – Current and Planned Use</td>
<td>Not applicable</td>
<td>SI</td>
<td>Not applicable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Use – Public Access</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Submerged Land Use – Current and Planned</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
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<tr>
<td>Submerged Land Use – Public Access</td>
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<td>LSI</td>
<td>Not applicable</td>
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</tbody>
</table>

Legend: LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts.
4.8 Recreation

Section 4.8 describes the potential impacts to recreational resources as a result of the proposed action. Restrictions on physical access to recreational resources during the construction and operational phases of the various alternative actions are the most quantifiable and direct anticipated impact. Recreation sites offshore that are encumbered by danger zones would also be subject to impacts from training. These impacts would be more pronounced on the island of Tinian because the island is populated and relies heavily on tourism. Visitors and residents regularly visit recreational, historical, and cultural sites around Tinian. A reduction in access to these sites may have an impact to tourism. Indirect impacts to the enjoyment of recreational resources may also occur, particularly to those resources located outside the Military Lease Area. Pagan is officially uninhabited and does not contain any official recreational areas, although there have been discussions about developing Pagan as an eco-tourism destination and a staging area for visitors to the Marianas Trench National Marine Monument area.

4.8.1 Approach to Analysis

The impact analysis used available data (e.g., field reconnaissance, agency and stakeholder interviews, commercial recreation and tour operator’s interviews, existing documentation) and conservative assumptions (e.g., no access at all during the live-fire training periods on Tinian and Pagan) for reduction in recreational use under each alternative. Information from the socioeconomic impact analysis in Section 4.15, Socioeconomics and Environmental Justice was also used to prepare this recreational resource analysis. Existing baseline data for the impact analysis are limited because the CNMI agencies and organizations do not collect comprehensive visitor data (e.g., user counts, visitor satisfaction, user comments, and visitor demands).

Both direct and indirect impacts were analyzed. Direct impacts include the following:

- The extended closure and loss of public access, either permanently or intermittently, to recreational resources during construction or operation.
- Training noise considered incompatible with land uses such as parks and playgrounds (as described in Section 4.5, Noise).
- Modification to and reduction in quantity, quality, and diversity of recreational opportunities and options.
- Potential destruction, damage or modification to the physical condition of recreational resources located within training areas.

Indirect impacts include the following:

- Increased demand for, and pressure on, recreational resources outside the Military Lease Area.
- Change in the quality of the visitor experience as a result of: (1) permanent or intermittent restricted access to recreational opportunities, and (2) modified or improved access corridors.
- Increase in user conflicts as recreational sites outside of the Military Lease Area experience increased crowding and modified usage.

As discussed in Section 3.8.2, Regulatory Framework, several entities are responsible for the management and maintenance of tourist sites and recreational areas on Tinian and Pagan. However, the...
island of Tinian and the CNMI government have no specific regulatory standards or guidance with regard to recreational resources. Therefore, for the purpose of this analysis, the project alternatives would cause a significant impact to recreational resources if they would:

- Substantially limit or prohibit access to recreational resources
- Substantially permanently or intermittently reduce the number of available recreational opportunities
- Substantially reduce or exceed the capacity of a recreation resource
- Cause substantial conflicts between recreation users
- Cause substantial physical deterioration of recreational resources
- Result in a substantial modification to the user experience across each recreation site
- Have noise impacts at recreation sites greater than the following, which are based on the noise zones used to determine land use compatibility with parks and playgrounds (see Section 3.5.2, Noise, Regulatory Framework):
  - 75 decibels A-weighted (small-caliber weapons and aircraft noise)
  - 70 decibels C-weighted (large-caliber weapons)
  - 104 decibels Peak

### 4.8.2 Resource Management Measures

Resource management measures that are applicable to recreational resources include the following:

- The DoN would provide proposed training schedules to the U.S. Coast Guard who would issue and broadcast a Notice to Mariners that will identify the location of the danger zones and direct vessel operators to navigate clear of the danger zones during specified time periods.

- Trained observers, or surface radar, would scan the danger zones prior to and during live-fire training to ensure that there are no vessels or individuals within or approaching the danger zone. If vessels or individuals are at risk from operation of the range, the vessel would be contacted via marine radio and instructed to vacate the area and/or alter its course to avoid the danger zone. If required, the range would suspend activities until the vessel has cleared the danger zone.

- The DoN would develop and implement a construction management plan and appropriate traffic management strategies to minimize impacts of construction on access to recreational resources near the construction areas.

- The DoN would prepare an access plan that would detail provisions for public access to the RTA. These provisions would include a range control facility and dedicated range scheduler that would be in place to assess public access in real-time and provide advance notice of restricted public access dates, times, and areas. Range control and the scheduler would coordinate public access directly with the Tinian Mayor’s Office and other interested parties, such as ranchers and entities within the tourism industry. The access plan would also detail access procedures that would be implemented to ensure safety and provide guidance and direction.
4.8.3 Tinian

As discussed in Section 3.8, Recreation, Tinian contains the following recreational opportunities:

- Twelve historic and cultural sites
- Eight beaches and parks
- Ocean-based resources, including snorkeling and diving (five sites), recreational fishing, and boating
- Scenic points
- Seven annual events

The majority of these recreational opportunities are located within the Military Lease Area. Specifically, there are 10 historic and cultural sites, 6 beaches and parks, 3 scenic points, and 5 annual events located within the Military Lease Area. In addition, four of the five dive sites would be encumbered by danger zones.

4.8.3.1 Tinian Alternative 1

4.8.3.1.1 Construction Impacts

The construction phase would include various forms of grading, drainage engineering, land clearing, utility installation, and roadway improvements. Construction would take place over a period of 8 to 10 years and would be intermittent. Construction materials and equipment would come through the Port of Tinian and through Tinian International Airport. Materials would be delivered to the construction sites via surface roadways, primarily along an upgraded 8th Avenue. Materials would also be delivered via 72nd Street, 86th Street, and the former runways of North Field.

Introducing slow-moving construction vehicles to the roadways in the Tinian RTA and constructing roads and training facilities would impact the public’s access to all recreational resources in the Military Lease Area. The increased traffic and slow operation of construction vehicles could result in negative impacts to visitor access to, and their overall experience of these resources. As previously mentioned, construction would take place on an intermittent basis over a period of 8 to 10 years. Therefore, construction activities would not impede access on a daily basis for the entire construction period.

Use of these roads during construction would require roadway improvements to support heavy construction vehicles. These roadway improvements and upgrades would remain in place upon completion of construction. Therefore, depending on location, Tinian Alternative 1 would improve access to various recreational resources during those times the resources are accessible to the public. This improved access to recreational resources is discussed in detail in the Roadway and Access Improvements section below.

Dive sites are primarily accessed via tourist boat operators based at the Port of Tinian; therefore, access to dive sites would not be impacted by land-based construction projects. Boating and diving could be impacted by the increased port congestion and disruption of port traffic, as a result of construction materials passing through the port, and the construction of port and associated roadway improvements. However, increased activity at the port associated with construction would be relatively short-lived and the effects would be temporary.
Unai Chulu would require in-water construction of a landing ramp and removal of areas of limestone on the beach to facilitate access for Amphibious Assault Vehicles. The beach would be closed during construction, which would displace potential visitors. However, the closure would be temporary, and construction is only expected to last up to 8 months.

As discussed in Section 4.3, Water Resources, construction activities would disturb sediments and increase turbidity, which could cause an indirect impact to nearshore waters at nearby beaches or dive spots. The construction would be relatively short-lived, and the effects would be temporary; therefore, the indirect impact to nearby beaches or dive sites would be reduced and potentially eliminated.

Tinian Alternative 1 construction activities would preclude access to Unai Chulu during the construction period. As discussed in Section 3.8.4.2, Beaches and Parks, Unai Chulu is the only beach within the Military Lease Area that is recommended by the Tinian Dynasty to visitors. It is also known to attract visitor groups for entertainment and picnics. Due to the loss of access, Tinian Alternative 1 construction activities would have a significant impact to Unai Chulu. Although construction would limit or prohibit access to recreational resources within the construction area, this impact would be temporary. Therefore, Tinian Alternative 1 construction activities would result in less than significant direct or indirect impacts to recreational resources.

4.8.3.1.2 Operation Impacts

Tinian Alternative 1 operations would have direct impacts to recreational resources. The most substantial impact to recreation from the training operations would be the closure of the Military Lease Area for up to 20 weeks of training per year, with some areas inaccessible to the public on a year-round basis (i.e., the entire High Hazard Impact Area, the Munitions Storage Area, the base camp, all fenced and gated training areas, Surface Radar, and the range Observation Posts). In general, public access would be allowed to all other locations when training is not occurring. It is envisioned that public access to some or all areas of the RTA, with the exceptions mentioned above, would occur during a couple of daylight hours on a nearly daily basis during the 20 weeks of live-fire training. A range control facility and dedicated range scheduler would be in place to assess public access in real-time and to provide advance notice of public access dates, time frames, and areas. Range control and the scheduler would coordinate public access directly with the Tinian Mayor’s Office and other interested parties, such as ranchers and entities within the tourism industry. Access procedures would be implemented to ensure safety and provide guidance and direction. Since the majority of the recreational opportunities on Tinian are located within the Military Lease Area, the limited access would substantially reduce recreational opportunities. The specific impacts and level of significance for each category of recreational resources are discussed in the subsections, below.

4.8.3.1.2.1 Historic and Cultural Sites

Ten of the 12 historic and cultural sites on Tinian are located within the Military Lease Area. Of these 10 historic and cultural sites, 8 would be inaccessible 20 weeks per year during training. Two resources, the Shinto Shrine and the Hinode American Memorial, are located within the proposed High Hazard Impact Area (Range Complex A); therefore, they would be inaccessible year-round. In addition, the High Hazard Impact Area would receive artillery, mortars, aerial gunfire, missiles, rockets, and inert aviation ordnance, which would lead to the physical damage and/or destruction of these two resources.
Since 10 of the 12 historic and cultural sites on Tinian are within the Military Lease Area, Tinian Alternative 1 operations would reduce recreational opportunities associated with historic and cultural sites. As discussed in Section 3.8.4, Tinian, there were over 54,000 visitors to Tinian in 2013, and the majority of the visitors are there to visit the historic and cultural sites (DoN 2014).

Tinian Alternative 1 operations would result in the following significant impacts to historic and cultural sites:

- Substantially limit or prohibit access to 10 of the 12 historic and cultural sites on Tinian
- Substantially reduce the number of available recreational opportunities associated with historic and cultural sites on an intermittent basis
- Cause substantial physical deterioration to two historic and cultural sites

Therefore, Tinian Alternative 1 operations would result in significant direct impacts to historic and cultural sites during operation.

Potential mitigation measures, which are detailed below, include scheduling of training events to avoid holidays and annual events and mitigation measures determined as part of the Section 106 process. However, even with mitigation measures, impacts to recreation opportunities (i.e., visitation) to historic and cultural sites would be significant due to intermittent reduction of public access during the 20 weeks of live-fire training, particularly access to the North Field National Historic Landmark and other World War II-era sites.

Potential Mitigation Measures include:

- In as much as possible, training would be scheduled around peak tourist holidays, such as the three World War II anniversaries.
- There is no mitigation currently proposed to minimize this impact to the Shinto Shrine and Hinode American Memorial. The DoN is consulting with the CNMI Historic Preservation Officer and other interested parties regarding impacts to the Shinto Shrine and Hinode American Memorial as part of the Section 106 process (see Appendix N, Cultural Resources Technical Memo for a discussion of the consultation process). Potential mitigation will be determined through this consultation process.

Mitigation monitoring would not be required for the development of an access plan or scheduling of training events to avoid holidays. Mitigation monitoring would be required for mitigation measures determined through the Section 106 consultation process. It is likely that these proposed potential mitigation measures would be implemented since tourism is the base of the Tinian economy and visitors tend to participate in multiple activities while on Tinian that include island tours within the Military Lease Area (see Section 3.15, Socioeconomics and Environmental Justice).

4.8.3.1.2.2 Beaches and Parks

There are eight beaches and parks open to the public on Tinian. Five of these beaches are located within the Military Lease Area and would be closed periodically during some portion of each training week up to 20 non-continuous weeks per year. These include the following:

- Unai Lam Lam
- Unai Babui
All but Unai Dankulo would be used for tactical amphibious training that would involve combat swimmers and small boats coming ashore. In addition to small boat and swimmer training, Unai Babui, Unai Chulu, and Unai Masalok would include amphibious landing training using Landing Craft Air Cushion vessels. With resource management measures (see Section 4.8.2, Resource Management Measures), including restoration of beach topography with hand-held tools, tactical amphibious training involving the swimmers, small boats, and Landing Craft Air Cushion vessels would not result in substantial changes to the physical shoreline and wave activity.

Unai Chulu would also include a landing area for Amphibious Assault Vehicles. Unai Chulu would be altered to allow Amphibious Assault Vehicles to come ashore. However, the in-water landing ramp and cleared area of the beach would not impede recreational users from utilizing the resource during non-training times.

There are three publicly accessible beaches and parks on Tinian located outside the Military Lease Area: Kammer Beach, Taga Beach, and Tachogna Beach. These are the most visited beaches on Tinian by both tourists and residents because they are located in San Jose and are near the Dynasty Hotel and Casino where 90% of the visitors to Tinian stay (DoN 2014). These beaches are also the only beaches on Tinian that have shaded picnic sites and pavilions. With other beaches and recreation sites closed in the Military Lease Area during training, these beaches may experience an increase in visitors, including tourists and residents. This could result in the increased use of facilities, parking, and crowding of the shoreline and nearshore waters. The potential crowding and modified usage of beaches and parks outside the Military Lease Area could result in an increase in user conflicts and competition for limited recreational resources. However, because the beaches and parks within the Military Lease Area are generally not heavily frequented, the increase in visitors to the beaches and parks outside the Military Lease Area would be small. Therefore, the capacity of the beaches and parks outside the Military Lease Area to absorb additional users would likely not be exceeded, nor is it expected that there would be substantial conflicts between recreation users. Nevertheless, Tinian Alternative 1 operations would result in the following significant impacts to beaches and parks:

- Substantially limit or prohibit access to five of the eight beaches and parks on Tinian
- Substantially reduce the number of available recreational opportunities associated with beaches and parks on an intermittent basis

Therefore, Tinian Alternative 1 operations would result in significant direct impacts to the recreational use of beaches during operation. Tinian Alternative 1 operations would result in less than significant indirect impacts to beaches outside the Military Lease Area due to increased use of these beaches during training periods when beaches within the Military Lease Area are inaccessible.

4.8.3.1.2.3 Ocean-based Resources

The presence of danger zones, which would be located over shorelines and open ocean areas, would require the closure of offshore areas to the public during active training periods (i.e., up to 20 non-
continuous weeks per year). This would include four popular snorkeling and diving sites located just offshore of the west coast of Tinian:

- Dump Coke North
- Dump Coke South
- Tinian Grotto
- Fleming Point

The intermittent, temporary loss of access during active training periods (i.e., 20 non-continuous weeks per year) to four of the five popular snorkeling and diving sites would increase demand on the remaining one remaining snorkeling and dive site: Two Corals. This indirect impact could in turn change the quality of the visitor experience because of overcrowding of this location, although it is not expected to exceed the capacity of the resource. However, the increased use of Two Corals could result in a substantial increase in user conflicts and negatively impact the quality of the visitor experience to these sites.

Additionally, shoreline locations used for recreational fishing are primarily located south of Dump Coke South and north of the Two Corals (Turtle Cove) diving sites on the west side of Tinian. All of these recreational shoreline fishing locations would be within danger zones and closed to the public during training activities (i.e., 20 non-contiguous weeks per year).

Tinian Alternative 1 operations would result in the following significant impacts to ocean-based resources:

- Substantially limit or prohibit access to four of the five popular snorkeling and diving sites
- Substantially limit or prohibit access to popular shoreline fishing locations
- Substantially reduce the number of available recreational opportunities associated with ocean-based resources on an intermittent basis
- Cause substantial conflicts between users of ocean-based resources due to overcrowding
- Result in a substantial modification to the user experience of ocean-based resources

Therefore, Tinian Alternative 1 operations would result in significant direct and indirect impacts to ocean-based recreational resources during operation.

4.8.3.1.2.4 Scenic Points

As discussed in Section 3.12, Visual Resources, there are several scenic points on Tinian, including Mount Lasso and Ushi “Cross” Point. Many of the scenic points also include a historic or cultural component and are described in Section 3.8.4.1, Historic and Cultural Sites. Impacts to these sites are discussed above in Section 4.8.3.1.2.1, Historic and Cultural Sites.

The Blow Hole is located within the Military Lease Area; therefore, access to the Blow Hole would be restricted 20 non-continuous weeks per year during training events. The Blow Hole is one of the most recognized and visited sites on the island of Tinian. There is no other accessible natural feature similar to it that replicates the experience for a visitor.

Tinian Alternative 1 operations would result in the following significant impacts to scenic points:

- Substantially limit or prohibit access to scenic points
• Substantially reduce the number of available recreational opportunities associated with scenic points on an intermittent basis

Therefore, Tinian Alternative 1 operations would result in significant direct impacts to scenic points during operation.

4.8.3.1.2.5 Annual Events

The annual Tinian Hot Pepper Festival, also known as the Pika Festival, along with other festivals and sporting events, are held at various locations on Tinian throughout the year. Closing various Tinian recreational resources for up to 20 weeks per year during training operations could result in a reduction of visitor attendance at these events, which would result in a decrease in quality of the visitor experience. Training operations and the closure of the Military Lease Area which is used for festivals and sporting events could impact annual events. Additionally, depending on dates and durations of training operations, danger zone restrictions could also impact the hosting of recreational and sport fishing events.

Tinian Alternative 1 operations would result in the following significant impacts to annual events:

• Substantially limit or prohibit access to areas used for annual events
• Result in a substantial modification to the user experience of visitors to annual events

Therefore, Tinian Alternative 1 operations would result in significant direct and indirect impacts to annual events from lack of access into the Military Lease Area.

Through implementation of proposed potential mitigation measures, including development of a training schedule and coordination with event sponsors, impacts to annual events would be less than significant.

Potential Mitigation Measures include:

• In as much as possible, training would be scheduled around peak tourist holidays, such as the three World War II anniversaries, and annual events. In as much as possible, the DoN would coordinate with event sponsors to ensure that training events do not occur during annual events.

Mitigation monitoring would not be required. It is likely that the proposed potential mitigation measures would be implemented since tourism is the base of the Tinian economy and visitors tend to participate in multiple activities while on Tinian that include island tours within the Military Lease Area (see Section 3.15, Socioeconomics and Environmental Justice).

4.8.3.1.2.6 Training Noise Impacts

As discussed in Section 4.5, Noise, there would be potential noise impacts associated with training activities. Noise would originate from small-caliber weapons, large-caliber weapons, and aircraft. Although noise levels within the Military Lease Area would exceed the thresholds for compatible use with recreation areas, these areas would be closed to the public during training (i.e., noise-producing events).
Noise levels above the threshold for compatible use at recreation areas outside the Military Lease Area and surface danger zones would include the following:

- Noise from large-caliber weapons would be greater than 70 decibels C-weighted over a small area of the Pacific Ocean between Ushi “Cross” Point and the Blow Hole (see Figure 4.5-3). Boating and recreational fishing may occur within this area during training events.

- Peak sound levels would be greater than 115 decibels over both the Philippine Sea on the west side of the Military Lease Area, the Pacific Ocean on the east side of the Military Lease Area, and north of Tinian to Saipan (see Figure 4.5-5).

Sustained sound levels from large-caliber weapons and Peak sound levels during training may result in a loss of enjoyment for boaters and potential success for fishermen. However, there are other boating and fishing areas around the southern part of Tinian that could be utilized during training events. Therefore, Tinian Alternative 1 operations would result in less than significant direct impacts to recreational resources from noise.

4.8.3.1.2.7 Roadway and Access Improvements

There are two primary roads leading from San Jose into the Tinian RTA: 8th Avenue and Broadway Avenue. While some of the major roads and trails in the Military Lease Area may be accessible when training is not occurring, Broadway Avenue from just south of the Shinto Shrine to north of the American Memorial traffic circle would be closed to the public on a year-round basis. This closure would prevent access to recreational resources via Broadway Avenue north of the American Memorial traffic circle, even when those northern resources are open to the public. Visitors’ sole access to the northern sites would be via 8th Avenue.

As described in Section 2.4, Tinian Alternatives, numerous trails and roadways would be improved or upgraded as an action common to all Tinian alternatives. Although some of the roadways would not be intended for public use, some roadways would be improved for public access. Specifically, road improvements for public use within the Military Lease Area would provide beneficial impacts as follows:

- 8th Avenue, repair existing road for public use. This upgrade would improve north-south travel and access to the Seabees Monument, Japanese Internment Camp, Mount Lasso, 509th Composite Group Camp, and the North Field National Historic Landmark, as well as Unai Chulu, Unai Babui, and Unai Lam Lam

- Riverside Drive and Lennox Avenue, repair existing road for public use. This upgrade would improve access to Unai Chulu, Unai Babui, and Unai Lam Lam

- 86th Street, repair existing road for general use. This upgrade would improve east-west cross connections between 8th Avenue and Broadway Avenue

The closure of Broadway Avenue would impede access to recreational resources north of the American Memorial traffic circle; however, access would be available via 8th Avenue. Additionally, improved roadways would facilitate better access to recreational sites within the Military Lease Area and result in a beneficial impact when public access is permissible. Therefore, the closure of Broadway Avenue would result in a less than significant indirect impact to recreational resources.
4.8.3.2 Tinian Alternative 2

4.8.3.2.1 Construction Impacts

The impacts to recreational resources from construction activities associated with Tinian Alternative 2 would be the same as those described for Tinian Alternative 1. See Section 4.8.3.1, Tinian Alternative 1, for a discussion of impacts. Construction activities associated with Tinian Alternative 2 would result in less than significant direct or indirect impacts to recreational resources.

4.8.3.2.2 Operation Impacts

The impacts to recreational resources from Tinian Alternative 2 operations would be similar to those described for Tinian Alternative 1. See Section 4.8.3.1, Tinian Alternative 1, for a discussion of impacts. However, noise impacts to recreational resources from Tinian Alternative 2 operations would be slightly different from those associated with Tinian Alternative 1.

Impacts to recreational resources from noise associated with Tinian Alternative 2 operations would be mostly the same as those described for Tinian Alternative 1. Under Tinian Alternative 2 noise from large-caliber weapons greater than 70 decibels C-weighted would expand further over the Philippine Sea on the west side of Tinian than it would for Alternative 1. However, this area is within the danger zone and would be closed to the public during training events and would not result in additional impacts to recreational resources. Therefore, Tinian Alternative 2 operations would result in less than significant impacts to recreational resources from noise.

Tinian Alternative 2 operations would have direct and indirect significant impacts to recreational opportunities associated with historic and cultural sites, beaches and parks within the military lease area, ocean-based resources, and scenic points.

Tinian Alternative 2 would have significant impacts to annual events. Through implementation of potential mitigation measures, including coordination with event sponsors, impacts to annual events would be less than significant.

Tinian Alternative 2 operations would result in less than significant impacts to beaches and parks outside the military lease area.

Tinian Alternative 2 would result in less than significant impacts from the closure of Broadway Avenue. The other roadway and access improvements would have beneficial impacts to recreational resources.

4.8.3.3 Tinian Alternative 3

4.8.3.3.1 Construction Impacts

The impacts to recreational resources from construction activities associated with Tinian Alternative 3 would be the same as those described for Tinian Alternative 1. See Section 4.8.3.1, Tinian Alternative 1, for a discussion of impacts from construction activities. Construction activities associated with Tinian Alternative 3 would result in less than significant direct or indirect impacts to recreational resources.
4.8.3.3.2 Operation Impacts

The impacts to recreational resources from the Tinian Alternative 3 operations would be the same as those described for Tinian Alternative 1, with the exception of impacts associated with training noise. See Section 4.8.3.1, Tinian Alternative 1, for a discussion of impacts to recreational opportunities associated with historic and cultural sites, beaches and parks, ocean-based resources, scenic points and annual events, as well as roadway and access improvements. See Section 4.8.3.2, Tinian Alternative 2, for a discussion of training noise impacts.

Tinian Alternative 3 operations would have direct and indirect significant impacts to recreational opportunities associated with historic and cultural sites, beaches and parks, ocean-based resources, scenic points, and annual events. Through implementation of proposed potential mitigation measures, including coordination with event sponsors, impacts to annual events would be less than significant.

Tinian Alternative 3 operations would have less than significant indirect impacts to recreational resources from noise. Although noise from large-caliber weapons greater than 70 decibels C-weighted would expand outside the Military Lease Area, the area that would be impacted is within the danger zone and would be closed to the public during training events.

Tinian Alternative 3 operations would result in less than significant indirect impacts from the closure of Broadway Avenue. The other roadway and access improvements would have beneficial impacts to recreational resources.

4.8.3.4 Tinian No-Action Alternative

Areas within the Military Lease Area that are in use during the periodic non-live-fire military training exercises that have and would continue to occur on Tinian would not be accessible to the public. These periodic non-live-fire military training exercises are of short duration and any lack of access would be temporary and not be significant to the overall recreational use of the Military Lease Area. As addressed in the Guam and CNMI Military Relocation EIS (DoN 2010a), four planned live-fire military training ranges would be established on Tinian. There would be less than significant impacts on access to recreational pursuits (see Table 9.2-4; DoN 2010a). Also, less than significant impacts to recreational resources would be incurred by the Mariana Islands Range Complex training (see Section 3.17.4; DoN 2010b). Therefore, under the no-action alternative, less than significant impacts to recreational resources would be anticipated.
4.8.3.5 Summary of Impacts for Tinian Alternatives

Table 4.8-1 provides a comparison of the potential impacts to recreational resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreation (Construction Only)</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Historic and Cultural</td>
<td>Not applicable</td>
<td>SI</td>
<td>SI</td>
<td>SI</td>
</tr>
<tr>
<td>Beaches and Parks</td>
<td>Not applicable</td>
<td>SI</td>
<td>SI</td>
<td>SI</td>
</tr>
<tr>
<td>Ocean-based Resources</td>
<td>Not applicable</td>
<td>SI</td>
<td>SI</td>
<td>SI</td>
</tr>
<tr>
<td>Scenic Points</td>
<td>Not applicable</td>
<td>SI</td>
<td>SI</td>
<td>SI</td>
</tr>
<tr>
<td>Annual Events</td>
<td>Not applicable</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
</tr>
<tr>
<td>Training Noise Impacts</td>
<td>Not applicable</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Roadway and Access Improvements</td>
<td>Not applicable</td>
<td>BI/LSI</td>
<td>BI/LSI</td>
<td>BI/LSI</td>
</tr>
</tbody>
</table>

Legend: BI = beneficial impact; LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.
### 4.8.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives

**Table 4.8-2** provides a summary of the proposed mitigation measures for recreational resources for the three Tinian alternatives.

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RECREATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Historic and Cultural Attractions</td>
<td>SI</td>
<td>- In as much as possible, training would be scheduled around peak tourist holidays, such as the three World War II anniversaries.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- There is no mitigation currently proposed to minimize this impact to the Shinto Shrine and Hinode American Memorial. The DoN is consulting with the CNMI Historic Preservation Officer and other interested parties regarding impacts to the Shinto Shrine and Hinode American Memorial as part of the Section 106 process (see Appendix N, <em>Cultural Resources Technical Memo</em> for a discussion of the consultation process). Potential mitigation will be determined through this consultation process and could include documentation and relocation of the Shinto Shrine and Hinode American Memorial.</td>
</tr>
<tr>
<td>Annual Events</td>
<td>SI mitigated to LSI</td>
<td>In as much as possible, the DoN would coordinate with event sponsors to ensure that training events do not occur during annual events.</td>
</tr>
</tbody>
</table>

**Legend:** LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.

**Note:** Mitigation measures only change the significance of impacts where noted.
4.8.4 Pagan

4.8.4.1 Pagan Alternative 1

Pagan is officially uninhabited and does not contain any official recreational areas. Nevertheless, as noted in Section 3.8, Pagan, there have been discussions about developing Pagan as an eco-tourism destination and a staging area for visitors to the Marianas Trench National Marine Monument area.

4.8.4.1.1 Construction Impacts

The type and extent of construction on Pagan would be limited, as there would be no permanent buildings proposed as part of either alternative on Pagan. Construction would occur over an 8 to 10 year period; however, the majority of the construction would occur in the first few years as part of training activities. The public would be restricted from accessing areas where construction is occurring. These access restrictions would be temporary and intermittent. Therefore, Pagan Alternative 1 would result in less than significant impacts to recreational resources during construction activities.

4.8.4.1.2 Operation Impacts

Pagan Alternative 1 operations would result in the permanent closure of the High Hazard Impact Area, restricted access and intermittent closure of the northern portion of the island, and establishment of a 3-mile (4.8-kilometer) perimeter danger zone offshore of the northern part of the island during 16 weeks of training per year. The closure of the northern portion of the island during training events would preclude any recreational activities during that time. As discussed in Section 3.8.5, Pagan, the island is officially uninhabited and there are no formally identified recreational facilities or activities on Pagan. However, there are occasional recreational visitors to the island. These are generally individuals from other islands in the CNMI who may use the island for hunting, camping, or other cultural and spiritual pursuits. Other visitors are part of ecotourism groups with a pre-planned agenda and have only occurred three times over the past year, as discussed in Section 3.8.5, Pagan.

Since there are no formally identified recreational facilities on Pagan, and Pagan only hosts occasional recreational visitors, Pagan Alternative 1 operations would not substantially limit or prohibit access to recreational resources, nor would it substantially reduce the number of recreational opportunities. Therefore, Pagan Alternative 1 operations would result in less than significant impacts to recreational resources during operation.

4.8.4.2 Pagan Alternative 2

4.8.4.2.1 Construction Impacts

The impacts to recreational resources resulting from Pagan Alternative 2 construction activities would be the same as those discussed in Section 4.8.4.1.1, Pagan Alternative 1, Construction Impacts. Implementation of Pagan Alternative 2 would result in less than significant impacts to recreational resources during construction.
4.8.4.2.2 Operation Impacts

The impacts to recreational resources resulting from Pagan Alternative 2 operations would be similar to those discussed in Section 4.8.4.1.2, Pagan Alternative 1, Operation Impacts. However, less of southern Pagan would be encumbered by the surface danger zones, which would allow visitors additional areas of access. Therefore, Pagan Alternative 2 operations would result in less than significant impacts to recreational resources during operation.

4.8.4.3 Pagan No-Action Alternative

There would be no impacts to the recreational opportunities on Pagan under the no-action alternative. There would be the same potential for use of Pagan for periodic eco-tourism visits under this alternative as currently exists.

4.8.4.4 Summary of Impacts for Pagan Alternatives

Table 4.8-3 provides a comparison of the potential impacts to recreational resources for the two Pagan alternatives and the no-action alternative.

Table 4.8-3. Summary of Impacts for Pagan Alternatives

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreation</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Recreation (General)</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; NI = no impact.
4.9 **TERRESTRIAL BIOLOGY**

Section 4.9 describes the specific direct and indirect impacts on terrestrial biological resources that could result from implementation of the proposed action. Both the construction and operation elements of the proposed action have the potential to impact the terrestrial biological resources of both Tinian and Pagan.

### 4.9.1 Approach to Analysis

A variety of laws, regulations, Executive Orders, plans, and policies, such as the Endangered Species Act and the Migratory Bird Treaty Act, are applicable to evaluating the proposed action impacts for terrestrial biology. A complete listing of applicable regulations is provided in Appendix E, *Applicable Federal and Local Regulations*.

The terrestrial biology impact analysis addresses potential effects to vegetation communities, wildlife, and special-status species (i.e., species protected by federal or local law). Representations of the Tinian and Pagan RTAs and their associated support facilities/infrastructure construction footprints (described in Chapter 2, *Proposed Action and Alternatives*) were quantified using Geographic Information System analysis. Training area disturbance footprints were also accounted for to ensure that the full range of potential impacts was identified. Under the proposed action, impacts may be either temporary (reversible) or permanent (irreversible). Direct and indirect impacts are distinguished as follows.

**Direct impacts** occur at the same place and/or time as actions generated by proposed construction (e.g., ground-disturbing activities) and training operations (e.g., range use). These impacts may include, but are not limited to, the following:

- Permanent loss of habitat due to vegetation removal during construction
- Temporary loss of habitat due to vegetation removal during construction (e.g., some areas would be revegetated after construction), noise, lighting, and/or human activity
- Permanent loss of habitat due to human activity, noise, and/or lighting that could prevent a wildlife species, including special-status species, from occupying otherwise suitable habitat
- Temporary or permanent injury or mortality of wildlife or special-status species caused by the action and occurring at the same time and place as the action
- Permanent or temporary loss of habitat due to potential wildfires generated by training activities

Direct impacts from construction ground disturbance and operational vegetation clearing were assumed within all areas labeled as facility footprints and as “Vegetation Maintenance” in Appendix F, *Geology and Soils Technical Memo*.

**Indirect impacts** are caused by or result from project-related activities, are usually later in time, and are reasonably foreseeable. Potential causes of indirect impacts include, but are not limited to, the following:

- Introduction of new or increased dispersal of existing non-native, invasive species within the CNMI
• Permanent or temporary loss of habitat due to potential wildfires generated by training activities (e.g., increased erosion, spread of invasive species)
• Pollutants that are released during military training
• Temporary or permanent impacts on reproductive success or survival of wildlife or special-status species caused by the action but occurring later in time

Indirect impacts from construction ground disturbance and operational vegetation clearing were assumed within all areas labeled as facility footprints and as “Vegetation Maintenance” in Appendix F, Geology and Soils Technical Memo.

General principles used to evaluate impacts are:
• The extent, if any, that the action would result in substantial loss or degradation of habitat or ecosystem functions (natural features and processes) essential to the persistence of native flora or fauna populations
• The extent, if any, that the action would diminish the population size, distribution, or habitat of special-status species or regionally important native plant or animal species
• The extent, if any, that the action would permanently degrade ecological habitat qualities that special-status species depend upon, and which partly determines the species’ prospects for conservation and recovery
• The extent, if any, that the action would be likely to jeopardize the continued existence in the wild of any species listed or proposed for listing under the Endangered Species Act

Specific evaluation criteria are discussed below. If significant impacts were determined, then mitigation may be proposed to minimize or offset the impacts.

4.9.1.1 Vegetation Communities

To determine whether impacts to vegetation communities were significant, a vegetation base map was overlaid onto the footprint of proposed ground disturbance using a Geographic Information System. This impact quantification focused on areas of high- and medium-intensity disturbance (i.e., vegetation removed [high] or habitat changed [medium]), with the rarity of the affected plant community taken into consideration in making an impact determination.

Native limestone forests are especially important because they retain the functional habitat for native species, particularly special-status species, and because restoration to replace cleared, native forest would be a decades-long process. Similarly, wetlands provide required habitat for native wildlife and special-status species and provide important hydrologic functions. Impacts to vegetation communities were evaluated for significance primarily based on the extent and landscape context (i.e., fragmentation) of temporary or permanent loss of primary limestone forest or wetland communities.

4.9.1.2 Native Wildlife

To identify potential impacts to wildlife, the activities associated with the proposed action were considered in the context of affected species’ life history and ecology (e.g., nesting behavior and habitat, foraging habitat, mobility, and migration). An action would be considered significant if there was physical loss of or exclusion from required habitat, death, or decreased productivity of native wildlife
populations. Assessment of the likelihood of these impacts was based on information from published scientific literature and the knowledge of subject matter experts.

Impacts were determined significant if native wildlife species are present and the proposed project would result in the decrease in population sizes or distributions of regionally important native wildlife species (excluding special-status wildlife species that are addressed separately below). Potential causes of impacts to native wildlife may include, but are not limited to:

- Permanent removal or degradation of a natural community or ecosystem that would substantially decrease the size or distribution of wildlife populations
- Permanent loss of vegetation or wildlife habitat identified as declining or rare in the region (i.e., native limestone forest and wetlands)
- Permanent loss or long-term disruption of a regionally important wildlife movement corridor.
- Inadvertent introduction of the brown treesnake to Tinian or Pagan by personnel, equipment, or supply movement from Guam
- Disruptions of key elements of the life history (e.g., breeding, nesting, foraging, resting) of wildlife species from human activities such as noise or lights

### 4.9.1.3 Special-status Species

Similar to the criteria applied to evaluate impacts to wildlife, the significance of impacts to special-status species were based on the presence of these species and the anticipated level of disturbance to the areas where they are present. The presence of species and their estimated densities were determined based on field surveys and wildlife inventories. A base map of this information was overlaid onto the footprint of potential disturbance from construction and operation, and the magnitude of impacts was then identified.

#### 4.9.1.3.1 Endangered Species Act-listed Species

In accordance with section 7 of the Endangered Species Act of 1973 (16 U.S. Code 1531 et seq.), a Biological Assessment is being prepared to analyze the potential effects of Department of Defense actions on listed threatened and endangered species and those proposed for listing under the jurisdiction of the U.S. Fish and Wildlife Service. Section 7(a)(2) of the Endangered Species Act requires federal agencies to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any federally threatened or endangered species or result in the destruction or adverse modification of critical habitat. In accordance with Section 102 of NEPA, the Department of Defense is in section 7 consultation with the U.S. Fish and Wildlife Service regarding the potential impacts from actions proposed under the preferred alternative presented in this EIS/OEIS on Endangered Species Act-listed species and is in section 7 conference for those species proposed to be listed. Those species that are addressed in the section 7 consultation and conference process with the U.S. Fish and Wildlife Service are as follows:

- Mariana fruit bat – threatened
- Mariana common moorhen – endangered
- Micronesian megapode – endangered
- Green turtle (nesting) – threatened
- Hawksbill turtle (nesting) – endangered
- Humped tree snail – proposed endangered
- Slevin’s skink – proposed endangered
- Pacific sheath-tailed bat – proposed endangered
- *Heritiera longipetiolata* – proposed endangered
- *Dendrobium guamense* – proposed endangered
- *Solanum guamense* – proposed endangered
- *Tuberolabium guamense* – proposed endangered
- *Cycas micronesica* – proposed threatened
- *Bulbophyllum guamense* – proposed endangered

Impacts of the proposed action under section 7 of the Endangered Species Act are analyzed as impacts to individuals (as defined by “take” under the Endangered Species Act). In contrast, analysis of impacts to species under NEPA, presented here, relates to the impacts on populations of these species. The proposed avoidance, minimization, and mitigation measures described in this EIS/OEIS to benefit Endangered Species Act-listed and proposed species are preliminary, are focused on population-level benefits, and may be revised or augmented to further minimize impacts to individuals during Endangered Species Act section 7 consultation.

### 4.9.1.3.2 Migratory Bird Treaty Act-listed Species

The Migratory Bird Treaty Act prohibits the taking, killing, or possession of migratory birds unless permitted by regulation. An activity has a significant effect if, over a reasonable period, it diminishes the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem. In 2007, the U.S. Fish and Wildlife Service finalized a rule authorizing the Department of Defense to “take” migratory birds in the course of military readiness activities, as directed by the 2003 National Defense Authorization Act. Congress defined military readiness activities as all training and operations of the armed forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use. Military readiness activities do not include: (A) routine operation of installation support functions such as administrative offices, military exchanges, water treatment facilities, schools, housing, storage facilities, and morale, welfare, and recreation activities; (B) the operation of industrial activities; and (C) the construction or demolition of facilities used for a purpose described in A or B (50 CFR).

For the purposes of this EIS/OEIS, the operation of the proposed Tinian and Pagan RTAs is considered a military readiness activity and the construction of the proposed Tinian and Pagan RTAs is considered a non-military readiness activity. The Department of Defense must confer and cooperate with the U.S. Fish and Wildlife Service on developing and implementing conservation measures to minimize or mitigate adverse effects of a military readiness activity if that activity has a significant adverse effect on a population of a migratory bird species. Migratory bird conservation relative to non-military readiness activities is addressed separately in a Memorandum of Understanding developed in accordance with Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds.
Potential causes of impacts to special-status species may include, but are not limited to:

- Permanent removal or degradation of a natural community or ecosystem that would substantially decrease the population size or distribution of any special-status species
- Permanent loss of or decrease in populations or habitat of any Endangered Species Act-listed species, any species that has been proposed for listing under the Endangered Species Act, any Migratory Bird Treaty Act-protected species, any CNMI-listed species, or any CNMI Species of Special Conservation Need
- Permanent loss or long-term disruption of a regionally important corridor for the movement of any special-status species
- Inadvertent introduction of the brown treesnake to Tinian or Pagan by personnel, equipment, or supply movement from Guam
- Disruptions of key elements of the life history (e.g., breeding, nesting, foraging, resting) of any population of a special-status species from noise, lighting, or other components of the action

4.9.2 Resource Management Measures

Resource management measures that are applicable to terrestrial biological resources include the following:

4.9.2.1 Avoidance and Minimization Measures

- **Bird/Animal Aircraft Strike Hazard Plan.** Preparation and implementation of a Bird/Animal Aircraft Strike Hazard Plan. The plan would include safeguards for aircraft and flight crews, and would decrease impacts to wildlife and special-status species by avoiding and minimizing potential aircraft strikes of birds and other animals.
- **Range Environmental Vulnerability Assessment.** Preparation of a Range Environmental Vulnerability Assessment to assess the potential impacts to human health and the environment from live-fire training operations. The purpose of the Range Environmental Vulnerability Assessment is to identify whether there is a release or a substantial threat of a release of munitions constituents from the operational range or range complex areas to off-range areas and determine if the release causes an unacceptable risk to human health and/or the environment (see Appendix D, **Best Management Practices**, for further details).
- **Range Fire Management Plan.** Preparation and implementation of a Range Fire Management Plan (within the Range Training Area Management Plan). Implementation of the plan would reduce the risk of fire originating from the RTAs, thereby minimizing potential for impacts to biological resources from fire.
- **Biosecurity.** Adherence to Commander Navy Region Marianas Instruction 3500.4A (**Marianas Training Manual**) Appendix A: Brown Treesnake Control and Interdiction Requirements; Commander Navy Region Marianas Instruction 5090.10A (**Brown Tree Snake Control and Interdiction Plan**); anticipated final Joint Region Marianas Instruction 5090.4, which will replace Instruction 5090.10A; and 36 Wing Instruction 32-7004 (**Brown Tree Snake Management**) will minimize the likelihood of brown treesnake introduction to Tinian or Pagan (see Appendix L, **Biological Resources Supporting Documentation**). In addition, for CJMT activities, per Department of Defense Transportation Regulations Chapter 505 protocols, the Department of
Defense will commit to implementing 100% inspection of all outgoing aircraft and all outgoing cargo transported via ship or aircraft from Guam to Tinian or Pagan with qualified quarantine officers and dog detection teams. Repeat (redundant) 100% inspections will also be conducted on Guam within snake-free quarantine areas for all cargo transported from Guam to Tinian or Pagan. These brown treesnake sterile areas will be subject to: (1) multiple day and night searches for snakes with qualified canine interdiction teams, (2) snake trapping, and (3) human visual inspection for snakes. For all brown treesnake interdiction work, the skills and standards required to certify an inspection team as "qualified" will be agreed upon mutually by the Department of Defense, U.S. Geological Survey Biological Resources Discipline, and U.S. Fish and Wildlife Service.

The Department of Defense is a participating department in the development of the Regional Biosecurity Plan (previously referred to as the Micronesia Biosecurity Plan), with the National Invasive Species Council, U.S. Department of Agriculture Animal and Plant Health Inspection Service, U.S. Geological Survey Biological Resources Discipline, and the Smithsonian Environmental Research Center. The Regional Biosecurity Plan is intended to coordinate and integrate inter-agency non-native invasive species management efforts such as species control, interdiction, eradication, and research. When the Regional Biosecurity Plan is completed, the Department of Defense will work cooperatively with the U.S. Fish and Wildlife Service in the development and implementation of protocols for interdiction and control methods in accordance with recommendations in the plan that are determined to be applicable to CJMT activities.

4.9.2.2 Best Management Practices and Standard Operating Procedures

Best management practices and standard operating procedures that are applicable specifically to the terrestrial biology resources include:

- **Brown Treesnake Interdiction.** Joint Region Marianas has established a comprehensive brown treesnake interdiction program to ensure that military activities do not contribute to the spread of brown treesnakes to the CNMI or other locations. Interdiction requirements specified in Commander Navy Region Marianas instructions will be implemented for CJMT activities.
- **Integrated Pest Management Plan.** The U.S. military would develop and implement a comprehensive Integrated Pest Management Plan. This Plan would encompass all activities regarding the importation, handling, storage, use, and application of pesticides as well as address prevention of the introduction of potential invasive species to the CNMI.
- **Invasive Species Interdiction.** Executive Order 13112, Invasive Species, directs federal agencies to prevent the spread of any invasive species in their work. To implement this directive for CJMT activities, the Department of Defense will require development and implementation of Hazard Analysis and Control Point plans for all construction, transport, and logistics activities related to CJMT actions.
Biosecurity Outreach and Education. A biosecurity outreach and education program will be implemented to inform contractors and Department of Defense civilian and military personnel about native versus non-native invasive species and the impacts of non-native invasive species on native ecosystems.

Regional Biosecurity Plan. DoN funded the development of a Regional Biosecurity Plan to coordinate inter-agency invasive species management efforts, including control, interdiction, eradication, and research. Protocols for interdiction and control methods will be developed and implemented for Regional Biosecurity Plan recommendations that are applicable to CJMT activities.

Contractor Education Program. The DoN has developed an education program to ensure construction contractor personnel are informed of the biological resources in the project area, including special-status species, avoidance measures, and reporting requirements.

For further details refer to Appendix D, Best Management Practices.

4.9.3 Tinian

4.9.3.1 Tinian Alternative 1

4.9.3.1.1 Construction Impacts

4.9.3.1.1.1 Vegetation Communities

Vegetation communities affected during construction activities associated with Tinian Alternative 1 are listed in Table 4.9-1 and shown in Figures 4.9-1a and 4.9-1b. Under this alternative, approximately 1,798 acres (728 hectares) of undeveloped or non-barren land would be impacted, representing approximately 8% of the island and 12% of the Military Lease Area. Two proposed facilities comprise approximately half of the total impacts to vegetation communities: the High Hazard Impact Area (527 acres [213 hectares]) and the Drop Zone (456 acres [185 hectares]). The majority of the impacted vegetation communities (1,737 acres [703 hectares]) are composed of tangantangan (780 acres [316 hectares] or 9% of total on island), mixed introduced forest (622 acres [252 hectares] or 9% of total on island), and herbaceous scrub (335 acres [135 hectares] or 7% of total on island). In addition, 6.3 acres (2.5 hectares), or 0.5% of total on island, of native limestone forest would be removed.

Native limestone forest has been significantly reduced on Tinian due to past activities, including widespread cultivation of non-native species (e.g., sugar cane), activities during World War II, intentional and accidental introduction of non-native plants and animals, and grazing by non-native ungulates. Limestone forests on Tinian are important because they retain the functional ecological components of native forest that provide habitat for the majority of Tinian’s native species, including Endangered Species Act-listed and proposed species, and the CNMI-listed species. These forests also help maintain water quality and reduce fire risk. Non-native plant species (e.g., tangantangan) significantly alter the native forest structure, composition, and resilience of the forest to other disturbances and also provide less suitable conditions for native flora and fauna species than a native forest (Morton et al. 2000; Tang et al. 2011; DoN 2013).
### Table 4.9-1. Potential Direct Impacts to Vegetation Communities with Implementation of Tinian Alternative 1

<table>
<thead>
<tr>
<th>Project Area*</th>
<th>NLF</th>
<th>MIF</th>
<th>TT</th>
<th>HS</th>
<th>Cas</th>
<th>Coco</th>
<th>BS</th>
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<th>Ag</th>
<th>Bar</th>
<th>Dev</th>
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<td>293.7</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
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<tr>
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</tr>
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<td>0</td>
<td>12.5</td>
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<td><strong>Total Impacted under Alternative 1</strong></td>
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<td><strong>622.4</strong></td>
<td><strong>780.6</strong></td>
<td><strong>335.5</strong></td>
<td><strong>35.1</strong></td>
<td><strong>0.8</strong></td>
<td><strong>17.2</strong></td>
<td><strong>0.5</strong></td>
<td>&lt;0.1</td>
<td><strong>3.1</strong></td>
<td><strong>252.9</strong></td>
<td><strong>2,054.4</strong></td>
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<tr>
<td>Total on Tinian</td>
<td>1,355.7</td>
<td>6,853.1</td>
<td>8,443.6</td>
<td>4,819.0</td>
<td>353.9</td>
<td>97.9</td>
<td>551.0</td>
<td>64.9</td>
<td>331.7</td>
<td>199.9</td>
<td>1,915.7</td>
<td>24,986.4</td>
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<tr>
<td>% Impacted under Alternative 1 on Tinian</td>
<td>0.5%</td>
<td>9.1%</td>
<td>9.2%</td>
<td>6.9%</td>
<td>9.7%</td>
<td>0.9%</td>
<td>3.1%</td>
<td>0.7%</td>
<td>&lt;0.1%</td>
<td>&lt;0.1%</td>
<td>13.2%</td>
<td>8.2%</td>
</tr>
</tbody>
</table>

Notes:
* Project areas are based on areas depicted and labeled in Section 2.4.
\(^{(1)}\) **NLF** = native limestone forest; **MIF** = mixed introduced forest; **TT** = tangantangan; **HS** = herbaceous-scrub; **Cas** = *Casuarina* forest; **Coco** = coconut forest; **BS** = beach strand; **Wet** = wetlands habitat; **Ag** = agriculture; **Bar** = barren; **Dev** = developed; < = less than.
\(^{(2)}\) Includes fire break/buffer, perimeter road, Hand Grenade Range, Mortar Range, Light Anti-armor Weapon Range, Grenade Launcher Range, targets for Close Air Support Range, targets for Offensive Air Support Range, targets for Field Artillery Indirect Fire Range.
\(^{(3)}\) Although two ephemeral ponds associated with the Mahalang Complex would be impacted under Alternative 1, these are not considered wetlands.
\(^{(4)}\) Includes Anti-armor Tracking Range, Tank/Fighting Vehicle Stationary Target Range, and Multi-purpose Range Complex.
Figure 4.9-1a
Northern Military Lease Area - Tinian Alternative 1, Vegetation Communities

Sources: Amidon 2009; DoN 2013b
Figure 4.9-1b
Southern Military Lease Area - Tinian Alternative 1, Vegetation Communities

Sources: Amidon 2009; DoN 2013b
Under Tinian Alternative 1, 6.3 acres (2.5 hectares) of native limestone forest, or 0.5% of the total acreage for this community on the island, would be removed, primarily within the High Hazard Impact Area (see Table 4.9-1). Therefore, given the importance of native limestone forest habitat for native species and the continuing loss of limestone forest on Tinian, the conversion of 6.3 acres (2.5 hectares) to developed area under Tinian Alternative 1 would result in significant, direct impacts to the regional vegetation community and its function.

In addition, two ephemeral ponds within the Mahalang Complex totaling less than 0.5 acre (0.2 hectare) of wetlands habitat would be lost due to construction of the hand grenade and grenade launcher ranges within the High Hazard Impact Area. Based on recent wetlands surveys on Tinian, one of these two ephemeral ponds is considered an isolated wetland that supports ephemeral wetland habitat during years of high rainfall. The loss of less than 0.5 acre (0.2 hectare) of wetland habitat would not be significant.

Mitigation measures may be implemented to mitigate potential significant direct, long-term impacts of proposed construction activities on vegetation communities with implementation of Tinian Alternative 1. To mitigate for these significant impacts to 6.3 acres (2.5 hectares) of native limestone forest, the DoN would propose to implement forest enhancement on a minimum of 6.3 acres (2.5 hectares) of mixed introduced forest. Implementation of proposed mitigation measures would reduce the impact to less than significant. Forest enhancement would include but is not limited to the following:

- Propagating, planting, and establishing dominant and rare species that are characteristic of native limestone forest habitats (e.g., *Cynometra ramiflora*, *Neisosperma oppositifolia*, *Eugenia palumbis*, *Guamia mariannae*, pandanus, banyan tree, and tropical almond)
- Removing non-native, invasive vegetation
- Controlling non-native predators (e.g. rats, feral cats)

The Department of Defense would prepare a Forest Enhancement/Restoration and Monitoring Plan that would provide detailed guidance on proposed forest enhancement activities on Tinian as well as long-term monitoring of the success of the proposed forest enhancement measures. Although the exact locations of the proposed forest enhancement areas have not been identified, prior to implementing any forest enhancement activities appropriate environmental compliance documentation would be prepared, including coordination with cultural resources personnel under Section 106 of the National Historic Preservation Act regarding the potential occurrence of cultural resources within any proposed forest enhancement site.

The anticipated benefit of implementing these potential mitigation measures is improved habitat quality for native flora and fauna, including wildlife and special-status species. Forest enhancement also supports natural regeneration and seed propagation, reduces erosion, and increases water retention which reduces fire risk.

### 4.9.3.1.1.2 Native Wildlife

Potential impacts from construction activities under Tinian Alternative 1 to native bird species on Tinian that are not listed under the Migratory Bird Treaty Act are described in this section. Impacts to native bird species protected under the Migratory Bird Treaty Act are addressed separately below in the *Special-status Species* section.
As discussed above in Vegetation Communities, a total of approximately 1,798 acres (728 hectares) of habitat for native species would be removed because of proposed construction activities under Tinian Alternative 1 (see Table 4.9-1). This is approximately 12% and 8% of the total habitat within the Military Lease Area and on all of Tinian, respectively. Table 4.9-2 provides the number of birds that may be impacted for the five monitored bird species due to the loss of 1,745 acres (706 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats. Estimated numbers were derived from the 2013 native bird surveys on Tinian (DoN 2014a).

The Tinian monarch nests in native limestone forest, mixed introduced forest, and tangantangan forest habitats. The Military Lease Area comprises roughly 66% of the current monarch habitat on the island and supports about 52% of the total monarch population (DoN 2014a). Based on estimated 2013 densities (DoN 2014a), the number of Tinian monarchs that would potentially be permanently displaced by loss of habitat through construction would be 6,600 birds (Table 4.9-2). The Tinian monarch is found only on Tinian, was previously listed as endangered under the Endangered Species Act, was delisted in 2004 (U.S. Fish and Wildlife Service 2004), and was petitioned in 2013 for relisting (Center for Biological Diversity 2013).

### Table 4.9-2. Potential Direct and Permanent Impacts to Five Native Bird Species from Proposed Construction Activities under Tinian Alternative 1

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Birds Impacted by Removal of Habitat*</th>
<th>Total</th>
<th>Estimated 2013 Total Tinian Population</th>
<th>% of Tinian Population Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridled white-eye</td>
<td>114 13,312 14,951 4,749</td>
<td>33,126</td>
<td>442,073</td>
<td>7.5%</td>
</tr>
<tr>
<td>Micronesian honeyeater</td>
<td>7 607 504 236</td>
<td>1,354</td>
<td>20,660</td>
<td>6.6%</td>
</tr>
<tr>
<td>Micronesian starling</td>
<td>11 1,044 1,240 578</td>
<td>2,873</td>
<td>40,489</td>
<td>7.1%</td>
</tr>
<tr>
<td>Rufous fantail</td>
<td>41 3,957 3,857 986</td>
<td>8,841</td>
<td>125,668</td>
<td>7.0%</td>
</tr>
<tr>
<td>Tinian monarch</td>
<td>29 2,764 3,164 676</td>
<td>6,633</td>
<td>91,420</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

*Notes: *NLF = native limestone forest, MIF = mixed introduced forest, TT = tangantangan, HS = herbaceous scrub.

*Source: DoN 2014a.*

The current Tinian Military Retention Land for Wildlife Conservation (or Conservation Area), which was established for the protection of Tinian monarch habitat under a previous Endangered Species Act consultation (U.S. Fish and Wildlife Service 1998; Government of the CNMI and United States of America 1999), would be impacted by proposed construction activities. Four areas are being assessed as potential conservation areas for the protection of the Tinian monarch and other wildlife species (Figure 4.9-2). These areas may also be used for additional natural resource conservation actions such as forest enhancement and/or invasive species control. The Department of Defense is coordinating with the Federal Aviation Administration and the U.S. Fish and Wildlife Service on these potential conservation areas.

Proposed construction activities would remove 1,745 acres (706 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats currently available to native birds on Tinian. In particular, the removal of forested and herbaceous scrub habitats would result in the loss of nesting, foraging, and resting areas for these bird species as well as other native wildlife species.
Figure 4.9-2
Potential Mitigation Areas with Implementation of Tinian Alternatives 1, 2 or 3

Legend
- Potential Mitigation Areas (1-4)
- Wetland “No Training Areas”
- No Wildlife Disturbance Area
- Military Lease Area
- Agriculture
- Barren (Soil, Sand, or Rock)
- Casuarina Forest
- Developed Land
- Herbaceous-Scrub
- Mixed Introduced Forest
- Native Limestone Forest
- Beach Strand
- Tangantangan

Sources: Amidon 2009; DoN 2013b
In addition, noise and the presence of construction equipment and human activity may cause wildlife to temporarily avoid areas in the immediate vicinity of construction activities. Nesting or breeding adults of various wildlife species may be disturbed by noise and construction activities, which may result in abandonment or predation of eggs or young. These activities may also temporarily displace wildlife from breeding habitat, resulting in reduced breeding success. Direct mortality from construction equipment is unlikely because noise associated with pre-construction activities and human presence is likely to disperse wildlife prior to any equipment use, although vehicle traffic would increase the potential for wildlife collisions. Although construction would occur over an 8 to 10 year period, these noise impacts would be short-term and minor because only a small number of range and support facilities would be under construction at any given time. As such, these temporary direct impacts to wildlife populations from construction noise and human activities would be less than significant.

Overall, implementation of Tinian Alternative 1 would result in significant direct impacts to the populations of bridled white-eye, Micronesian honeyeater, Micronesian starling, rufous fantail, and Tinian monarch due to the permanent removal of approximately 1,745 acres (706 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats. These bird species are territorial, meaning that a minimum area is required for each bird or breeding pair for all of their foraging and nesting activities. For most animal species, and particularly within island ecosystems, available but unoccupied habitat is rare (if it does exist, it is generally very low-quality habitat). This is the case unless populations are limited not by habitat, but by predators, disease, or over-hunting. Based on available data, there is no indication that there are large areas of available but unoccupied habitat on Tinian, particularly for forest and shrub breeding bird species. For these reasons, the loss of 1,745 acres (706 hectares) of habitat would be significant, even with forest enhancement efforts. Although bird densities are higher in higher-quality habitats and more birds are expected to eventually occupy areas of proposed forest enhancement, the proposed area of forest enhancement is not large enough to make up for the overall loss of available habitat under Alternative 1. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

To mitigate the potential significant direct, long-term impacts to forested and herbaceous scrub habitats used by native bird and other wildlife species, the DoN would propose to implement forest enhancement of native limestone forest, mixed introduced forest, tangantangan forest, and herbaceous scrub habitats. This is in addition to the forest enhancement of 6.3 acres (2.5 hectares) of native limestone forest or mixed introduced forest described above in the Vegetation Communities section. Forest enhancement would include but is not limited to the following:

- Propagating, planting, and establishing dominant and rare species that are characteristic of native limestone forest habitats (e.g., Cynometra ramiflora, Neisosperma oppositifolia, Eugenia palumbis, Guamia mariannae, pandanus, banyan tree, and tropical almond)
- Removing non-native, invasive vegetation
- Controlling non-native predators (e.g. rats, feral cats)

**Tinian Military Retention Land for Wildlife Conservation.** Under Tinian Alternative 1, portions of the existing Wildlife Conservation Area would be impacted by proposed construction activities. Four areas are being considered as potential conservation areas for the protection of the Tinian monarch and other
wildlife species (see Figure 4.9-2). These areas may also be used for additional natural resource conservation actions such as forest enhancement and/or invasive species control. The Department of Defense is coordinating with the Federal Aviation Administration and the U.S. Fish and Wildlife Service on these potential conservation areas.

Even with implementation of mitigation measures, impacts to native wildlife would be significant and unavoidable due to vegetation removal associated with range construction.

Mitigation monitoring would be required for these potential mitigation measures. Therefore, the DoN would prepare a Forest Enhancement/Restoration and Monitoring Plan that would provide detailed guidance on proposed forest enhancement activities on Tinian as well as long-term monitoring of the success of the proposed forest enhancement measures.

The DoN, in coordination with the U.S. Fish and Wildlife Service, would also prepare a Forest Bird Monitoring and Tinian Monarch Management Plan to monitor the potential effects of proposed CJMT activities on the Tinian monarch and other forest birds within the Military Lease Area. The proposed Management Plan would be based on continuing the forest bird surveys conducted along a series of transects surveyed in 1982, 1996, 2008, and 2013. The continued surveys would assess the species’ overall status and allow evaluation of long-term trends in population size and distribution through comparison with the four previous island-wide surveys of forest birds on Tinian. The data from this monitoring effort would enable the DoN to determine if the Tinian monarch is experiencing declines in abundance or distribution. The Management Plan would also provide recommendations for habitat management to benefit the Tinian monarch population, including, for example, predator control.

4.9.3.1.1.3 Special-status Species: Endangered Species Act-listed and Proposed Species

Based on historical data and surveys conducted in support of this EIS/OEIS, Figures 4.9-3a and 4.9-3b provide the general locations of special-status species within the Military Lease Area. Potential direct impacts to special-status species from proposed construction activities associated with Tinian Alternative 1 include the removal of habitat, fragmentation of remaining habitat, and associated noise, light, and human activities. Individual special-status species are discussed below.

**Mariana Fruit Bat**

Of the existing 720 acres (291 hectares) of suitable foraging and roosting habitat (i.e., native limestone forest, *Casuarina* forest, and coconut forest) for the Mariana fruit bat, proposed construction activities associated with Tinian Alternative 1 would remove approximately 45 acres (18 hectares). However, due to historic hunting pressure on the species and limited suitable habitat, the Mariana fruit bat no longer regularly occurs on Tinian. As stated in Section 3.9.4.4, the greatest number of recent sightings from Tinian occurred in 2005 when approximately five individuals were sighted in cliff-line forest in the Maga region. Surveys in 2008 resulted in no observations of fruit bats at eight separate count stations at seven locations on Tinian. Fruit bats may occasionally move between Tinian and Aguiguan, which supports a small colony, but currently there is no fruit bat population on Tinian (DoN 2014a).

Because of the rarity of occurrence of Mariana fruit bats on Tinian, the lack of fruit bat roost sites on the island, and the area of native limestone forest that would remain on Mount Lasso Ridge and elsewhere within the Military Lease Area, potential impacts to Mariana fruit bats from proposed construction activities under Tinian Alternative 1 would be less than significant.
Figure 4.9-3a
Northern Military Lease Area - Tinian Alternative 1, Occurrence of Special-status Species

Legend
- Military Lease Area
- Surface Radar Tower
- Range Control Observation Post
- Proposed Vegetation Clearance
- Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicle, Landing Craft Air Cushion, small boat, and swimmer training
- Landing Craft Air Cushion, small boat, and swimmer training
- Small boat and swimmer training
- Convoy Course
- Proposed Perimeter Road/Firebreak/Buffer Area
- Proposed Access Road
- Mariana Common Moorhen
- Mariana Fruit Bat
- Micronesian Megapode
- Micronesian Gecko
- Humped Tree Snail
- Green Sea Turtle Nesting

Note: Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.
Figure 4.9-3b
Southern Military Lease Area - Tinian Alternative 1, Occurrence of Special-status Species

Legend

- Military Lease Area
- Surface Radar Tower
- Range Control Observation Post
- Proposed Vegetation Clearance
- Existing Tinian Military Retention
- Land for Wildlife Conservation
- Convoy Course
- Proposed Access Road
- Mariana Common Moorhen
- Mariana Fruit Bat
- Micronesian Megapode
- Humped Tree Snail
- Green Sea Turtle Nesting
- Tactical Amphibious Landing Beaches
- Landing Craft Air Cushion, small boat, and swimmer training

Note: Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.

Sources:
In addition, the potential mitigation measures described above in the Vegetation Communities section would also result in a conservation benefit to the Mariana fruit bat due to the proposed forest enhancement of foraging habitat if Mariana fruit bats from Aguiguan or Saipan begin frequenting Tinian in the future.

**Mariana Common Moorhen**

Construction for road improvements and creation of training ranges on Tinian is anticipated to generate noise levels of 70-90 decibels at a distance of 50 feet (15 meters). The majority of moorhens found on Tinian are located at Lake Hagoi and the Bateha sites, which would not be directly impacted by construction. As construction activities would occur more than 50 feet (15 meters) from Lake Hagoi and the Bateha sites, moorhens using these areas would not be exposed to construction noise, such that impacts to moorhens in these areas are not anticipated.

Noise from vegetation clearing and construction of the Hand Grenade Range and Grenade Launcher Range and a perimeter road around the High Hazard Impact Area within the vicinity of the Mahalang sites may result in moorhens flushing from and temporarily avoiding the Mahalang ephemeral ponds during the wet season.

In addition, proposed construction of the Hand Grenade Range and Grenade Launcher Range within the western portion of the High Hazard Impact Area would remove two ephemeral ponds totaling less than 0.1 acre (0.04 hectare) of suitable moorhen resting and foraging habitat within the Mahalang complex (see Table 4.9-1). None of the ephemeral ponds associated with the Mahalang complex are known to support nesting moorhens, and the sites are used only during the wet season, when they retain sufficient ponded water to support resting or foraging by moorhens. Noise associated with proposed construction activities within the High Hazard Impact Area may cause moorhens to avoid the Mahalang sites; however, moorhens would likely move to available foraging or resting habitat at Lake Hagoi or the Bateha sites.

Therefore, due to the lack of construction noise impacts on moorhens at Lake Hagoi and the Bateha isolated wetlands, and the ability of moorhens to move from the Mahalang sites to Hagoi or Bateha in response to construction noise, construction activities under Tinian Alternative 1 would result in less than significant direct and indirect impacts to the Mariana common moorhen population.

**Micronesian Megapode**

As stated in Section 3.9.4.4, Micronesian megapodes occur in very low numbers on Tinian with only individual megapodes rarely detected during surveys of the Mount Lasso and Maga areas. Taped-playback surveys in 2013 and 2014 did not detect any megapodes within the Mount Lasso or Maga areas. Megapodes may occasionally move between Tinian and Aguiguan or Saipan, both of which support small breeding populations, but currently there is no megapode population on Tinian within the Military Lease Area.

Although a megapode within the Mount Lasso Ridge or Maga areas could potentially hear noise associated with construction activities, based on the limited use of lands within the Military Lease Area by megapodes and that the area of suitable habitat within the Mount Lasso and Maga areas would not be impacted, potential impacts to Micronesian megapodes from proposed construction activities under Tinian Alternative 1 would be less than significant.
Sea Turtles

Construction for road improvements and creation of training ranges on Tinian is anticipated to generate noise levels from 70-90 decibels at a distance of 50 feet (15 meters). The majority of proposed construction activities do not occur in proximity to beaches that may support nesting sea turtles; construction at Unai Chulu is addressed below. However, all construction activities would be carried out during daylight hours, such that exposure to construction noise for green turtles nesting on the beaches at night is not anticipated. Potential impacts to eggs or embryos within nests on beaches from construction noise is considered discountable given the distance of the nests from proposed construction activities and the fact that sound would be attenuated or prevented from reaching eggs or embryos that are buried beneath sand.

Under Tinian Alternative 1, 3.0 acres (1.2 hectares) of beach would be impacted due to disturbance resulting from the construction associated with the Tactical Amphibious Landing Beach at Unai Chulu. To minimize and avoid potential impacts from hazardous substances associated with construction equipment and vehicles, appropriate resource management measures (e.g., Spill Prevention, Control and Countermeasures Plan) would be implemented during all construction activities. Proposed construction would involve construction equipment and human activity on the beach for approximately 8 months. For this reason, it is assumed that construction at Unai Chulu would result in the loss of one turtle nesting season on this beach, as turtles would likely avoid the construction equipment and human activity. Modification of the beach slope and dunes adjacent to these areas could impact turtle nesting habitat. However, following construction, any adjacent beach strand habitat that has been altered would be restored. Although loss of sea turtle nesting habitat would occur over one nesting season at Unai Chulu, impacts would occur at the level of individual nesting turtles, and not at the population level. Therefore, construction activities under Tinian Alternative 1 would result in less than significant direct and indirect impacts to nesting sea turtles.

Assessment of potential impacts to sea turtles in the marine environment is provided in Section 4.10, Marine Biology.

Humped Tree Snail

The humped tree snail was historically present on Tinian and was thought to have been extirpated (i.e., no longer occurring on Tinian) until two discrete populations were discovered during surveys in June 2013 near the southern end of Lamanibot Bay, known locally as Dump Coke. Other surveys within potentially suitable native limestone habitat throughout the Military Lease Area did not detect any other living tree snails (DoN 2014a). There are no proposed construction activities within or adjacent to the Dump Coke population of humped tree snails. Therefore, construction activities under Tinian Alternative 1 would not result in any direct or indirect impacts to humped tree snails.

Heritiera longipetiolata

Within the Military Lease Area, the tree species *H. longipetiolata* has been found in coastal forests near Unai Masalok on the east coast and along the Lamanibot Bay (Dump Coke) escarpment (Hawaiian Agronomics International, Inc. 1985; DoN 2014a). There are no proposed construction activities within or adjacent to these populations. Therefore, construction activities under Tinian Alternative 1 would not result in any direct or indirect impacts to *H. longipetiolata*. 
**Dendrobium guamense**

Currently, a single population of the orchid *D. guamense* is known from Tinian near Unai Dankulo along the east coast (U.S. Fish and Wildlife Service 2014). There are no proposed construction activities within or adjacent to this population. Therefore, construction activities under Tinian Alternative 1 would not result in any direct or indirect impacts to *D. guamense*.

### 4.9.3.1.1.4 Special-status Species: Migratory Bird Treaty Act-listed Species

Of the 44 native bird species that have been reported on Tinian, 39 are protected under the Migratory Bird Treaty Act. The majority are seabirds or shorebirds found primarily in coastal areas (e.g., noddies, terns, boobies, plovers, tattlers, sandpipers, herons, egrets). The Pacific golden plover is one of the most common species observed on Tinian during migration, primarily in open grassy fields and along the coast. Additional species include waterfowl or ducks, which are rare transient visitors during migration and are typically observed at Lake Hagoi, the Bateha sites, or along the coast.

As discussed above in *Vegetation Communities*, approximately 1,798 acres (728 hectares) of habitat for native species would be removed because of Tinian Alternative 1 proposed construction activities (see Table 4.9-1). Construction impacts to landbird species protected under the Migratory Bird Treaty Act would be similar to those described above for native wildlife. Table 4.9-3 provides the number of landbirds that may be impacted for three monitored Migratory Bird Treaty Act-listed species due to the loss of 1,745 acres (706 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats. The estimates of bird numbers using these habitats were derived from the 2013 native bird surveys on Tinian (DoN 2014a). The number of birds impacted was calculated by multiplying the number of acres of a specific habitat or vegetation community that would be removed by the estimated density of each species of bird within that habitat.

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Birds Impacted by Removal of Habitat*</th>
<th>Total</th>
<th>Estimated Total Tinian Population</th>
<th>% of Tinian Population Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collared kingfisher</td>
<td>NLF = 1, MIF = 60, TT = 46, HS = 51</td>
<td>158</td>
<td>2,508</td>
<td>6.3%</td>
</tr>
<tr>
<td>Mariana fruit-dove</td>
<td>NLF = 1, MIF = 123, TT = 98, HS = 53</td>
<td>275</td>
<td>4,042</td>
<td>6.8%</td>
</tr>
<tr>
<td>White-throated ground-dove</td>
<td>NLF = 2, MIF = 150, TT = 50, HS = 64</td>
<td>266</td>
<td>4,879</td>
<td>5.4%</td>
</tr>
</tbody>
</table>

*Notes: *NLF = native limestone forest, MIF = mixed introduced forest, TT = tangantangan, HS = herbaceous scrub. 
*Source: DoN 2014a.*

Proposed construction activities would remove 1,745 acres (706 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats currently available to Migratory Bird Treaty Act-listed species on Tinian. There would be no impacts to coastal or grassland habitats used by seabird or shorebird species. In particular, the removal of forested and herbaceous scrub habitats would result in the loss of nesting, foraging, and resting areas for these bird species protected under the Migratory Bird Treaty Act. In addition, nests in the immediate vicinity of construction activities may be disturbed by noise, light, and human activities and susceptible to abandonment by adults and predation of eggs or young. These activities may also temporarily displace birds from breeding habitat, resulting in reduced reproductive success. Direct mortality from construction equipment is unlikely because noise associated with pre-construction activities and human
presence is likely to disperse wildlife prior to any equipment use, although vehicle traffic would increase the potential for wildlife collisions. Although construction would occur over an 8 to 10 year period, these noise impacts would be short-term and minor because only a small number of range and support facilities would be under construction at any given time. As such, these temporary and direct impacts to bird populations from construction noise and human activities would be less than significant.

Therefore, implementation of Tinian Alternative 1 and the removal of approximately 1,745 acres (706 hectares) of forested and herbaceous scrub habitats would result in less than significant impacts to Migratory Bird Treaty Act-listed species, but significant impacts to the populations of forest- and scrub-nesting Migratory Bird Treaty Act-listed species due to removal of habitat. Forest- and scrub-nesting Migratory Bird Treaty Act-listed bird species are territorial, meaning that a minimum area is required for each bird or breeding pair for all of their foraging and nesting activities. For most animal species, and particularly within island ecosystems, available but unoccupied habitat is rare (if it does exist, it is generally very low-quality habitat). This is the case unless populations are limited not by habitat, but by predators, disease, or over-hunting. Based on available data, there is no indication that there are large areas of available but unoccupied habitat on Tinian, particularly for forest and shrub breeding bird species. For these reasons, the loss of 1,745 acres (706 hectares) of habitat would be significant, even with forest enhancement efforts. Although bird densities are higher in higher-quality habitats and more birds are expected to eventually occupy areas of proposed forest enhancement, the proposed area of forest enhancement is not large enough to make up for the overall loss of available habitat under Alternative 1. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

Tinian Alternative 1 construction activities would have potential significant direct, long-term impacts on forest- and scrub-nesting Migratory Bird Treaty Act-listed species due to loss of habitat. To mitigate the potential significant direct, long-term impacts of the removal of 1,745 acres (706 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats, the DoN proposes to implement forest enhancement of native limestone forest, mixed introduced forest, and herbaceous scrub habitats. This is in addition to the forest enhancement of 6.3 acres (2.5 hectares) of native limestone forest or mixed introduced forest described above in the Vegetation Communities section. Forest enhancement would include but is not limited to the following:

- Propagating, planting, and establishing dominant and rare species that are characteristic of native limestone forest habitats (e.g., *Cynometra ramiflora*, *Neisosperma oppositifolia*, *Eugenia palumbis*, *Guamia mariannae*, pandanus, banyan tree, and tropical almond)
- Removing non-native, invasive vegetation
- Controlling non-native predators (e.g. rats, feral cats)

A Forest Enhancement/Restoration and Monitoring Plan would be prepared and implemented that would provide detailed guidance on proposed forest enhancement activities on Tinian as well as long-term monitoring of the success of the proposed forest enhancement measures. Although the exact locations of the proposed forest enhancement areas have not been identified, prior to implementing any forest enhancement activities appropriate environmental compliance documentation would be
prepared, including coordination with cultural resources personnel under Section 106 of the National Historic Preservation Act regarding the potential occurrence of cultural resources within any proposed forest enhancement site.

In addition, the DoN, in coordination with the U.S. Fish and Wildlife Service, would prepare a Tinian Forest Bird Monitoring and Tinian Monarch Management Plan to monitor the potential effects of proposed CJMT activities on Migratory Bird Treaty Act-listed forest birds within the Military Lease Area. The proposed Management Plan would be based on continuing the forest bird surveys conducted along a series of transects surveyed in 1982, 1996, 2008, and 2013. The continued surveys would assess the overall status of Migratory Bird Treaty Act-listed forest birds and allow evaluation of long-term trends in population size and distribution through comparison with the four previous island-wide surveys of forest birds on Tinian. The data from this monitoring effort would enable the DoN to determine if the Migratory Bird Treaty Act-listed forest birds are experiencing declines in abundance or distribution.

4.9.3.1.5 Special-status Species: CNMI-listed Species

As described in Section 3.9, Terrestrial Biology, the Mariana common moorhen, Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are all CNMI-listed threatened/endangered species. These species are discussed above within the Endangered Species Act-listed Species section. The CNMI-listed Micronesian gecko is discussed below.

Micronesian Gecko

This gecko was believed to have been extirpated in 1946 until it was collected in 2003 in southern Tinian and in 2008 within the Mount Lasso area. The proposed construction activities would not remove native limestone forest within the Mount Lasso area, the only known location within the Military Lease Area that supports the Micronesian gecko. Potential mitigation measures described above in the Vegetation Communities section would also result in a conservation benefit to the Micronesian gecko. For this reason, implementing Tinian Alternative 1 would result in no impacts to the Micronesian gecko.

4.9.3.1.2 Operation Impacts

4.9.3.1.2.1 Vegetation Communities

Foot traffic associated with training in the Military Lease Area is currently an authorized, ongoing activity. Implementing Tinian Alternative 1 would increase the frequency of on-foot training throughout the Military Lease Area, although it would be concentrated within the northern Battle Area Complex, Multi-purpose Range Complex, and Infantry Platoon Battle Course. The increased foot traffic would result in the trampling and breaking of vegetation; however, vegetation cutting is not proposed within the maneuver areas, and bivouac or camping sites would only be established in the region of the base camp. In addition, in accordance with previous Endangered Species Act section 7 consultations with the U.S. Fish and Wildlife Service, Lake Hagoi and a surrounding buffer would remain a “No Training Area,” and all native limestone forest within the Military Lease Area would be designated a “No Wildlife Disturbance Area” with limited, non-invasive, on-foot military training allowed (see Figure 4.9-2) (U.S. Fish and Wildlife Service 2010).

Outside of these specially designated maneuver areas, foot traffic associated with training would occur up to 20 weeks per year. Any potential impacts to vegetation associated with foot traffic would not be
significant as land training within the Military Lease Area would be short-term, infrequent, diffuse, and vary in location across training events; if trampled or broken, vegetation on Tinian is known to recover quickly; and ecosystem functions provided by the vegetation would remain intact.

Impacts to vegetation from vehicle use would be localized, as vehicle travel is restricted to existing or proposed roads and trails. Amphibious operations on the beaches would disturb beach habitat, however the DoN would use hand-tools to restore beach contours and smooth divots. Ordnance use would be limited to designated impact areas (i.e., High Hazard Impact Area, range targets, objective areas, and engagement areas) that would be cleared of vegetation during construction.

Fire potential would increase due to proposed live-fire range operations. Fire can result in direct effects to vegetation by killing or damaging individual plants; or indirect effects by increasing erosion, allowing non-native species to invade, and altering wildlife habitat by reducing food resources, breeding habitat, and shelter. Native habitats on Tinian are adapted to a humid, tropical climate and are not adapted to a fire driven ecosystem (U.S. Fish and Wildlife Service 2008). To reduce the potential for fires, designated target areas, including the High Hazard Impact Area, would be cleared of vegetation during construction and maintained to remain within 6 inches (15 centimeters) of the ground. The High Hazard Impact Area would also be surrounded by a perimeter road and firebreak, and fire prevention and management activities would be implemented upon initiation of CJMT live-fire training per a Fire Prevention and Management Plan that would be developed. This plan would outline standard procedures for safe range usage and risk reduction related to fire management (e.g., water trucks present at each range during training activities).

Potential impacts to vegetation communities from training operations would be avoided and minimized by implementing resource management measures summarized in Section 4.9.2 and presented in detail in Appendix D, Best Management Practices. In particular, with establishment of a firebreak around the High Hazard Impact Area, vegetation management within the associated target areas and firebreak, and implementation of a Fire Prevention and Management Plan, which establishes management and fire suppression and emergency response procedures, implementation of the training activities associated with Tinian Alternative 1 would result in less than significant direct and indirect impacts to vegetation communities.

### 4.9.3.1.2.2 Native Wildlife

This section describes the potential impacts to native wildlife species on Tinian from training activities under Alternative 1. Impacts to special-status species are addressed separately. Potential direct impacts to all wildlife species would result from maneuver training, munitions use (including noise), noise from aircraft overflights, aircraft strikes of native and Migratory Bird Treaty Act-listed birds, and fire. Indirect impacts to all wildlife species may result from pollutants and potential non-native species introductions.

**Maneuver Training**

As presented above under Vegetation Communities, disturbance from Tinian Alternative 1 foot traffic would occur throughout the Military Lease Area. Camping, ground disturbance, or direct disturbance of any wildlife species would be prohibited. While wildlife may react to military personnel moving through forest or other habitats, these reactions are expected to be insignificant as land training within the Military Lease Area would be short-term, infrequent, diffuse, and vary in location across training events.
Although vehicle maneuver training on roads could result in mortality of wildlife species, vehicle speeds would be limited to 25 miles per hour (40 kilometers per hour) or less and wildlife would be able to avoid injury by moving away from vehicles.

**Munitions Use**

Fragments of non-dud producing ammunition may fall within the surface danger zones; however, the likelihood of any single animal being struck is negligible. Ordnance explosions could result in direct impacts to wildlife if a species occurs within the High Hazard Impact Area during live-fire operations. However, the High Hazard Impact Area would be cleared of vegetation and would be less likely to attract wildlife species due to the decrease in habitat suitability.

**Fires**

Although there are no records of wildfires on Tinian resulting from U.S. military training activities (DoN 2014a), fire potential would be increased from live-fire and vehicle maneuvering operations. Indirect impacts to wildlife habitat adjacent to the High Hazard Impact Area from potential fire hazard would be reduced due to clearing of vegetation, a perimeter road and firebreak, and water trucks present at each range during operations. Fire can result in direct effects to all wildlife through mortality or smoke inhalation. Native plants, animals, and their habitats on Tinian are adapted to a humid, tropical climate and are not adapted to a fire-driven ecosystem. Fire potential is higher in non-native communities such as grasslands and tangantangan forests, particularly in the dry season (U.S. Fish and Wildlife Service 2008). The alteration or removal of habitats by fire could reduce food sources, prevent or inhibit breeding, or create competition for feeding and sheltering, particularly for species that establish discrete territories. However, due to the proposed vegetation clearing during construction, vegetation management, and the preparation and implementation of a Fire Prevention and Management Plan (see previous discussion under Vegetation Communities); the potential for wildfire outside the High Hazard Impact Area would be minimized.

**Noise**

Direct impacts from noise would be limited to times of active live-fire training operations, which would occur up to 20 non-consecutive weeks per year (but not 24/7). Noise modeling studies were conducted for the proposed training activities; noise levels and noise contours are provided in Section 4.5, Noise. Wildlife within the Military Lease Area would be exposed to noise of more than 85 decibels A-weighted day-night average sound exposure level and 104 decibels Peak level from small-caliber weapons (see Figures 4.5-1 and 4.5-2), 70 decibels C-weighted day-night average sound level and 130 decibels Peak level from large-caliber weapons (see Figures 4.5-3 and 4.5-4), and 75-80 decibels (A-weighted) noise levels from aircraft operations, primarily adjacent to the Tinian International Airport (see Figure 4.5-6).

It is important to note that all operational noise disturbances would be temporary and would not be continuous for several reasons. First, the type of activity (small- and large-caliber firing, and aircraft overflights) consists of non-continuous events. Second, training events would only occur up to 20 non-consecutive weeks per year. Third, some ranges would likely not be used on any given training day.

No noise studies have been conducted specifically on wildlife species present on Tinian; however, noise studies have been conducted on the effects of military noise on wildlife species associated with other ranges that are similar to those proposed for use on Tinian. Wildlife response from noise under the
proposed training activities may vary among individuals because of habituation, in which after a period of exposure to a stimulus, an animal stops responding to the stimulus. In general, a species can often habituate to human-generated noise when the noise is not followed by an adverse impact (i.e., physical injury).

In addition to noise level, the frequency and regularity of the noise also affect species sensitivity. That is, different types of noise sources produce varied effects on different species. Noise from aircraft overflights may not produce the same response from a wildlife species as noise from a land-based source such as a vehicle, chainsaw, or gunshot. Wildlife species often do not react to a noise source when unaccompanied by a visual cue, but often do react to the visual component associated with that noise source. For example, birds may not react to just the sound of a chainsaw, but when that sound is coupled with a human walking near the bird, the bird will flush. This is also shown in reactions by various species to aircraft overflights (airplanes and helicopters). An overflight with just a sound component does not elicit a strong response, but if a bird hears and then sees the aircraft, the bird will more likely flush and move away (Manci et al. 1988; U.S. Forest Service 1992; Krausman et al. 1993; Bowles 1995).

Aircraft disturbances have been found to impact native and non-native species at an individual and community level (e.g., Gladwin et al. 1987; National Park Service 1994). Wildlife generally respond to low-altitude aircraft, although the ways in which they respond varies depending on life history, habitat, aircraft and flight activities, as well as previous exposure to aircraft (Burger 1981). Physiological and/or behavioral responses can reduce an animal’s fitness and ability to survive, or increase its propensity to relocate. It is thought that low-altitude overflights can cause excessive stimulation, alertness, or stress (Manci et al. 1988; Fletcher 1990). Aircraft overflights of Lake Hagoi and the two Bateha isolated wetlands would be restricted to altitudes of greater than 500 feet (150 meters) above ground level. As such, the primary impacts to wildlife would be from noise associated with aircraft overflights.

Vanderwerf et al. (2000) studied the effects of military noise on the Oahu elepaio (Chasiempis sandwichensis), an endangered Pacific flycatcher in the same family as the Tinian monarch. The study provides some indirect evidence that the Tinian monarch, and other native birds, may not be highly sensitive to live-fire noise.

The study evaluated the responses of Oahu elepaio at the Schofield Barracks Range in Hawaii to 282 high explosive artillery (60-millimeter, 105-millimeter, and 155-millimeter) and demolition blasts located 330 to 3,300 feet (100 to 1,000 meters) from elepaio nests, ranging in intensity from 81 to 116 decibels A-weighted. Responses to artillery blast noise were only detected in two instances. The response was minor and short-lived in both cases; the male lowered its head and resumed preening 1-2 seconds after each blast noise had subsided. In neither instance did an elepaio flush from the nest or pause when returning to the nest in response to artillery noise. This study suggests that Oahu elepaio reproductive success is not negatively impacted by noise associated with live-fire training, particularly artillery (VanderWerf et al. 2000). It should be noted the elepaio studied at Schofield Barracks Range may be habituated to the noise associated with live-fire training and because live-fire training has not been conducted on Tinian recently, it may take some time for the birds to habituate to the noise. Birds habituate to noises and may not respond to stimuli when they do not perceive a direct threat (e.g., a visual threat connected to the noise event).
In addition to the elepaio study, coastal California gnatcatchers (*Polioptila californica*) regularly occur and nest successfully within 400 feet (122 meters) of the local Sheriff’s Training Range and a Trap and Skeet Range at Marine Corps Air Station Miramar in California (DoN 2011). Furthermore, the federally listed black-capped vireo (*Vireo atricapilla*) and golden-cheeked warbler (*Dendroica chrysoparia*) are bird species that are known to nest within live-fire training ranges, including the live-fire impact area at Fort Hood in Texas, despite the occurrence of ongoing training activities similar to that proposed under Tinian Alternative 1 (U.S. Fish and Wildlife Service 2005).

A cooperative study between the Department of Defense and the U.S. Fish and Wildlife Service, assessed the response of the red-cockaded woodpecker (*Picoides borealis*) to a range of military training noise events, including artillery, small arms, helicopter, and maneuver noise (Delaney et al. 2000). The project findings show that the red-cockaded woodpecker successfully acclimates to military noise events. Depending on the noise level that ranged from innocuous to very loud, the birds responded by flushing from their nest cavities. When the noise source was closer and the noise level was higher, the number of flushes increased proportionately. In all cases, however, the birds returned to their nests within a relatively short period of time (usually within 12 minutes). Additionally, the noise exposure did not result in any mortality or statistically detectable changes in reproductive success (Delaney et al. 2000). Red-cockaded woodpeckers did not flush when artillery simulators were more than 400 feet (122 meters) away and sound exposure levels were 70 decibels.

Because training would not be continuous and wildlife species have been shown to habituate to noise associated with military live-fire training activities, there would be less than significant impacts to native wildlife species under Tinian Alternative 1.

**Introduction of Non-native Species**

Training activities would result in increased transport of material and personnel by ship and aircraft between Guam, other CNMI locations, and Tinian. These activities have the potential to introduce non-native invasive species that could degrade the ecosystem on Tinian. The brown treesnake is one of the most serious potential non-native species that could be inadvertently brought to Tinian. Non-native insects such as the little fire ant, coconut rhinoceros beetle, and cycad scale would also severely damage Tinian's native species and habitats. Invasive plant species (e.g., refer to Space and Falanruw 1999) also pose a risk to native wildlife. Such non-native invasive plant and animal species have the potential to increase the mortality of native species, degrade habitats by altering species composition and structure, increase rates of predation, and increase competition between species.

*Section 4.9.2, Resource Management Measures; Appendix D, Best Management Practices; and Appendix L, Biological Resources Supporting Documentation*; provide details regarding applicable biosecurity measures that the U.S. military would implement to ensure that risk from transporting invasive species to Tinian is controlled.

**Aircraft Strikes**

Under Tinian Alternative 1, the potential for bird/animal aircraft strikes would increase from the current baseline with increased use of North Field and the Tinian International Airport. However, in accordance with DoN requirements, a Bird/Animal Aircraft Strike Hazard Plan would be prepared to address all aircraft operations on Tinian. This plan would be prepared to minimize the occurrence of bird/animal
aircraft strikes, and would provide detailed procedures to monitor and react to heightened risk of bird/animal strikes. When risk increases, limits would be placed on low-altitude flight and some types of training. Special briefings would be provided to pilots whenever the potential exists for increased bird/animal strikes within the airspace.

With implementation of these resource management measures described above, potential direct and indirect impacts to native wildlife species from proposed operations would be less than significant.

4.9.3.1.2.3 Special-status Species: Endangered Species Act-listed Species and Proposed Species

Potential impacts to special-status species from munitions, non-native species, and potential wildfires from training activities associated with Tinian Alternative 1 would be similar to those discussed above under Native Wildlife, and would be less than significant. Impacts from noise and human activity are discussed below.

*Mariana Fruit Bat*

Mariana fruit bats are rare transient visitors to Tinian, possibly moving between Aguiguan and Saipan. Under Alternative 1, noise associated with live-fire training activities, physical disturbance, and habitat removal or degradation may occur in potential Mariana fruit bat habitat (i.e., native limestone forest, mixed introduced forest, *Casuarina* forest) on Tinian due to the proposed action. However, given the rarity of occurrence of fruit bats on Tinian, and that there are no known fruit bat roost sites on Tinian, exposure to these stressors would be discountable or insignificant.

Based on the limited use of Tinian by Mariana fruit bats, Tinian Alternative 1 training activities would result in less than significant direct and indirect impacts.

*Mariana Common Moorhen*

The majority of moorhens found on Tinian are located at Lake Hagoi, with some use of the Bateha sites and ephemeral ponds at the Mahalang complex. Lake Hagoi and the two Bateha isolated wetlands would remain designated by Department of Defense as “No Training Areas” (see Figure 4.9-2). The only military training activities in a “No Training Area” are troop and vehicle movements along established boundary roads, and ground disturbance and vegetation removal of any kind would be prohibited. To avoid and minimize effects to the Mariana common moorhen at Lake Hagoi, the DoN has established a 215-acre (87-hectare) “No Training Area” around Lake Hagoi. The “No Training Area” is bounded by existing roads, with the closest road within 246 feet (75 meters) of the wetland.

Noise levels from munitions training and aircraft operations were modeled for Lake Hagoi, the Mahalang complex, and the two Bateha isolated wetlands to assess potential effects to Mariana common moorhens. At Lake Hagoi, noise from small-caliber weapons training would expose moorhens to 63 decibels A-weighted day-night average sound level and 108 decibels Peak noise levels (see Figures 4.5-1 and 4.5-2 and Table 4.5-3). Noise generated by large-caliber weapons would expose moorhens at Lake Hagoi to 77 decibels C-weighted day-night average sound level, and 124 decibels and 135 decibels Peak during neutral and unfavorable weather conditions, respectively (see Figures 4.5-3, 4.5-4, and 5.4-5 and Tables 4.5-7 and 4.5-9). Aircraft operations would result in 63 decibels A-weighted day-night average sound level for Lake Hagoi (see Figure 4.5-6 and Table 4.5-13). Sound levels from large-caliber weapons
training on Tinian may cause periodic startle responses or flushing of moorhens at Lake Hagoi. Effects of these responses may include altered foraging or breeding behaviors. Moorhens are not likely to flush from nests in response to these noise levels, such that effects on reproductive success are not anticipated.

At the Mahalang complex, noise from small-caliber weapons training would expose moorhens to 67 decibels A-weighted day-night average sound level and 104 decibels Peak noise levels (see Figures 4.5-1 and 4.5-2 and Table 4.5-3). Noise generated by large-caliber weapons would expose moorhens at Mahalang to 89 decibels C-weighted day-night average sound level, and 138 decibels and 147 decibels Peak during neutral and unfavorable weather conditions, respectively (see Figures 4.5-3, 4.5-4, and 5.4-5 and Tables 4.5-7 and 4.5-9). Aircraft operations would result in 65 decibels A-weighted day-night average sound level for Mahalang (see Figure 4.5-6 and Table 4.5-13). Sound levels from small- and large-caliber weapons training on Tinian may cause moorhens to flush from and avoid the Mahalang area periodically or permanently. Effects of these responses may include altered foraging behaviors, as moorhens may move to Lake Hagoi or the Bateha wetlands for foraging during the wet season.

At the two Bateha isolated wetlands, noise from small-caliber weapons training would expose moorhens to 65 and 75 decibels A-weighted day-night average sound level and 107 and 108 decibels Peak noise levels at the north and south sites, respectively (see Figures 4.5-1 and 4.5-2 and Table 4.5-3). Noise generated by large-caliber weapons would expose moorhens at the north Bateha site to 70 decibels C-weighted day-night average sound level, and 117 and 130 decibels Peak during neutral and unfavorable weather conditions, respectively (see Figures 4.5-3, 4.5-4, and 5.4-5 and Tables 4.5-7 and 4.5-9). Large-caliber weapons noise at the south Bateha site would expose moorhens to 71 decibels C-weighted day-night average sound level, and 119 and 131 decibels Peak during neutral and unfavorable weather conditions, respectively. Aircraft operations would result in 62 and 67 decibels A-weighted day-night average sound level for the north and south Bateha sites, respectively (see Figure 4.5-6 and Table 4.5-13). Sound levels from small- and large-caliber weapons training on Tinian may cause moorhens to exhibit startle behaviors or flush from the Bateha sites periodically. Effects of these responses may include altered foraging behaviors within the Bateha sites or as moorhens move to Lake Hagoi for foraging during the wet season.

Although noise may impact individual moorhens at Lake Hagoi, the Mahalang sites, and the Bateha isolated wetlands, the birds may move between sites in response to the intermittent noise events. The periods of noise disturbance from live-fire weapons training and aircraft operations on Tinian would not be continuous during any single day, all live-fire ranges and aircraft operations would not operate at the same time during any given day, and training exercises would occur approximately 20 non-consecutive weeks per year. Birds habituate to noises and may not respond to stimuli when they do not perceive a direct threat (e.g., a visual threat connected to the noise event). As stated previously under Native Wildlife, because training would not be continuous and wildlife species have been shown to habituate to noise associated with military live-fire training activities, noise impacts to the Mariana common moorhen population on Tinian are anticipated to be less than significant.

**Micronesian Megapode**

Under Tinian Alternative 1, native limestone forest, where megapodes are most often observed on Tinian, would be designated as a “No Wildlife Disturbance Area,” and only limited, non-invasive, on-foot
military training would be allowed. As megapodes would not occur within or near live-fire ranges or the High Hazard Impact Area, there would be no potential for direct mortality from live-fire training operations. Direct impacts to megapodes on Tinian from noise would be similar to those described above for native wildlife and would be less than significant. In addition, megapodes on Farallon de Medinilla, a DoN live-fire bombing range to the north of Tinian, are subject to intensive live-fire activities and associated noise from ordnance use. Megapodes persist on Farallon de Medinilla and do not appear to be affected by noise levels associated with ordnance use.

Given the above, and the extremely rare occurrences of megapodes on Tinian, noise associated with ordnance within the Tinian Alternative 1 High Hazard Impact Area on Tinian is expected to result in less than significant direct and indirect impacts to megapodes on Tinian.

Sea Turtles

Results of noise modeling indicate that small-caliber weapons training on Tinian would expose nesting green turtles to less than 60 decibels A-weighted day-night average sound level at Unai Chiget, Unai Masalok, and Unai Lam Lam, and less than 65 decibels A-weighted day-night average sound level at Unai Chulu and Unai Dankulo. Small-caliber weapons fire would generate less than 97 decibels Peak and less than 110 decibels Peak at these same beaches. Noise generated by large-caliber weapons would potentially expose nesting green turtles to 66-78 decibels C-weighted day-night average sound level and 110 to 127 decibels and 121 to 138 decibels Peak during neutral and unfavorable weather conditions, respectively. Aircraft operations on Tinian would expose nesting green turtles to 56.7 to 66.0 decibels A-weighted Day-Night Average Sound Level.

Approximately 70% of green turtle nesting activity within the Tinian Military Lease Area over the past 4 years has occurred on Unai Dankulo. Adjacent to the proposed High Hazard Impact Area, Unai Dankulo would be exposed to noise levels from large-caliber weapons of 78 decibels C-weighted day-night average sound level and 127 and 138 decibels Peak noise during neutral and unfavorable weather conditions, respectively. Although the periods of noise disturbance from live-fire weapons training on Tinian would not be continuous, training exercises would occur approximately 20 non-consecutive weeks per year. Sound levels from large-caliber weapons training at night may cause adult turtles to avoid nesting beaches or to abandon nesting attempts during periods of training. Effects of these responses include altered nesting behavior that may reduce reproductive success.

Under Tinian Alternative 1, proposed annual amphibious operations would include 213 Amphibious Assault Vehicles landings, 72 Landing Craft Air Cushion landings, and 96 small boat landings. Activities and personnel associated with amphibious landings on Tinian would potentially disturb sea turtle nesting habitat. Noise during amphibious training activities could also startle nesting female sea turtles or prevent them from ascending the beach zone to excavate a nest. There is an elevated risk to sea turtles during nighttime training activities as sea turtle nesting occurs primarily at night. However, implementation of the training restrictions such as those described by the *Biological Opinion for the Mariana Islands Range Complex, Guam and the Commonwealth of the Northern Mariana Islands 2010-2015* (U.S. Fish and Wildlife Service 2010) would ensure that these disturbances would not affect sea turtles on the beach or their nests. Restrictions include implementing a monitoring program during amphibious training events that includes pre-event surveys to delineate boundaries around nest sites as well as postponing landing activities when a nesting sea turtle is observed on land. The DoN also uses
hand-tools to restore beach contours and smooth divots that may trap hatchlings after landing activities. Further, data from the DoN’s monthly monitoring program are used to prioritize beaches for landing activities that are less important to sea turtle nesting. Thus far, the DoN’s implementation of avoidance and minimization measures have resulted in no takes of nesting sea turtles. Similar training and measures within the Hawaii Island Range Complex and other training locations that also support sea turtle nesting have also proven effective in protecting turtles and their nests.

Therefore, there would be less than significant direct and indirect impacts to sea turtles from military training activities associated with Tinian Alternative 1. Potential impacts to sea turtles in the Tinian marine environment are discussed in Section 4.10, Marine Biology.

**Humped Tree Snail**

Training operations under Tinian Alternative 1 would not occur within or in the vicinity of the only known populations of humped tree snails on Tinian. Therefore, there would be no impacts to humped tree snails with implementation of Tinian Alternative 1.

**Heritiera longipetiolata**

Training operations under Tinian Alternative 1 would not occur within or in the vicinity of the only known population of *H. longipetiolata* on Tinian. Therefore, there would be no impacts to *H. longipetiolata* with implementation of Tinian Alternative 1.

**Dendrobium guamense**

Training operations under Tinian Alternative 1 would not occur within or in the vicinity of the only known population of *D. guamense* on Tinian. Therefore, there would be no impacts to *D. guamense* with implementation of Tinian Alternative 1.

**4.9.3.1.2.4 Special-status Species: Migratory Bird Treaty Act-listed Species**

Direct and indirect impacts from operational activities on the 39 protected bird species are similar to those discussed under the Native Wildlife section and would be less than significant.

**4.9.3.1.2.5 Special-status Species: CNMI-listed Species**

As described in Section 3.9, Terrestrial Biology, the Mariana common moorhen, Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are all CNMI-listed threatened/endangered species. These species are discussed above within the Endangered Species Act-listed Species section.

**Micronesian Gecko**

Noise and visual stimuli associated with training activities under Tinian Alternative 1 would not affect Micronesian geckos because their known habitat on Mount Lasso would not be disturbed. Therefore, Tinian Alternative 1 operations would result in no impacts to Micronesian geckos.
4.9.3.2 Tinian Alternative 2

4.9.3.2.1 Construction Impacts

4.9.3.2.1.1 Vegetation Communities

The vegetation communities that would be impacted during proposed construction activities under Tinian Alternative 2 are shown in Figures 4.9-4a and 4.9-4b and listed in Table 4.9-4. Under Alternative 2, approximately 1,938 acres (784 hectares) of undeveloped or non-barren land would be impacted, representing approximately 8% of the island and approximately 13% of the Military Lease Area. The High Hazard Impact Area (527 acres [213 hectares]) and the Drop Zone (456 acres [184 hectares]) comprise approximately half of the total impacts to vegetation communities. The majority of the impacted vegetation communities (1,877 acres [760 hectares]) are composed of tangantangan (817 acres [331 hectares] or 10% of total on island), mixed introduced forest (693 acres [280 hectares] or 11% of total on island), and herbaceous scrub (367 acres [148 hectares] or 8% of total on island). In addition, 6.3 acres (2.5 hectares), or 0.5% of total on island, of native limestone forest would be removed, primarily within the High Hazard Impact Area (see Table 4.9-5).

As discussed previously under Alternative 1, given the importance of native limestone forest habitat for native species and the continuing loss of limestone forest on Tinian, the conversion of 6.3 acres (2.5 hectares) to developed area under Tinian Alternative 2 would result in significant direct impacts to the regional vegetation community and its function.

In addition, two ephemeral ponds within the Mahalang Complex totaling less than 0.5 acre (0.2 hectare) of wetlands habitat would be lost due to construction of the hand grenade and grenade launcher ranges within the High Hazard Impact Area. Based on recent wetlands surveys on Tinian, one of two ephemeral ponds is considered an isolated wetland that supports ephemeral wetland habitat during years of high rainfall. This loss of less than 0.5 acre (0.2 hectare) of wetland habitat would not be significant.

The same potential mitigation measures discussed previously under Alternative 1 to mitigate potential significant direct, long-term impacts of proposed construction activities on native limestone forest would be applicable under Alternative 2 (i.e., forest enhancement of 6.3 acres [2.5 hectares] of mixed introduced forest). Implementation of proposed mitigation measures would reduce the impact to less than significant. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).
Figure 4.9-4a
Northern Military Lease Area - Tinian Alternative 2, Vegetation Communities

Sources: Amidon 2009; DoN 2013b
Figure 4.9-4b
Southern Military Lease Area - Tinian Alternative 2, Vegetation Communities

Sources: Amidon 2009; DoN 2013b
### Table 4.9-4. Potential Direct Impacts to Vegetation Communities with Implementation of Tinian Alternative 2

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<td></td>
<td></td>
<td>85.0</td>
</tr>
<tr>
<td>Convoy Course Engagement Areas</td>
<td>0</td>
<td>13.2</td>
<td>34.6</td>
<td>22.0</td>
<td>2.4</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>80.8</td>
</tr>
<tr>
<td>Convoy Course</td>
<td>0</td>
<td>9.8</td>
<td>20.9</td>
<td>3.5</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>62.1</td>
</tr>
<tr>
<td>Tracked Vehicle Driver’s Course</td>
<td>1.5</td>
<td>33.1</td>
<td>39.8</td>
<td>18.1</td>
<td>0.7</td>
<td>0.3</td>
<td>&lt;0.1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>100.2</td>
</tr>
<tr>
<td>Tactical Amphibious Landing Beach (Unai Chulu)</td>
<td>0</td>
<td>0.1</td>
<td>0.9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>4.0</td>
</tr>
<tr>
<td>Landing Zones</td>
<td>0</td>
<td>7.0</td>
<td>5.3</td>
<td>6.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
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<td></td>
<td></td>
<td>19.8</td>
</tr>
<tr>
<td>Range Control Observation Points</td>
<td>0</td>
<td>1.7</td>
<td>9.4</td>
<td>3.7</td>
<td>0</td>
<td>0</td>
<td>&lt;0.1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>14.8</td>
</tr>
<tr>
<td>Surface Radar Sites</td>
<td>0</td>
<td>1.8</td>
<td>0.6</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>3.3</td>
</tr>
<tr>
<td>Roadway Improvements</td>
<td>0</td>
<td>4.0</td>
<td>4.4</td>
<td>2.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>43.2</td>
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<tr>
<td>Fences</td>
<td>1.1</td>
<td>10.9</td>
<td>9.0</td>
<td>9.0</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>5.7</td>
</tr>
<tr>
<td>Munitions Storage Area</td>
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<td>27.0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>37.8</td>
</tr>
<tr>
<td>Airport Improvements and Staging Area</td>
<td>0</td>
<td>147.8</td>
<td>233</td>
<td>7.9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>227.7</td>
</tr>
<tr>
<td>Tinian Port Improvements and Staging Area</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>4.5</td>
</tr>
<tr>
<td>Base Camp</td>
<td>0</td>
<td>229.9</td>
<td>10.5</td>
<td>3.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td>256.2</td>
</tr>
</tbody>
</table>

**Total Impacted under Alternative 2** 6.3 | 692.8| 816.6 | 367.0 | 34.6 | 2.8 | 17.2 | 0.5 | 0.1 | 3.1 | 257.1 | 2,198.1

**Total on Tinian** 1,355.7 | 6,853.1| 8,443.6 | 4,819.0 | 353.9 | 97.9 | 551.0 | 64.9 | 331.7 | 199.9 | 1,915.7 | 24,986.4

* % Impacted under Alternative 2 on Tinian 0.5% | 10.1% | 9.7% | 7.5% | 9.8% | 2.9% | 3.1% | 0.7% | <0.1% | 1.5% | 13.4% | 8.7%

Notes: *Project areas are based on areas depicted and labeled in Section 2.4.

[1] NLF = native limestone forest; MIF = mixed introduced forest; TT = tangantangan; HS = herbaceous-scrub; Cas = Casuarina forest; Coco = coconut forest; BS = beach strand; Wet = potential wetlands; Ag = agriculture; Bar = barren; Dev = developed; < = less than.


[3] Although two ephemeral ponds associated with the Mahaling Complex would be impacted under Alternative 2, these have not been delineated as wetlands at this time.

Native Wildlife

Potential impacts from construction activities under Tinian Alternative 2 to native bird species on Tinian that are not listed under the Migratory Bird Treaty Act are described in this section. Impacts to native bird species protected under the Migratory Bird Treaty Act are addressed separately below in the Special-status Species section.

As discussed above in vegetation, a total of approximately 1,938 acres (784 hectares) of habitat for native species would be removed because of proposed construction activities under Tinian Alternative 2 (see Table 4.9-4). This is approximately 13% and 8% of the total habitat within the Military Lease Area and on all of Tinian, respectively. Table 4.9-5 provides the number of birds that may be impacted for five monitored bird species due to the loss of 1,883 acres (762 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats (DoN 2014a). Estimated numbers were derived from the 2013 native bird surveys on Tinian (DoN 2014a).

Table 4.9-5. Potential Direct and Permanent Impacts to Five Native Bird Species from Proposed Construction Activities under Tinian Alternative 2

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Birds Impacted by Removal of Habitat*</th>
<th>Total</th>
<th>Estimated 2013 Total Tinian Population</th>
<th>% of Tinian Population Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridled white-eye</td>
<td>114 14,821 15,938 5,269</td>
<td>36,142</td>
<td>442,073</td>
<td>8.1%</td>
</tr>
<tr>
<td>Micronesian honeyeater</td>
<td>7 675 537 262</td>
<td>1,481</td>
<td>20,660</td>
<td>7.1%</td>
</tr>
<tr>
<td>Micronesian starling</td>
<td>11 1,162 1,322 642</td>
<td>3,137</td>
<td>40,489</td>
<td>7.7%</td>
</tr>
<tr>
<td>Rufous fantail</td>
<td>41 4,405 4,111 1,093</td>
<td>9,650</td>
<td>125,668</td>
<td>7.6%</td>
</tr>
<tr>
<td>Tinian monarch</td>
<td>29 3,078 3,373 750</td>
<td>7,230</td>
<td>91,420</td>
<td>7.9%</td>
</tr>
</tbody>
</table>

Notes: *NLF = native limestone forest, MIF = mixed introduced forest, TT = tangantangan, HS = herbaceous scrub. Source: DoN 2014a.

Under Tinian Alternative 2, approximately 7,230 Tinian monarchs would potentially be permanently displaced by loss of habitat through construction (see Table 4.9-5). Therefore, because of the amount of habitat removed and the number of birds potentially impacted, significant direct impacts to the Tinian monarch would occur under Tinian Alternative 2.

As discussed under Alternative 1 (see Section 4.9.3.1), four areas are being assessed as potential conservation areas for the protection of the Tinian monarch and other wildlife species (see Figure 4.9-2). These areas may also be used for additional natural resource mitigation measures such as forest enhancement and/or invasive species control. The Department of Defense is coordinating with the Federal Aviation Administration and the U.S. Fish and Wildlife Service on these potential conservation areas.

Similar to Tinian Alternative 1, impacts under Alternative 2 from proposed construction activities would reduce the amount of habitat available to native birds on Tinian (see Section 4.9.3.1). Therefore, the removal of approximately 1,883 acres (762 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats under Alternative 2 would result in significant, unavoidable direct impacts to the populations of bridled white-eye, Micronesian honeyeater, Micronesian starling, rufous fantail, and Tinian monarch. These bird species are territorial, meaning that a minimum area is required for each bird or breeding pair for all of their foraging and nesting activities. For most animal species, and particularly within island ecosystems, available but unoccupied habitat is rare (if it does exist, it is generally very low-quality habitat). This is the case unless populations are
limited not by habitat, but by predators, disease, or over-hunting. Based on available data, there is no indication that there are large areas of available but unoccupied habitat on Tinian, particularly for forest and shrub breeding bird species.

The same potential mitigation measures discussed previously under Alternative 1 to mitigate potential significant direct, long-term impacts of proposed construction activities on native forest birds would be applicable under Alternative 2 (i.e., forest enhancement of native limestone forest, mixed introduced forest, tangantangan forest, and herbaceous scrub habitats). However, the loss of 1,883 acres (762 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitat would be significant, even with forest enhancement efforts. Although bird densities are higher in higher-quality habitats and more birds are expected to eventually occupy areas of proposed forest enhancement, the proposed area of forest enhancement is not large enough to make up for the overall loss of available habitat under Alternative 2.

In addition, mitigation monitoring would be conducted with the preparation of a Forest Enhancement/Restoration and Monitoring Plan and a Forest Bird Monitoring and Tinian Monarch Management Plan.

Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

4.9.3.2.1.3 Special-status Species: Endangered Species Act-listed and Proposed Species

Figures 4.9-5a and 4.9-5b provide the general locations of special-status species within the Military Lease Area in relation to Tinian Alternative 2. Direct impacts to special-status species from proposed construction activities include the removal of habitat, fragmentation of remaining habitat, and associated noise, light, and human activities. Individual special-status species are discussed below.

**Mariana Fruit Bat**

Impacts to Mariana fruit bats resulting from implementation of Tinian Alternative 2 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, potential direct and indirect impacts to Mariana fruit bats from proposed construction activities under Tinian Alternative 2 would be less than significant.

**Mariana Common Moorhen**

Impacts to Mariana common moorhens resulting from implementation of Tinian Alternative 2 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, potential direct and indirect impacts from proposed construction activities under Tinian Alternative 2 would be less than significant.

**Micronesian Megapode**

Impacts to Micronesian megapodes resulting from implementation of Tinian Alternative 2 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, potential direct and indirect impacts to Micronesian megapodes from proposed construction activities under Tinian Alternative 2 would be less than significant.
Figure 4.9-5a
Northern Military Lease Area - Tinian Alternative 2,
Occurrence of Special-status Species

Legend
- Military Lease Area
- Surface Radar Tower
- Range Control Observation Post
- Proposed Vegetation Clearance
- Amphibious Assault Vehicle
- Landing Craft Air Cushion, small boat, and swimmer training
- Landing Craft Air Cushion, small boat, and swimmer training
- Small boat and swimmer training
- Convoy Course
- Proposed Perimeter Road/ Firebreak/Buffer Area
- Proposed Access Road
- Mariana Common Moorhen
- Mariana Fruit Bat
- Micronesian Megapode
- Micronesian Gecko
- Humped Tree Snail
- Green Sea Turtle Nesting

Note: Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.

Sources:
Figure 4.9-5b
Southern Military Lease Area - Tinian Alternative 2, Occurrence of Special-status Species

Legend
- Military Lease Area
- Convoy Course
- Surface Radar Tower
- Proposed Access Road
- Range Control Observation Post
- Mariana Common Moorhen
- Proposed Vegetation Clearance
- Mariana Fruit Bat
- Existing Tinian Military Retention
- Micronesian Megapode
- Land for Wildlife Conservation
- Humped Tree Snail
- Tactical Amphibious Landing Beaches
- Green Sea Turtle Nesting
- Landing Craft Air Cushion, small boat, and swimmer training

Note: Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.

Sources:
**Sea Turtles**

Impacts to nesting sea turtles resulting from implementation of Tinian Alternative 2 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, potential direct and indirect impacts to sea turtles from proposed construction activities under Tinian Alternative 2 would be less than significant. The assessment of potential impacts to sea turtles in the marine environment is provided in Section 4.10, *Marine Biology*.

**Humped Tree Snail**

Impacts to humped tree snails resulting from implementation of Tinian Alternative 2 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, there would be no impacts to humped tree snails from proposed construction activities under Tinian Alternative 2.

**Heritiera longipetiola**

Impacts to *H. longipetiola* resulting from implementation of Tinian Alternative 2 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, there would be no impacts to *H. longipetiola* from proposed construction activities under Tinian Alternative 2.

**Dendrobium guamense**

Impacts to *D. guamense* resulting from implementation of Tinian Alternative 2 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, there would be no impacts to *D. guamense* from proposed construction activities under Tinian Alternative 2.

**4.9.3.2.1.4 Special-status Species: Migratory Bird Treaty Act-listed Species**

As discussed above in vegetation communities, approximately 1,938 acres (784 hectares) of habitat for native species would be removed because of proposed construction activities associated with Tinian Alternative 2 (see Table 4.9-4). Table 4.9-6 provides the number of birds that may be impacted for three monitored Migratory Bird Treaty Act-listed bird species due to the loss of 1,883 acres (762 hectares) of forested and herbaceous scrub habitats (DoN 2014a).

*Table 4.9-6. Potential Direct and Permanent Impacts to Three Migratory Bird Treaty Act-listed Species from Proposed Construction Activities under Tinian Alternative 2*

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Birds Impacted by Removal of Habitat*</th>
<th>Total</th>
<th>Estimated 2013 Total Tinian Population</th>
<th>% of Tinian Population Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NLF</td>
<td>MIF</td>
<td>TT</td>
<td>HS</td>
</tr>
<tr>
<td>Collared Kingfisher</td>
<td>1</td>
<td>67</td>
<td>49</td>
<td>57</td>
</tr>
<tr>
<td>Mariana Fruit-dove</td>
<td>1</td>
<td>136</td>
<td>104</td>
<td>58</td>
</tr>
<tr>
<td>White-throated Ground-dove</td>
<td>2</td>
<td>167</td>
<td>54</td>
<td>71</td>
</tr>
</tbody>
</table>

Notes: *NLF = native limestone forest, MIF = mixed introduced forest, TT = tangantangan, HS = herbaceous scrub.*
Source: DoN 2014a.

Direct and indirect impacts to Migratory Bird Treaty Act-listed bird species under Tinian Alternative 2 would be similar to those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Under Tinian Alternative 2, proposed construction activities would remove 1,883 acres (762 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats available to Migratory Bird Treaty Act-listed birds on Tinian. Therefore, implementation of Tinian Alternative 2 and the removal of approximately 1,883 acres (762 hectares) of forested and
herbaceous scrub habitats would result in less than significant direct and indirect impacts to Migratory Bird Treaty Act-listed species seabirds and shorebirds, but significant direct impacts to populations of forest- and scrub-nesting bird species. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

The same potential mitigation measures discussed previously for Alternative 1 to mitigate potential significant direct, long-term impacts of proposed construction activities on Migratory Bird Treaty Act-listed species would be applicable under Alternative 2. Under Alternative 2, forest enhancement of forested and herbaceous scrub habitats would occur. However, impacts from the loss of 1,883 acres (762 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitat would be significant, even with forest enhancement efforts. In addition, mitigation monitoring would be conducted with the preparation of a Forest Enhancement/Restoration and Monitoring Plan and a Forest Bird Monitoring and Tinian Monarch Management Plan.

Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

4.9.3.2.1.5 Special-status Species: CNMI-listed Species

As described in Section 3.9, Terrestrial Biology, the Mariana common moorhen, Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are all CNMI-listed threatened/endangered species. These species are discussed above within the Endangered Species Act-listed and Proposed Species section.

Micronesian Gecko

Impacts to Micronesian geckos resulting from implementation of Tinian Alternative 2 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, there would be no impacts to Micronesian geckos from proposed construction activities under Tinian Alternative 2.

4.9.3.2.2 Operation Impacts

4.9.3.2.2.1 Vegetation Communities

Impacts to vegetation communities from training operations under Tinian Alternative 2 would be the same as those previously discussed for Tinian Alternative 1 (see Section 4.9.3.1). Therefore, implementation of the training activities associated with Tinian Alternative 2 would result in less than significant direct and indirect impacts to vegetation communities.

4.9.3.2.2.2 Native Wildlife

Impacts to native wildlife resulting from Tinian Alternative 2 training operations would be the same as those previously discussed for Tinian Alternative 1 (see Section 4.9.3.1). Therefore, implementation of the training activities associated with Tinian Alternative 2 would result in less than significant direct impacts to native wildlife. In addition, as discussed under Alternative 1, the DoN, in coordination with the U.S. Fish and Wildlife Service, would prepare a Tinian Forest Bird Monitoring and Tinian Monarch Management Plan to monitor the potential effects of proposed CJMT activities on Migratory Bird Treaty
Act-listed forest birds within the Military Lease Area. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

4.9.3.2.2.3 Special-status Species

Impacts to Endangered Species Act-listed and proposed species, Migratory Bird Treaty Act-listed species, and CNMI-listed species resulting from implementation of Tinian Alternative 2 would be similar to those previously discussed for Tinian Alternative 1 (see Section 4.9.3.1). Therefore, there would be less than significant direct and indirect impacts to special-status species from proposed training activities under Tinian Alternative 2.

4.9.3.3 Tinian Alternative 3

4.9.3.3.1 Construction Impacts

4.9.3.3.1.1 Vegetation Communities

The vegetation communities that would be affected by Tinian Alternative 3 construction activities are shown in Figures 4.9-6a and 4.9-6b listed in Table 4.9-7. Approximately 1,914 acres (775 hectares) of undeveloped or non-barren land would be impacted, representing approximately 8% of the island and approximately 13% of the Military Lease Area. Two project areas comprise approximately half of the total impacts to vegetation communities: The High Hazard Impact Area (527 acres [213 hectares]) and the Drop Zone (456 acres [184 hectares]). The majority of the impacted vegetation communities (1,856 acres [751 hectares]) are comprised of tangantangan (799 acres [323 hectares] or 10% of total on island), mixed introduced forest (690 acres [279 hectares] or 11% of total on island), and herbaceous scrub (367 acres [148 hectares] or 8% of total on island). In addition, 6.3 acres (2.5 hectares), or 0.5% of total on island, of native limestone forest would be removed, primarily within the High Hazard Impact Area (Table 4.9-7).

As discussed previously under Alternative 1, given the importance of native limestone forest habitat for native species and the continuing loss of limestone forest on Tinian, the conversion of 6.3 acres (2.5 hectares) to developed area under Tinian Alternative 3 would result in significant direct impacts to the regional vegetation community and its function.

In addition, two ephemeral ponds within the Mahalang Complex totaling less than 0.5 acre (0.2 hectare) of wetland habitat would be lost due to construction of the hand grenade and grenade launcher ranges within the High Hazard Impact Area. Based on recent wetlands surveys on Tinian, one of these two ephemeral ponds is considered an isolated wetland that supports wetland habitat during years of high rainfall. This loss of less than 0.5 acre (0.2 hectare) of wetland habitat would not be significant.

The same potential mitigation measures discussed previously under Alternative 1 to mitigate potential significant direct, long-term impacts of proposed construction activities on native limestone forest would be applicable for Alternative 3 (i.e., forest enhancement of 6.3 acres [2.5 hectares] of mixed introduced forest). Implementation of proposed mitigation measures would reduce the impact to less than significant. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).
Figure 4.9-6a
Northern Military Lease Area - Tinian Alternative 3,
Vegetation Communities

Sources: Amidon 2009, DoN 2013b
### Table 4.9-7. Potential Direct Impacts to Vegetation Communities with Implementation of Tinian Alternative 3

<table>
<thead>
<tr>
<th>Project Area*</th>
<th>NLF</th>
<th>MIF</th>
<th>TT</th>
<th>HS</th>
<th>Cas</th>
<th>Coco</th>
<th>BS</th>
<th>Wet</th>
<th>Ag</th>
<th>Bar</th>
<th>Dev</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Hazard Impact Area^{(2)}</td>
<td>3.3</td>
<td>73.9</td>
<td>293.7</td>
<td>145.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.5^{(3)}</td>
<td>0</td>
<td>0</td>
<td>11.0</td>
<td>527.5</td>
</tr>
<tr>
<td>Combat Pistol Range</td>
<td>0</td>
<td>2.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.1</td>
<td>4.2</td>
</tr>
<tr>
<td>Multi-purpose Range Complex^{(4)}</td>
<td>0</td>
<td>6.1</td>
<td>2.8</td>
<td>6.4</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
<td>16.1</td>
</tr>
<tr>
<td>Battle Sight Zero Range</td>
<td>0</td>
<td>2.1</td>
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<td>0</td>
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<td>2.1</td>
<td>4.2</td>
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<tr>
<td>Multi-purpose Training Range</td>
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<td>0</td>
<td>14.3</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>22.6</td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>Multi-purpose Automated Unknown Distance Range/Field Fire Range</td>
<td>0</td>
<td>9.2</td>
<td>0.4</td>
<td>21.4</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>31.0</td>
<td></td>
</tr>
<tr>
<td>infantry Platoon Battle Course (Automated)</td>
<td>0</td>
<td>16.2</td>
<td>0</td>
<td>6.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.6</td>
<td>23.2</td>
<td></td>
</tr>
<tr>
<td>Urban Assault Course (South)</td>
<td>0</td>
<td>20.1</td>
<td>4.6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>24.7</td>
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</tr>
<tr>
<td>Southern Battle Area Complex</td>
<td>0</td>
<td>69.8</td>
<td>11.8</td>
<td>12.1</td>
<td>0.1</td>
<td>2.5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>96.3</td>
<td></td>
</tr>
<tr>
<td>Drop Zone</td>
<td>0</td>
<td>0.2</td>
<td>302.2</td>
<td>42.7</td>
<td>14.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>96.5</td>
<td>455.6</td>
<td></td>
</tr>
<tr>
<td>Field Artillery Indirect Fire Range (Firing Points)</td>
<td>0.4</td>
<td>18.9</td>
<td>32.2</td>
<td>14.1</td>
<td>1.5</td>
<td>0</td>
<td>17.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.9</td>
<td>85.0</td>
</tr>
<tr>
<td>Convoy Course Engagement Areas</td>
<td>0</td>
<td>13.2</td>
<td>34.6</td>
<td>22.0</td>
<td>2.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8.6</td>
<td>80.8</td>
</tr>
<tr>
<td>Convoy Course</td>
<td>0</td>
<td>9.8</td>
<td>20.9</td>
<td>3.5</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>27.5</td>
<td>62.1</td>
</tr>
<tr>
<td>Tracked Vehicle Driver’s Course</td>
<td>1.5</td>
<td>33.1</td>
<td>39.8</td>
<td>18.1</td>
<td>0.7</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
<td>0</td>
<td>1.4</td>
<td>6.4</td>
<td>100.2</td>
</tr>
<tr>
<td>Tactical Amphibious Landing Beach (Unai Chulu)</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
<td>0.9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3.0</td>
<td>0</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>Landing Zones</td>
<td>0</td>
<td>7.0</td>
<td>5.3</td>
<td>6.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.4</td>
<td>19.8</td>
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</tr>
<tr>
<td>Range Control Observation Points</td>
<td>0</td>
<td>1.7</td>
<td>9.4</td>
<td>3.7</td>
<td>0</td>
<td>0</td>
<td>&lt;0.1</td>
<td>0</td>
<td>&lt;0.1</td>
<td>0</td>
<td>14.8</td>
<td></td>
</tr>
<tr>
<td>Surface Radar Sites</td>
<td>0</td>
<td>0.1</td>
<td>0.6</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
<td>0</td>
<td>&lt;0.1</td>
<td>0</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Roadway Improvements</td>
<td>0</td>
<td>4.0</td>
<td>4.4</td>
<td>2.4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>32.4</td>
<td>43.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fences</td>
<td>1.1</td>
<td>10.9</td>
<td>9.0</td>
<td>9.0</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>&lt;0.1</td>
<td>0</td>
<td>5.7</td>
<td>35.8</td>
</tr>
<tr>
<td>Munitions Storage Area</td>
<td>0</td>
<td>5.9</td>
<td>27.0</td>
<td>4.9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>&lt;0.1</td>
<td>37.8</td>
</tr>
<tr>
<td>Airport Improvements and Staging Area</td>
<td>0</td>
<td>147.8</td>
<td>0</td>
<td>23.3</td>
<td>7.9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>48.7</td>
<td>227.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tinian Port Improvements and Staging Area</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4.5</td>
<td>4.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Camp</td>
<td>0</td>
<td>229.9</td>
<td>0</td>
<td>10.5</td>
<td>3.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12.5</td>
<td>256.2</td>
<td></td>
</tr>
<tr>
<td><strong>Total Impacted under Alternative 3</strong></td>
<td><strong>6.3</strong></td>
<td><strong>690.3</strong></td>
<td><strong>798.8</strong></td>
<td><strong>367.0</strong></td>
<td><strong>31.0</strong></td>
<td><strong>2.8</strong></td>
<td><strong>17.2</strong></td>
<td><strong>0.5</strong></td>
<td><strong>0.1</strong></td>
<td><strong>3.1</strong></td>
<td><strong>259.0</strong></td>
<td><strong>2,176.1</strong></td>
</tr>
<tr>
<td><strong>Total on Tinian</strong></td>
<td><strong>1,355.7</strong></td>
<td><strong>6,853.1</strong></td>
<td><strong>8,442.7</strong></td>
<td><strong>4,819.0</strong></td>
<td><strong>353.9</strong></td>
<td><strong>97.9</strong></td>
<td><strong>551.0</strong></td>
<td><strong>64.9</strong></td>
<td><strong>331.7</strong></td>
<td><strong>199.9</strong></td>
<td><strong>1,915.7</strong></td>
<td><strong>24,986.4</strong></td>
</tr>
</tbody>
</table>

**% Impacted under Alternative 3 on Tinian** | 0.5% | 10.1% | 9.5% | 7.5% | 9.1% | 2.9% | 3.1% | 0% | 0.0% | 0.1% | 13.4% | 8.7% |

**Notes:**
*Project areas are based on areas depicted and labeled in Section 2.4.
^{(1)}NLF = native limestone forest; MIF = mixed introduced forest; TT = tangantangan; HS = herbaceous-scrub; Cas = *Casuarina* forest; Coco = coconut forest;
BS = beach strand; Wet = potential wetlands; Ag = agriculture; Bar = barren; Dev = developed; < = less than.
^{(2)}Includes fire break/buffer, perimeter road, Hand Grenade Range, Mortar Range, Light Anti-armor Weapon Range, Grenade Launcher Range, targets for Close Air Support Range, targets for Offensive Air Support Range, targets for Field Artillery Indirect Fire Range.
^{(3)}Although two ephemeral ponds associated with the Mahalang Complex would be impacted under Alternative 3, these have not been delineated as wetlands at this time.
^{(4)}Includes Anti-armor Tracking Range, Tank/Fighting Vehicle Stationary Target Range, and Multi-purpose Range Complex.
4.9.3.3.1.2 Native Wildlife

Potential impacts from construction activities associated with Tinian Alternative 3 to native bird species that are not listed under the Migratory Bird Treaty Act are described in this section. As discussed above in vegetation, a total of approximately 1,914 acres (775 hectares) of habitat would be removed because of proposed construction activities under Tinian Alternative 3 (see Table 4.9-7).

Table 4.9-8 provides the number of birds that may be impacted for five monitored bird species due to the loss of 1,862 acres (754 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats (DoN 2014a).

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Birds Impacted by Removal of Habitat*</th>
<th>Total</th>
<th>Estimated 2013 Total Tinian Population</th>
<th>% of Tinian Population Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridled white-eye</td>
<td>114</td>
<td>35,919</td>
<td>442,073</td>
<td>8.0%</td>
</tr>
<tr>
<td>Micronesian honeyeater</td>
<td>7</td>
<td>1,473</td>
<td>20,660</td>
<td>7.0%</td>
</tr>
<tr>
<td>Micronesian starling</td>
<td>11</td>
<td>3,119</td>
<td>40,489</td>
<td>7.6%</td>
</tr>
<tr>
<td>Rufous fantail</td>
<td>41</td>
<td>9,593</td>
<td>125,668</td>
<td>7.6%</td>
</tr>
<tr>
<td>Tinian monarch</td>
<td>29</td>
<td>7,182</td>
<td>91,420</td>
<td>7.8%</td>
</tr>
</tbody>
</table>

Notes: *NLF = native limestone forest, MIF = mixed introduced forest, TT = tangantangan, HS = herbaceous scrub. Source: DoN 2014a.

Under Tinian Alternative 3, approximately 7,182 Tinian monarchs would potentially be permanently displaced by loss of habitat associated with construction (see Table 4.9-8). Therefore, because of the amount of habitat removed and the number of birds potentially impacted, significant direct impacts to the Tinian monarch would occur from implementation of Tinian Alternative 3.

As discussed under Alternative 1 (see Section 4.9.3.1), four areas are being assessed as potential conservation areas for the protection of the Tinian monarch and other wildlife species (Figure 4.9-2). These areas may also be used for additional natural resource mitigation measures such as forest enhancement and/or invasive species control. The Department of Defense is coordinating with the Federal Aviation Administration and the U.S. Fish and Wildlife Service on these potential conservation areas.

Similar to Tinian Alternative 1, proposed construction activities would reduce the amount of habitat available to native birds on Tinian and impacts under Alternative 3 (see Section 4.9.3.1). Therefore, implementation of Tinian Alternative 3 and the removal of approximately 1,862 acres (754 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats would result in significant direct impacts to the populations of bridled white-eye, Micronesian honeyeater, Micronesian starling, rufous fantail, and Tinian monarch. These bird species are territorial, meaning that a minimum area is required for each bird or breeding pair for all of their foraging and nesting activities. For most animal species, and particularly within island ecosystems, available but unoccupied habitat is rare (if it does exist, it is generally very low-quality habitat). This is the case unless populations are limited not by habitat, but by predators, disease, or over-hunting. Based on available data, there is no indication that there are large areas of available but unoccupied habitat on Tinian, particularly for forest and shrub breeding bird species.
The same potential mitigation measures discussed previously under Alternative 1 to mitigate potential significant direct, long-term impacts of proposed construction activities on native forest birds would be applicable under Alternative 3 (i.e., forest enhancement of native limestone forest, mixed introduced forest, tangantangan forest, and herbaceous scrub habitats). However, impacts from the loss of 1,862 acres (754 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitat would be significant, even with forest enhancement efforts. Although bird densities are higher in higher-quality habitats and more birds are expected to eventually occupy areas of proposed forest enhancement, the proposed area of forest enhancement is not large enough to make up for the overall loss of available habitat under Alternative 3.

In addition, mitigation monitoring would be conducted with the preparation of a Forest Enhancement/Restoration and Monitoring Plan and a Forest Bird Monitoring and Tinian Monarch Management Plan.

Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

### 4.9.3.3.1.3 Special-status Species: Endangered Species Act-listed and Proposed Species

Figures 4.9-7a and 4.9-7b provide the general locations of special-status species within the Military Lease Area in relation to Tinian Alternative 3. Direct impacts to special-status species from proposed construction activities include the removal of habitat, fragmentation of remaining habitat, and associated noise, light, and human activities. Individual special-status species are discussed below.

#### Mariana Fruit Bat

Impacts to Mariana fruit bats resulting from implementation of Tinian Alternative 3 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, potential direct and indirect impacts to Mariana fruit bats from proposed construction activities associated with Tinian Alternative 3 would be less than significant.

#### Mariana Common Moorhen

Impacts to Mariana common moorhens resulting from implementation of Tinian Alternative 3 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, potential direct and indirect impacts to Mariana common moorhens from proposed construction activities associated with Tinian Alternative 3 would be less than significant.

#### Micronesian Megapode

Impacts to Micronesian megapodes resulting from implementation of Tinian Alternative 3 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, potential direct and indirect impacts to Micronesian megapodes from proposed construction activities associated with Tinian Alternative 3 would be less than significant.
**Legend**

- Military Lease Area
- Surface Radar Tower
- Range Control Observation Post
- Proposed Vegetation Clearance
- Tactical Amphibious Landing Beaches
  - Amphibious Assault Vehicle
  - Landing Craft Air Cushion, small boat, and swimmer training
- Proposed Perimeter Road/Range Control Observation Post
- Proposed Access Road
- Mariana Common Moorhen
- Mariana Fruit Bat
- Micronesian Megapode
- Micronesian Gecko
- Humped Tree Snail
- Green Sea Turtle Nesting

**Note:** Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.

**Figure 4.9-7a**
Northern Military Lease Area - Tinian Alternative 3, Occurrence of Special-status Species

**Sources:**
- Hawaiian Agronomics 1985
- Krueger and O’Daniel 1999
- O’Daniel and Krueger 1999
- Witteman 2001
- Vogt 2008
- USFWS 2009, 2010
- Wenninger 2012
- DoN 2013a, 2013b, 2013d, 2014a, 2014c
Figure 4.9-7b
Southern Military Lease Area - Tinian Alternative 3, Occurrence of Special-status Species

Legend
- Military Lease Area
- Surface Radar Tower
- Range Control Observation Post
- Proposed Vegetation Clearance
- Existing Tinian Military Retention
- Land for Wildlife Conservation
- Tactical Amphibious Landing Beaches
- Landing Craft Air Cushion, small boat, and swimmer training

Note: Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.

Sources:
Sea Turtles

Impacts to nesting sea turtles resulting from implementation of Tinian Alternative 3 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, potential direct and indirect impacts to sea turtles from proposed construction activities associated with Tinian Alternative 3 would be less than significant. The assessment of potential impacts to sea turtles in the marine environment is provided in Section 4.10, Marine Biology.

Humped Tree Snail

Impacts to humped tree snails under Tinian Alternative 3 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, there would be no impacts to humped tree snails from proposed construction activities under Tinian Alternative 3.

Heritiera longipetiolata

Impacts to *H. longipetiolata* under Tinian Alternative 2 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, there would be no impacts to *H. longipetiolata* from proposed construction activities under Tinian Alternative 2.

Dendrobiun guamense

Impacts to *D. guamense* under Tinian Alternative 3 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Therefore, there would be no impacts to *D. guamense* from proposed construction activities under Tinian Alternative 3.

4.9.3.3.1.4 Special-status Species: Migratory Bird Treaty Act-listed Species

As discussed above in vegetation communities, approximately 1,914 acres (775 hectares) of habitat for native species would be removed because of proposed construction activities associated with Tinian Alternative 3 (see Table 4.9-7). Table 4.9-9 provides the number of birds that may be impacted for three monitored Migratory Bird Treaty Act-listed bird species due to the loss of 1,862 acres (754 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats (DoN 2014a).

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Birds Impacted by Removal of Habitat*</th>
<th>Total</th>
<th>Estimated 2013 Total Tinian Population</th>
<th>% of Tinian Population Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NLF</td>
<td>MIF</td>
<td>TT</td>
<td>HS</td>
</tr>
<tr>
<td>Collared Kingfisher</td>
<td>1</td>
<td>67</td>
<td>49</td>
<td>57</td>
</tr>
<tr>
<td>Mariana Fruit-dove</td>
<td>1</td>
<td>136</td>
<td>103</td>
<td>58</td>
</tr>
<tr>
<td>White-throated Ground-dove</td>
<td>2</td>
<td>167</td>
<td>53</td>
<td>71</td>
</tr>
</tbody>
</table>

Notes: *NLF = native limestone forest, MIF = mixed introduced forest, TT = tangantangan, HS = herbaceous scrub. Source: DoN 2014a.

Direct and indirect impacts to Migratory Bird Treaty Act-listed species resulting from implementation of Tinian Alternative 3 would be similar to those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1). Under Tinian Alternative 3, proposed construction activities would remove 1,862 acres (754 hectares) of forested (native limestone forest, mixed introduced forest, and tangantangan) and herbaceous scrub habitats available to Migratory Bird Treaty Act-listed species on Tinian. Therefore,
implementation of Tinian Alternative 3 and the removal of approximately 1,862 acres (754 hectares) of forested and herbaceous scrub habitats would result in less than significant direct and indirect impacts to Migratory Bird Treaty Act-listed seabirds and shorebirds, but significant impacts to populations of forest- and scrub-nesting bird species. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of best management practices (see Section 4.9.2).

The same potential mitigation measures discussed previously under Alternative 1 to mitigate potential significant direct, long-term impacts of proposed construction activities on Migratory Bird Treaty Act-listed species would be applicable under Alternative 3. Under Alternative 3, forest enhancement of forested and herbaceous scrub habitats would occur. However, impacts from the loss of 1,862 acres (754 hectares) of forested and herbaceous scrub habitat would be significant, even with forest enhancement efforts. In addition, mitigation monitoring would be conducted with the preparation of a Forest Enhancement/Restoration and Monitoring Plan and a Forest Bird Monitoring and Tinian Monarch Management Plan.

Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

4.9.3.3.1.5 Special-status Species: CNMI-listed Species

As described in Section 3.9, Terrestrial Biology, the Mariana common moorhen, Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are all CNMI-listed threatened/endangered species. These species are discussed above within the Endangered Species Act-listed Species section.

Micronesian Gecko

Impacts to Micronesian geckos resulting from implementation of Tinian Alternative 3 would be the same as those previously discussed under Tinian Alternative 1 (see Section 4.9.3.1).

4.9.3.3.2 Operation Impacts

4.9.3.3.2.1 Vegetation Communities

Impacts to vegetation communities from training operations associated with Tinian Alternative 3 would be the same as those previously discussed for Tinian Alternative 1 (see Section 4.9.3.1). Therefore, implementation of Tinian Alternative 3 would result in less than significant direct and indirect impacts to vegetation communities.

4.9.3.3.2.2 Native Wildlife

Impacts to native wildlife from training operations associated with Tinian Alternative 3 would be the same as those previously discussed for Tinian Alternative 1 (see Section 4.9.3.1). Therefore, implementation of Tinian Alternative 3 would result in less than significant direct impacts to native wildlife. In addition, as discussed under Alternative 1, the DoN, in coordination with the U.S. Fish and Wildlife Service, would prepare a Tinian Forest Bird Monitoring and Tinian Monarch Management Plan to monitor the potential effects of proposed CJMT activities on Migratory Bird Treaty Act-listed forest birds within the Military Lease Area. Potential indirect impacts associated with potential introduction of...
non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

4.9.3.3.2 Special-status Species

Impacts to Endangered Species Act-listed and proposed species, Migratory Bird Treaty Act-listed species, and CNMI-listed species resulting from the implementation of Tinian Alternative 3 would be the same as those previously discussed for Tinian Alternative 1 (see Section 4.9.3.1). Therefore, there would be less than significant direct and indirect impacts to special-status species from operational activities associated with Tinian Alternative 3.

4.9.3.4 Tinian No-Action Alternative

Vegetation and ground disturbance activities would be minor and localized during the periodic non-live-fire military training exercises that occur within the Military Lease Area. Vehicular noise and air emissions would also occur during these periodic training exercises. All existing mitigation and compensation measures would be adhered to in order to minimize any adverse impacts to terrestrial biological resources, including special-status species. Biosecurity measures on Tinian are in place to minimize the introduction or spread of invasive species including the brown treesnake. The Guam and CNMI Military Relocation EIS (DoN 2010a) included the establishment of the four live-fire training ranges on Tinian that would introduce significant but mitigable impacts to native habitat and special-status species (see Table 10.2-13; DoN 2010a). No impacts to terrestrial biology resources would occur due to Mariana Islands Range Complex operations (see Table 3.11-6, Summary of Effects to Endlisted Species Act-listed Species, and Table 3.11-7; DoN 2010b). Therefore, overall, significant but mitigable impacts would occur under the no-action alternative.
### Summary of Impacts for Tinian Alternatives

Table 4.9-10 provides a comparison of the potential impacts to terrestrial biology resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th><strong>Tinian (Alternative 1)</strong></th>
<th><strong>Tinian (Alternative 2)</strong></th>
<th><strong>Tinian (Alternative 3)</strong></th>
<th><strong>No-Action Alternative</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vegetation Communities</strong></td>
<td>SI</td>
<td>LSI</td>
<td>SI</td>
<td>LSI</td>
</tr>
<tr>
<td><strong>Native Wildlife</strong></td>
<td>SI</td>
<td>LSI</td>
<td>SI</td>
<td>LSI</td>
</tr>
<tr>
<td>Special-status Species: Endangered Species Act – Listed and Proposed</td>
<td>LSI (Mariana fruit bat, Mariana common moorhen, Micronesian megapode, sea turtles). NI (humped tree snail, Heritiera longipetiola, Dendrobium guamense)</td>
<td>LSI (Mariana fruit bat, Mariana common moorhen, Micronesian megapode, sea turtles). NI (humped tree snail, Heritiera longipetiola, Dendrobium guamense)</td>
<td>LSI (Mariana fruit bat, Mariana common moorhen, Micronesian megapode, sea turtles). NI (humped tree snail, Heritiera longipetiola, Dendrobium guamense)</td>
<td>LSI (Mariana fruit bat, Mariana common moorhen, Micronesian megapode, sea turtles). NI (humped tree snail, Heritiera longipetiola, Dendrobium guamense)</td>
</tr>
<tr>
<td>Special-status Species: Migratory Bird Treaty Act</td>
<td>SI</td>
<td>LSI</td>
<td>SI</td>
<td>LSI</td>
</tr>
<tr>
<td>Special-status Species: CNMI-listed Species</td>
<td>NI (Micronesian gecko)</td>
<td>NI (Micronesian gecko)</td>
<td>NI (Micronesian gecko)</td>
<td>NI (Micronesian gecko)</td>
</tr>
</tbody>
</table>

**Legend:** LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts.
### 4.9.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives

Table 4.9-11 provides a summary of the potential mitigation measures for terrestrial biology resources for the three Tinian alternatives.

#### Table 4.9-11. Summary of Mitigation Measures for Tinian Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>TinianPhase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TERRESTRIAL BIOLOGY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Vegetation Communities | SI | • Department of Defense may implement forest enhancement on 6.3 acres (2.5 hectares) to replace the area of native limestone forest removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native limestone forest habitats.  
• To avoid and minimize impacts to native limestone forest on Tinian, the Department of Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as “No Wildlife Disturbance Areas,” with the following actions prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.  
• Department of Defense may implement forest enhancement in areas of tangantangan or herbaceous scrub habitat to replace the forested habitats removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native forest habitats. | X |
Table 4.9-11. Summary of Mitigation Measures for Tinian Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Native Wildlife</strong> &lt;br&gt; <em>Alternative 1:</em> The removal of 1,745 acres (706 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the Tinian monarch, and other native wildlife species would be unavoidable. &lt;br&gt; <em>Alternative 2:</em> The removal of 1,883 acres (762 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the Tinian monarch, and other native wildlife species would be unavoidable. &lt;br&gt; <em>Alternative 3:</em> The removal of 1,862 acres (754 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the Tinian monarch, and other native wildlife species would be unavoidable.</td>
<td>SI</td>
<td>- Department of Defense may implement forest enhancement in areas of mixed introduced forest, tangantangan, or herbaceous scrub habitat to replace the forest habitat removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native forest habitats. &lt;br&gt; - Department of Defense may replace the current Tinian Military Retention Land for Wildlife Conservation by establishing a conservation area(s) for the protection of the Tinian monarch and other wildlife species with one or more conservation sites within the Military Lease Area. Forest enhancement and invasive species control may also be implemented within the replacement Wildlife Conservation site(s). &lt;br&gt; - To improve habitat quality for native wildlife on Tinian, the Department of Defense may implement monitoring and control of non-native invasive species within forest habitat, including control of invasive plant, mammal, and insect species. &lt;br&gt; - To avoid and minimize impacts to native wildlife species that use native limestone forest on Tinian, the Department of Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as “No Wildlife Disturbance Areas,” with the following actions prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.</td>
</tr>
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</table>
Table 4.9-11. Summary of Mitigation Measures for Tinian Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>TinianPhase</th>
</tr>
</thead>
</table>
| Special-status Species: Endangered Species-Act-listed and Proposed Species | LSI | • To avoid impacts to Mariana common moorhens at the Lake Hagoi and two Bateha wetland sites, the Department of Defense will designate the three wetland sites as “No Training Areas.” Ground disturbance and vegetation removal of any kind will be prohibited within these “No Training Areas.” In addition, CJMT-associated aircraft overflights of these sites will be limited to a minimum altitude of 500 feet (152 meters) above ground level. Wetland “No Training Area” restrictions would be implemented upon initiation of CJMT training activities on Tinian.  
• To mitigate for loss of Mariana common moorhen foraging habitat at Mahalang, the Department of Defense may implement portions of the DoN Tinian Wetlands Management Plan at Hagoi and two Bateha sites. This may include invasive plant surveys, monitoring, and control; habitat restoration and improvement; baseline surveys for moorhen predators; and predator control at Hagoi and Bateha.  
• To avoid and minimize impacts to special-status species that use native limestone forest on Tinian, the Department of Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as “No Wildlife Disturbance Areas,” with the following actions prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.  
• To avoid and minimize impacts to nesting sea turtles, the Department of Defense will implement training protocols at all beaches used for amphibious operations on Tinian. Biologists trained in identifying sea turtle nests will survey landing beaches no | X |
Table 4.9-11. Summary of Mitigation Measures for Tinian Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>TinianPhase</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>more than 6 hours prior to the first craft landing or use of other beach landing equipment. Any potential sea turtle nests will be flagged, with a buffer zone of 20 feet (6 meters) from the edge of the nesting activity (area disturbed by the turtle) to ensure complete avoidance. The flagged area will be avoided by landing craft and personnel. Beach training activities will also be coordinated with monthly sea turtle nest monitoring, during which any potential turtle nests will be flagged, with a buffer zone of 20 feet (6 meters) to ensure avoidance. If an active nest with a pre-hatch hole is discovered on a beach during monitoring, night training over the next 5 nights will be conducted only on other beaches. If beach sand is compacted by landing craft, the beach topography will be restored within 3 days using non-mechanized methods (e.g., rakes or other hand tools). The Department of Defense will implement beach training protocols upon initiation of CJMT amphibious training activities.</td>
<td>SI</td>
</tr>
</tbody>
</table>

Special-status Species: Migratory Bird Treaty Act-listed Species

Alternative 1: The removal of 1,745 acres (706 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the collared kingfisher, Mariana fruit dove, and white-throated ground-dove, would be unavoidable.

Alternative 2: The removal of 1,883 acres (762 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the collared kingfisher, Mariana fruit dove, and white-throated ground-dove, would be unavoidable.

Alternative 3: The removal of 1,862 acres (754 hectares) of forested and herbaceous scrub habitats (including Tinian
Table 4.9-11. Summary of Mitigation Measures for Tinian Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>TinianPhase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military Retention Land for Wildlife Conservation) used by native landbirds, including the collared kingfisher, Mariana fruit dove, and white-throated ground-dove, would be unavoidable.</td>
<td></td>
<td>with the following actions prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.</td>
<td>Construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To improve habitat quality for native wildlife on Tinian, Department of Defense may implement monitoring and control of non-native species within forest habitat, including control of invasive plant, mammal, and insect species.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To avoid and minimize impacts to Mariana fruit bats and sea turtles, hooded lights will be used to the maximum extent practicable at all new roads and facilities within sea turtle nesting habitat and fruit bat foraging and roosting habitat. “Night-adapted” lights will be installed in the briefing and bleacher areas. Illumination of forests, coastlines, and beaches will be kept to an absolute minimum. Lighting will be designed to meet minimum safety, anti-terrorism, and force protection requirements.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To avoid impacts to Migratory Bird Treaty Act-listed species that use the Lake Hagoi and two Bateha wetland sites, the Department of Defense will designate the three wetland sites as “No Training Areas.” Ground disturbance and vegetation removal of any kind will be prohibited within these “No Training Areas.” In addition, the CJMT-associated aircraft overflights of these sites will be limited to a minimum altitude of 500 feet (152 meters) above ground level. Wetland “No Training Area” restrictions would be implemented upon initiation of CJMT training activities on Tinian.</td>
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</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.
Note: Mitigation measures associated with terrestrial biology do not alter the significance of the impacts.
4.9.4 Pagan

4.9.4.1 Pagan Alternative 1

4.9.4.1.1 Vegetation Communities

Vegetation communities that would be impacted during construction activities under Pagan Alternative 1 are listed in Table 4.9-12 and shown in Figure 4.9-8. While bare ground, lava, and sand areas do not have vegetation that would be impacted, the acreage within the project footprints for these community types is included for habitat area reference.

Table 4.9-12. Potential Direct Impacts to Vegetation Communities with Implementation of Pagan Alternative 1

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Vegetation Community (acres)*</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>NF</td>
</tr>
<tr>
<td>Northern High Hazard Impact Area</td>
<td>7.1</td>
</tr>
<tr>
<td>Isthmus High Hazard Impact Area</td>
<td>7.2</td>
</tr>
<tr>
<td>Field Artillery Direct Fire Range</td>
<td>0</td>
</tr>
<tr>
<td>Field Artillery Indirect Fire Range</td>
<td>0</td>
</tr>
<tr>
<td>Airfield Clear Zone</td>
<td>0</td>
</tr>
<tr>
<td>Munitions Storage Area</td>
<td>0.8</td>
</tr>
<tr>
<td>Landing Zones</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Military Training Trails</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>Total Impacted under Alternative 1</strong></td>
<td><strong>19.8</strong></td>
</tr>
<tr>
<td><strong>Total on Pagan</strong></td>
<td><strong>418</strong></td>
</tr>
<tr>
<td>% Impacted under Alternative 1 on Pagan</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

Notes: *Impact areas are based on areas depicted and labeled in Chapter 2, Proposed Action and Alternatives, Figure 2.6-4. Numbers may not add precisely due to rounding.
Legend: Bar = barren: lava, cinder, or bare ground; Cas = Casuarina forest; Coco = coconut forest; Grass = grassland; HS = herbaceous scrub; MNIF = mixed native-introduced forest; NF = native forest; Sand = sand.

Under Pagan Alternative 1, approximately 623 vegetated acres (252 hectares) would be cleared within the northern part of the island and represents approximately 7% of the island’s vegetation. The majority of the removed habitat comprises approximately 47 acres (19 hectares) of mixed native-introduced forest (12% of total on island), 98 acres (40 hectares) of herbaceous scrub (7% of total on island), and 167 acres (68 hectares) of *Casuarina* forest (5% of total on island). Approximately 20 acres (8 hectares) (4% of total on island) of native forest would be removed, primarily within the High Hazard Impact Areas (see Table 4.9-11). Given the importance of native forest habitat for native species, this permanent loss of native vegetation would be a significant and unavoidable direct impact. Potential indirect impacts to vegetation associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2 and Appendix D, Best Management Practices).
Pagan Alternative 1, Vegetation Communities

Legend

Proposed Vegetation Clearance
Proposed Military Training Trail Network

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

Barren (Bare Ground)
Barren (Lava or Cinder)
Casuarina Forest
Coconut Forest
Grassland
Herbaceous-Scrub
Mixed Native-Introduced Forest
Native Forest
Sand

Figure 4.9-8
Pagan Alternative 1, Vegetation Communities

Source: Rogers 2010
To mitigate for significant impacts to native forest on Pagan, the Department of Defense may facilitate native forest regeneration on southern Pagan by implementing feral ungulate removal. This would consist of active control (i.e. trapping, snaring, shooting) of animals, with the goal of eradicating all feral ungulates from southern Pagan. The Department of Defense may also implement monitoring and control of non-native invasive species within forest habitat on Pagan, including control of invasive plant, mammal, and insect species.

### 4.9.4.1.1.2 Native Wildlife

Potential impacts from construction activities associated with Pagan Alternative 1 to native bird species on Pagan that are not listed under the Migratory Bird Treaty Act are described in this section. Species protected under the Migratory Bird Treaty Act are addressed separately in the Special-status Species section. Long-term habitat loss would result from the construction of the proposed facilities. Approximately 258 acres (104 hectares) of forested habitat would be removed by construction (see Table 4.9-11). This permanent loss of habitat would affect approximately 5% of the island’s forest habitat and reduce the available habitat for wildlife populations.

Therefore, implementation of Pagan Alternative 1 and the removal of approximately 258 acres (104 hectares) of forested habitats would result in less than significant direct impacts to native wildlife populations. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).

### 4.9.4.1.1.3 Special-status Species: Endangered Species Act-listed and Proposed Species

Based on historical data and surveys conducted in support of this EIS/OEIS, Figure 4.9-9 provides the general locations of special-status species in relation to Pagan Alternative 1. Direct impacts to special-status species from proposed construction activities include the removal of habitat, fragmentation of remaining habitat, and associated noise and human activities. With the exception of the Mariana fruit bat, none of the areas proposed for construction would occur within the vicinity of federally listed or proposed species habitat on Pagan, as most Endangered Species Act-listed species are located on southern Pagan south of the isthmus. Therefore, there would be no impacts to these species resulting from construction. Construction in the northern portion of the island would remove potential foraging habitat for the Mariana fruit bat (4% of native forest, 12% of mixed native introduced forest, and 5% of Casuarina forest). In addition, construction activities could potentially temporarily displace fruit bats from their foraging areas due to noise and human presence.

Construction noise on Pagan would occur with the extension of the expeditionary airfield, clearing of landing zones, and clearing for an unpaved perimeter road around the northern portion of the island (see Figures 2-13 and 2-14). Noise levels from equipment and other construction activities are anticipated to generate noise levels from 70-90 decibels at a distance of 50 feet (15 meters). Fruit bats on the northeastern end of Pagan may flush from and temporarily avoid the roosting site and foraging locations in this area during clearing for the perimeter road. Effects of such flushing may include temporary disruption of roosting and foraging behaviors. As there are no proposed construction activities within southern Pagan, the two fruit bat colonies in southern Pagan would not be exposed to construction noise.
Figure 4.9-9
Pagan Alternative 1, Occurrence of Special-status Species

Legend
- Proposed Vegetation Clearance
- Tactical Amphibious Landing Beaches
  - Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
  - Landing Craft Air Cushion, small boat and swimmer training
  - Small boat and swimmer training
- Proposed Military Training Trail
- Micronesian Megapode Occurrence: depicts transects where megapodes were detected during 2010 surveys
- Humped Tree Snail population
- Slevin’s Skink

Note: Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.

Sources: Reed et al. 2010; Amidon et al. 2011
Based upon the above information, direct impacts to the Mariana fruit bat population from construction activities associated with Pagan Alternative 1 would be less than significant.

4.9.4.1.4 Special-status Species: Migratory Bird Treaty Act-listed Species

Of the 12 bird species that have been observed on Pagan and are protected under the Migratory Bird Treaty Act (Table 3.9-7), 9 species are seabirds and 3 are landbirds. As discussed above in Vegetation Communities, approximately 258 acres (104 hectares) of forested habitat for native species would be removed because of Pagan Alternative 1 proposed construction activities (see Table 4.9-12). Construction impacts to landbird species protected under the Migratory Bird Treaty Act would be similar to that described above for wildlife. Therefore, implementation of Pagan Alternative 1 and the removal of approximately 258 acres (104 hectares) of forested habitats through construction activities would result in less than significant direct and indirect impacts to populations of Migratory Bird Treaty Act-listed forest birds.

4.9.4.1.5 Special-status Species: CNMI-listed Species

As described in Section 3.9, Terrestrial Biology, the federally listed Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are also listed as threatened/endangered by the CNMI. Impacts to these species are discussed previously under the Special-status Species: Endangered Species Act-listed and Proposed Species section. No other CNMI-listed species occur on Pagan.

4.9.4.1.2 Operation Impacts

4.9.4.1.2.1 Vegetation Communities

Potential impacts to vegetation communities from training operations associated with Pagan Alternative 1 include foot traffic, vehicle use, and fire potential. There would be no impacts to vegetation from vehicle use in the southern portion of the island as vehicle travel would be restricted to only the northern portion of the island where the topography allows. Off-road vehicle use in the Northern Live-Fire Maneuver Area would increase the potential of soil erosion and cause direct vegetation disturbance. Soil erosion could also be generated through ongoing training exercises where lands are cleared and/or disturbed for bivouac sites and digging. Large amounts of foot traffic, camping, equipment staging, and ordnance deployment would result in the crushing, breaking, removal, and reduction of overall vegetative cover; and could potentially cause erosion during the rainy season. However, the location of foot traffic would vary during training throughout the maneuver areas, thereby minimizing impacts in any one area. In addition, vegetation growth on Pagan is fairly robust and it is expected that vegetation would regrow rapidly.

Fire potential would increase due to proposed live-fire range operations. Fire can result in direct effects to vegetation by killing or damaging individual plants; or indirect effects, for example, increasing erosion, allowing non-native species to invade and altering wildlife habitat by reducing food resources, breeding habitat, and shelter. The majority of the northern High Hazard Impact Area would be located within lava/cinder and bare ground areas. Vegetation in both the northern and isthmus High Hazard Impact areas would be maintained at approximately 6 inches (15 centimeters) above ground. In addition, the isthmus High Hazard Impact Area would contain a fire break established around the perimeter, and targets would be placed in areas of sparse vegetation. The potential for the spread of wildfire would thus be minimized. A fire prevention and management plan would be developed prior to
initiation of live-fire training that would outline standard procedures for safe range use and management of fire risk.

Potential impacts to vegetation communities from training operations would be avoided and minimized by implementing resource management measures summarized in Section 4.9.2 and presented in detail in Appendix D, Best Management Practices. In particular, establishment of a firebreak around the High Hazard Impact Area, vegetation management within the associated target areas and firebreak, and implementation of a Fire Prevention and Management Plan, which establishes management and fire suppression and emergency response procedures, would minimize fire risk. Given implementation of resource management measures, implementation of the training activities associated with Pagan Alternative 1 would result in less than significant direct and indirect impacts to vegetation communities due to foot traffic and vehicle use.

4.9.4.1.2.2 Native Wildlife

Potential direct and indirect impacts to native wildlife species may result from direct strikes during maneuver training and munitions use, fires, noise from munitions training and aircraft, and direct strikes from aircraft. Indirect impacts to wildlife species may result from potential non-native species introductions.

Direct Strikes from Maneuver Training and Munitions Use

Heavy vehicle movement both on roads and off-road as well as ordnance explosion could result in direct impacts to wildlife including wildlife injury/mortality and indirect impacts such as degradation and/or loss of habitat. The majority of the High Hazard Impact Areas would be located where there is limited wildlife habitat within lava/cinder and bare ground areas in the higher elevations of the Pagan or in areas where vegetation has been cleared. In addition, direct strike of wildlife by munitions is unlikely, as animals would flush and move away from target areas in response to munitions noise. Stray ammunition may fall within the surface danger zones; however, the likelihood of any single animal being struck is negligible. There is the potential for certain wildlife species to be crushed by vehicles, but most wildlife would be able to move away from the maneuvers to avoid this.

Disturbance from foot traffic throughout the island as well as off-road vehicle maneuvering in the northern maneuver area could cause some limited degradation and fragmentation of habitat. However, the location of foot traffic would vary during training throughout the maneuver areas minimizing impacts in any one area. In addition, vegetation growth on Pagan is fairly robust and it is expected that vegetation would regrow rather rapidly. As a result, it is expected that there would be less than significant direct and indirect impacts to wildlife due to direct strikes associated with maneuver training and munitions use under Pagan Alternative 1.

Fires

As stated in the Vegetation Communities section, fire potential would be increased from live-fire and vehicle maneuvering operations. Fire can result in direct effects to all wildlife through mortality from smoke inhalation or incineration. Native plants, animals, and their habitats on Pagan are adapted to a humid, tropical climate and are not adapted to a fire-driven ecosystem (U.S. Fish and Wildlife Service
2008). The alteration or removal of habitats by fire could reduce food sources, prevent or inhibit breeding, or create competition for feeding and sheltering, particularly for species that establish discrete territories. However, due to the proposed vegetation clearing during construction, vegetation management, and the preparation and implementation of a Fire Prevention and Management Plan (see previous discussion under Vegetation Communities), the potential for wildfire would be minimized. With implementation of these measures, direct and indirect impacts to native wildlife from fire are not anticipated under Pagan Alternative 1.

**Noise**

Direct impacts from noise would be limited to times of active training operations, which would occur up to 16 non-consecutive weeks per year (but not 24/7). Noise modeling studies were conducted for the proposed small arms and large caliber munitions and aircraft activities; noise levels and noise contours are provided in Section 4.5, Noise. Wildlife within the northern portion of Pagan would be exposed to noise of more than 85 decibels A-weighted day-night average sound level and 104 decibels Peak level from small-caliber weapons (see Figures 4.5-7 and 4.5-8), 70 decibels C-weighted day-night average sound level and 130 dB Peak level from large-caliber weapons (see Figures 4.5-9 and 4.5-10), and 65-70 decibels A-weighted day-night average sound level from aircraft operations (see Figure 4.5-12).

It is important to note that all operational noise disturbances would be temporary and would not be continuous for several reasons: (1) the type of activity (small- and large-caliber firing, and aircraft overflights) consists of non-continuous events; (2) training events would only occur up to 16 non-consecutive weeks per year; and (3) some ranges would likely not be used on any given training day.

No noise studies have been conducted specifically on wildlife species present on Pagan. However, noise studies have been conducted on the effects of military noise on wildlife species associated with other ranges that are similar to those proposed for use on Pagan. Refer to Tinian Alternative 1, Native Wildlife (see Section 4.9.3.1) for a summary of potential wildlife responses to noise associated with military training.

Training on Pagan would not be continuous, and some wildlife species have been shown to habituate to noise associated with training activities. However, due to the noise levels, time of day, and large geographic extent of noise that would be generated by live-fire training, there would be less than significant impacts to native wildlife species due to noise associated with Pagan Alternative 1 training operations.

**Aircraft Strikes**

Implementation of Pagan Alternative 1 would result in the potential for bird/animal aircraft strikes. However, in accordance with DoN requirements, a Bird/Animal Aircraft Strike Hazard Plan would be prepared to address all aircraft operations on Pagan. This plan would be prepared to minimize the occurrence of bird/animal aircraft strikes, and would provide detailed procedures to monitor and react to heightened risk of bird strikes. When risk increases, limits would be placed on low-altitude flight and some types of training. Special briefings would be provided to pilots whenever the potential exists for increased bird/animal strikes within the airspace.
With implementation of these procedures, potential direct and indirect impacts to native wildlife species from aircraft strikes resulting from implementation of Pagan Alternative 1 would be less than significant.

Introduction of Non-native Species

Training activities would result in increased transport of material and personnel by ship and aircraft between Guam, other CNMI locations, and Pagan. These activities have the potential to introduce non-native species that could degrade habitat. The brown treesnake is the most serious potential non-native species that could be brought to Pagan. In addition, several non-native plant species (e.g., refer to Space and Falanruw 1999) could be introduced due to the proposed training activities. These and other species have the potential to prey on or compete with native species and degrade native forest habitats.

Section 4.9.2 discusses in detail applicable biosecurity measures that the U.S. military would implement to ensure that risk from transporting invasive species to Pagan is controlled. Refer to Appendix D, Best Management Practices, and Appendix L, Biological Resources Supporting Documentation, for a detailed discussion of biosecurity measures.

With implementation of resource management measures, the introduction of non-native species would be avoided and potential direct and indirect impacts to native wildlife species would be less than significant.

4.9.4.1.2.3 Special-status Species: Endangered Species Act-listed and Proposed Species

Potential direct and indirect impacts to special-status species from direct strikes during maneuver training and munitions use, fires, direct strikes from aircraft, and non-native species introduction would be similar to those previously discussed for wildlife. There would be significant direct and indirect impacts from munitions noise on the Mariana fruit bat population on Pagan.

Mariana Fruit Bat

Currently, three Mariana fruit bat roost colonies are known on Pagan: two on southern Pagan and one on northern Pagan.

For those species of fruit bats that have been tested for hearing sensitivity, the hearing curves are very similar to those of humans, with similar upper and lower frequency limits and hearing threshold levels (Calford et al. 1985; Hall and Richards 2000). Therefore, it is likely that noise from live-fire operations at the proposed ranges would be heard by fruit bats as it would be heard by humans, and the modeled A- and C-weighted noise levels are appropriate for assessing the potential impacts of noise associated with proposed CJMT activities.

Munitions Noise. A summary of the expected noise levels at the three fruit bat colonies on Pagan due to live-fire weapons operations is presented in Table 4.9-13. Fruit bats at the colony located on northern Pagan would be exposed to small-caliber weapons noise levels of 64 decibels A-weighted day-night average sound level and 124 decibels Peak (Table 4.9-13). Received noise levels from large-caliber weapons would be 74 decibels C-weighted day-night average sound level and 147 decibels and greater than 150 decibels Peak under neutral and unfavorable weather conditions, respectively (Table 4.9-13).
Table 4.9-13. Modeled Weapons and Aircraft Noise Levels at Mariana Fruit Bat Colonies on Pagan under Alternative 1

<table>
<thead>
<tr>
<th>Location</th>
<th>Small-caliber Weapons</th>
<th>Large-caliber Weapons</th>
<th>Aircraft Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DNL (dBA)</td>
<td>Peak (dB)</td>
<td>DNL (dBC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Peak-n* (dB)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Peak-u* (dB)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>SEL (dBA)</td>
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<tr>
<td></td>
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<tr>
<td>Southern 1</td>
<td>&lt;50</td>
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<td></td>
<td></td>
<td></td>
<td>86.2</td>
</tr>
<tr>
<td>Southern 2</td>
<td>&lt;50</td>
<td>&lt;87</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>125</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>136</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>48.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>80.7</td>
</tr>
<tr>
<td>Northern</td>
<td>64</td>
<td>104</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>147</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>64.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>78.6</td>
</tr>
</tbody>
</table>

Legend: dB = decibels; dBA = A-weighted decibels; dBC = C-weighted decibels; DNL = day-night average sound level; Peak-n = Peak noise level under neutral weather conditions; Peak-u = Peak noise level under unfavorable weather conditions; < = less than; > = greater than.

Sources: Army Public Health Command 2014; DoN 2014b.

The periods of potential noise disturbance from live-fire weapons training on Pagan would occur approximately 16 non-consecutive weeks per year and would occur during both day and night. Due to the proximity of the High Hazard Impact Area to the northern colony, and the high noise levels from small- and large-caliber weapons training, Mariana fruit bats are expected to flush from and avoid the northeastern portion of the island periodically or permanently. Effects of such periodic flushing may include disruption of roosting and foraging behaviors, decreased ability to regulate their body temperature, increased stress, particularly during daytime hours, and abandonment and mortality of offspring.

The fruit bat colonies on southern Pagan would be exposed to lower noise levels from live-fire of small- and large-caliber weapons. The two southern colonies would be exposed to small-caliber weapons noise levels of less than 50 decibels A-weighted day-night average sound level, while Peak levels would be less than 87 decibels (see Table 4.9-13). Received noise levels at the Southern 1 colony from large-caliber weapons would be 55 decibels C-weighted day-night average sound level, and less than 110 decibels and 120 decibels Peak under neutral and unfavorable weather conditions, respectively (see Table 4.9-13). Large-caliber weapons training on northern Pagan at the isthmus High Hazard Impact Area would expose the Southern 2 colony to noise levels of 58 decibels C-weighted day-night average sound level and 112 decibels and 124 decibels Peak under neutral and unfavorable weather conditions, respectively (see Table 4.9-13). Received noise levels on southern Pagan from large-caliber weapons training, particularly training that uses the isthmus High Hazard Impact Area, may cause Mariana fruit bats to flush from and avoid the roosting colony location near the isthmus of Pagan periodically or permanently. Effects of such periodic flushing may include disruption of roosting and foraging behaviors, decreased ability to regulate their body temperature, increased stress, particularly during daytime hours, and abandonment and mortality of offspring.

Therefore, proposed large-caliber weapons firing would result in significant direct impacts to Mariana fruit bats at the Southern 2 and Northern colonies; noise impacts to the Southern 1 colony from proposed large-caliber weapons firing are not anticipated based on modeled sound levels.

**Aircraft Noise.** Aircraft operations on Pagan would expose the fruit bat colony on northern Pagan to noise levels of 64.2 decibels A-weighted day-night average sound level and 78.6 decibels A-weighted day-night average sound level. Aircraft operations would expose the two fruit bat colonies on southern Pagan to noise levels of approximately 45.7 and 48.7 decibels A-weighted day-night average sound level and 86.2 and 80.7 decibels A-weighted day-night average sound level, respectively (see Table 4.9-13). These modeled noise levels are due to aircraft, primarily jets, approaching the High Hazard Impact Area.
from the south over the isthmus and west of the fruit bat colonies in southern Pagan. Previous studies of Mariana fruit bat reactions to aircraft overflights at Andersen Air Force Base on Guam have shown flushing and noticeable increases in maintenance, decreased ability to regulate their body temperature, and alertness behaviors 0-10 min after aircraft overflights. However, the animals in these studies were directly beneath or immediately adjacent to the runway departure corridors where noise levels are significantly higher (J.M. Morton 1996; Joint Region Marianas, Naval Facilities Engineering Command Marianas, and Andersen Air Force Base 2012). To minimize noise impacts to the fruit bat colonies on southern Pagan, flight restrictions would be established that would limit all aircraft to greater than 500 feet (152 meters) above ground level over the fruit bat colonies on southern Pagan, and a 0.5-mile (0.8-kilometer) lateral buffer zone will be established around the southern colonies.

**Aircraft Strikes.** Aircraft overflights of fruit bat colonies have the potential to result in aircraft strikes of fruit bats, particularly with a species such as the Mariana fruit bat that flies in large groups when moving between foraging or roosting sites. To avoid and minimize potential aircraft-fruit bat strikes, aircraft would be restricted to 500 feet (152 meters) above ground level over the fruit bat colonies in southern Pagan. Data on aircraft strikes of fruit bats in Australia have shown that the majority of strikes occurred at or below 1,000 feet (305 meters), with the largest proportion of those occurring below 492 feet (150 meters) around sunset (5-8 p.m.) (Parsons et al. 2008, 2009). In addition to avoiding and minimizing noise disturbance to fruit bat colonies, the 0.5-mile (0.8-kilometer) buffer zone around each colony would also significantly reduce the potential for aircraft strikes of fruit bats.

As a best management practice, a Bird/Animal Aircraft Strike Hazard Plan would be prepared to address all aircraft operations on Pagan. This plan will be prepared to minimize the occurrence of aircraft strikes, and it will provide detailed procedures for aviators to monitor and react to heightened risk of strikes. These procedures will also reduce the risk of aircraft strike hazard for fruit bats on Pagan.

Overall, impacts to the Mariana fruit bat population under Pagan Alternative 1 would be significant and unavoidable and unmitigable due to noise from large-caliber munitions.

**Micronesian Megapode**

Megapodes have been observed only within the southern portion of Pagan within *Casuarina*, coconut, and mixed native-introduced forests. These areas are located within the Non-Live-Fire Maneuver Area. No vegetation would be removed during proposed operations, and only foot traffic (no vehicle use) would occur in southern Pagan. Noise from large-caliber weapons and aircraft overflights may cause impacts to megapodes. However, the megapode population on Farallon de Medinilla, a DoN live-fire range to the north of Tinian, is subject to large-caliber live-fire munitions training and aircraft overflights. Megapodes persist on Farallon de Medinilla and do not appear to be affected by the noise levels associated with live-fire training and aircraft overflights on that range. In addition, proposed overflight altitude restrictions of a minimum of 500 feet (152 meters) over southern Pagan would minimize aircraft noise impacts to megapodes. Megapodes may be exposed to physical disturbance by troops conducting on-foot maneuvers that may result in flushing of birds. However, this level of disturbance is anticipated to have less than significant impacts on the megapode population on Pagan. Potential impacts to individual megapodes under the preferred alternative will be addressed during Endangered Species Act section 7 consultation with the U.S. Fish and Wildlife Service.
Sea Turtles

No sea turtles have been observed nesting on the beaches of Pagan. In addition, sightings of sea turtles on the beaches of Pagan are rare, with one green sea turtle observed basking on Red Beach (Kessler 2011), one of the proposed amphibious landing sites. In addition, seven beaches on Pagan were surveyed in July of 2013. No active or past nesting activity was observed on any of these beaches (DoN 2014c). Although no turtles have been observed nesting on Pagan, the potential exists. Therefore, training restrictions would be implemented to avoid and minimize effects to sea turtles.

With implementation of resource management measures, military training activities associated with Pagan Alternative 1 would result in less than significant direct and indirect impacts to green or hawksbill turtles. Potential impacts to sea turtles in the marine environment of Pagan are discussed in Section 4.10, Marine Biology.

Humped Tree Snail

The humped tree snail is known to occur only in native forest and mixed coconut native forest inside or along the rim of the caldera on southern Pagan. Native forest on Pagan would be designated “No Wildlife Disturbance Areas,” with the following actions prohibited: vehicle maneuvers, mechanical vegetation clearing, digging or excavation without prior approval; open fires; and flights below 500 feet (152 meters) above ground level. Any maneuvers conducted in native forest will be on foot. Therefore, military training activities under Pagan Alternative 1 would result in less than significant direct and indirect impacts to the humped tree snail population on Pagan.

Slevin’s Skink

Slevin’s skink may still be present on Pagan, but if so, it occurs in small numbers (Reed et al. 2010). Stressors including noise and physical disturbance may occur in potential Slevin’s skink habitat on Pagan with implementation of Pagan Alternative 1. However, given the rarity of occurrence of Slevin’s skinks on Pagan, exposure to these stressors would be discountable or insignificant (effects are unlikely to occur or would not be meaningfully measured or detected). Therefore, military training activities under Pagan Alternative 1 would result in less than significant direct and indirect impacts to the Slevin’s skink population on Pagan.

Cycas micronesica

*Cycas micronesica* was recently reported on Pagan in ravines of the southern part of the island (Pratt 2010). Foot maneuvers and associated physical disturbance on southern Pagan may occur with implementation of Pagan Alternative 1. However, with implementation of the proposed conservation measures, including invasive species interdiction, invasive species monitoring and control, fire prevention and management, training restrictions associated with native forest “No Wildlife Disturbance Areas,” and ungulate removal or control on southern Pagan, it is expected that military training activities associated with Pagan Alternative 1 would result in less than significant direct and indirect impacts to *C. micronesica*. 
**Bulbophyllum guamense**

Historically *B. guamense* occurred on Pagan, but has not been observed since 1984 (U.S. Fish and Wildlife Service 2014). Therefore, military training activities associated with Pagan Alternative 1 would result in no direct or indirect impacts to *B. guamense*.

**4.9.4.1.2.4 Special-status Species: Migratory Bird Treaty Act-listed Species**

Direct and indirect impacts to Migratory Bird Treaty Act-listed species from operations under Pagan Alternative 1 would be similar to those discussed under the Native Wildlife section and are therefore expected to be less than significant.

**4.9.4.1.2.5 Special-status Species: CNMI-listed Species**

As described in Section 3.9, Terrestrial Biology, the federally listed Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are also listed as threatened/endangered by the CNMI. Impacts to these species are discussed previously under the Special-status Species: Endangered Species Act-listed and Proposed Species section.

**4.9.4.2 Pagan Alternative 2**

**4.9.4.2.1 Construction Impacts**

**4.9.4.2.1.1 Vegetation Communities**

Impacts to vegetation from proposed construction activities would be similar to those described for Pagan Alternative 1; however, under Pagan Alternative 2 there would be no isthmus High Hazard Impact Area (Figure 4.9-10). Approximately 13 acres (5 hectares) of native forest would be removed, primarily in the northern High Hazard Impact Area (see Table 4.9-12). Given the importance of native forest habitat for native species, the conversion of approximately 13 acres (5 hectares) of native forest on Pagan to developed area from the implementation of Pagan Alternative 2 would result in significant direct impacts to the island vegetation community and its function.

Proposed potential mitigation measures would be the same as those previously proposed for Pagan Alternative 1 (see Section 4.9.4.1). To mitigate for significant impacts to native forest, the Department of Defense may facilitate native forest regeneration on southern Pagan by implementing feral goat and pig removal. This would consist of active control (i.e. trapping, snaring, shooting) of animals, with the goal of eradicating all feral ungulates from southern Pagan. The Department of Defense may also implement monitoring and control of non-native invasive species within forest habitat on Pagan, including control of invasive plant, mammal, and insect species. With implementation of this potential mitigation, direct impacts to native forest under Pagan Alternative 2 would be less than significant. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).
Figure 4.9-10
Pagan Alternative 2, Vegetation Communities

Legend
- Proposed Vegetation Clearance
- Proposed Military Training Trail Network

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

Barren (Bare Ground)
Barren (Lava or Cinder)
Casuarina Forest
Coconut Forest
Grassland
Herbaceous-Scrub
Mixed Native-Introduced Forest
Native Forest
Sand

Source: Rogers 2010
4.9.4.2.1.2 Native Wildlife

Direct and indirect impacts to wildlife from proposed construction activities would be the similar to that described for Pagan Alternative 1. Approximately 212 acres (86 hectares) of forested habitat would be removed during construction (Table 4.9-14). Therefore, implementation of Pagan Alternative 2 and the removal of approximately 212 acres (86 hectares) of forested wildlife habitat would result in significant impacts to native wildlife populations.

Table 4.9-14. Potential Direct Impacts to Vegetation Communities with Implementation of Pagan Alternative 2

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Vegetation Community (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NF</td>
</tr>
<tr>
<td>Northern High Hazard Impact Area</td>
<td>7.1</td>
</tr>
<tr>
<td>Field Artillery Direct Fire Range</td>
<td>0</td>
</tr>
<tr>
<td>Field Artillery Indirect Fire Range</td>
<td>0</td>
</tr>
<tr>
<td>Airfield Clear Zone</td>
<td>0</td>
</tr>
<tr>
<td>Munitions Storage Area</td>
<td>0.8</td>
</tr>
<tr>
<td>Landing Zones</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Road Development</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>Total Impacted under Alternative 2</strong></td>
<td><strong>12.6</strong></td>
</tr>
<tr>
<td><strong>Total on Pagan</strong></td>
<td><strong>418</strong></td>
</tr>
<tr>
<td><strong>% Impacted under Alternative 2 on Pagan</strong></td>
<td><strong>2.8</strong></td>
</tr>
</tbody>
</table>

Notes: Impact areas are based on areas depicted and labeled in Chapter 2, Figure 2.6-4. Numbers may not add precisely due to rounding.

Legend: Bar = barren: lava, cinder, or bare ground; Cas = Casuarina forest; Coco = coconut forest; Grass = grassland; HS = herbaceous scrub; MNIF = mixed native-introduced forest; NF = native forest; Sand = sand; < = less than.

4.9.4.2.1.3 Special-status Species: Endangered Species Act-listed and Proposed Species

Based on historical data and surveys conducted in support of this EIS/OEIS, Figure 4.9-11 provides the general locations of special-status species in relation to Pagan Alternative 2. Direct impacts to special-status species from proposed construction activities include the removal of habitat, fragmentation of remaining habitat, and associated noise and human activities.

Direct and indirect impacts to Endangered Species Act-listed species from proposed construction activities associated with Pagan Alternative 2 would similar to those described for Pagan Alternative 1. However, the amount of potential foraging habitat removed for the Mariana fruit bat would be less under Pagan Alternative 2. With the exception of the Mariana fruit bat, none of the areas proposed for construction would occur within the vicinity of Endangered Species Act-listed or proposed species habitat on Pagan. Therefore, no impacts to these species would result from construction. Potential foraging habitat for the Mariana fruit bat (1% of native forests and 2% of Casuarina forest) would be removed in the northern portion of Pagan; however, no fruit bat habitat in the southern portion of the island would be removed.

Therefore, direct and indirect impacts to the Mariana fruit bat population from construction activities associated with Pagan Alternative 2 would be less than significant.
Legend

- **Proposed Vegetation Clearance**
- **Tactical Amphibious Landing Beaches**
  - Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
  - Landing Craft Air Cushion, small boat and swimmer training
  - Small boat and swimmer training

- **Proposed Military Training Trail**

- **Micronesian Megapode Occurrence**: depicts transects where megapodes were detected during 2010 surveys

- **Humped Tree Snail population**
- **Slevin's Skink**

Note: Species observations are historical sightings over multiple years and multiple surveys and do not represent the current population status or distribution of species within the depicted area.

**Figure 4.9-11**
Pagan Alternative 2, Occurrence of Special-status Species

Sources: Reed et al. 2010; Amidon et al. 2011
4.9.4.2.1.4  Special-status Species: Migratory Bird Treaty Act-listed Species

Direct and indirect impacts to species listed under the Migratory Bird Treaty Act from proposed construction activities would be similar to those described for Pagan Alternative 1 and would be less than significant. However, the amount of habitat removed would be less under Pagan Alternative 2. As discussed above in vegetation, approximately 212 acres (86 hectares) of forested habitat for native species would be removed (see Table 4.9-14).

4.9.4.2.1.5  Special-status Species: CNMI-listed Species

As described in Section 3.9, Terrestrial Biology, the federally listed Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are also listed as threatened/endangered by the CNMI. Impacts to these species are discussed previously under the Special-status Species: Endangered Species Act-listed Species section. No other CNMI-listed species occur on Pagan.

4.9.4.2.2  Operation Impacts

4.9.4.2.2.1  Vegetation Communities

Impacts to vegetation from proposed operations would be similar to Pagan Alternative 1 (see Section 4.9.4.1); however, there would be no isthmus High Hazard Impact Area and the northern High Hazard Impact Area would be smaller, decreasing the potential for impacts to vegetation from ordnance. Therefore, implementation of the training activities associated with Pagan Alternative 2 would result in less than significant direct and indirect impacts to vegetation communities.

4.9.4.2.2.2  Native Wildlife

Impacts to native wildlife from training operations associated Pagan Alternative 2 would be similar as those previously discussed for Pagan Alternative 1 (see Section 4.9.4.1). Therefore, implementation of Pagan Alternative 2 would result in less than significant impacts to native wildlife.

4.9.4.2.2.3  Special-status Species: Endangered Species Act-listed and Proposed Species

Impacts to Endangered Species Act-listed and proposed species from implementation of Pagan Alternative 2 would be the same as those previously discussed for Pagan Alternative 1, with the exception of the Mariana Fruit Bat which is discussed below. Therefore, there would be less than significant direct and indirect impacts to populations of the Micronesian megapode, nesting sea turtles, humped tree snail, Slevin’s Skink, Cycas micronesica, and Bulbophyllum guamense from implementation of Pagan Alternative 2. Assessment of impacts to individuals of these species will be conducted during Endangered Species Act section 7 consultation with the U.S. Fish and Wildlife Service.

Mariana Fruit Bat

Potential impacts from small-caliber munitions and aircraft noise associated with Pagan Alternative 2 would be less than significant and would be similar to those previously discussed for Pagan Alternative 1 (see Section 4.9.4.1). Proposed large-caliber weapons firing would result in significant direct impacts to Mariana fruit bats at the Southern 2 and Northern colonies; noise impacts to the Southern 1 colony from proposed large-caliber weapons firing are not anticipated based on modeled sound levels. However, impacts from noise levels associated with large-caliber weapons training would be lower with Pagan Alternative 2.
Munitions Noise: A summary of the expected noise levels at the three fruit bat colonies on Pagan due to live-fire weapons operations is presented in Table 4.9-15. Under Pagan Alternative 2, impacts to fruit bats from small-caliber noise would be the same as those under Alternative 1 (Tables 4.9-13 and 4.9-15, and Figure 4.5-8). Received noise levels from large-caliber weapons under both Pagan alternatives would be the same for the northern fruit bat colony and Southern 1 fruit bat colony. However, under Pagan Alternative 2, there would be no High Hazard Impact Area on the isthmus. This would result in the Southern 2 fruit bat colony experiencing received sound levels of 58 decibels C-weighted day-night average sound level compared to 62 decibels C-weighted day-night average sound level under Alternative 1. Large-caliber Peak noise under neutral conditions at the Southern 2 colony would be 112 decibels under Alternative 2, compared to 125 decibels under Alternative 1. Large-caliber Peak noise under unfavorable conditions at the Southern 2 colony would be 124 decibels under Alternative 2, compared to 136 decibels under Alternative 1 (Tables 4.9-13 and 4.9-15).

<table>
<thead>
<tr>
<th>Location</th>
<th>Small-caliber Weapons</th>
<th>Large-caliber Weapons</th>
<th>Aircraft Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DNL (dBA)</td>
<td>Peak (dB)</td>
<td>DNL (dBC)</td>
</tr>
<tr>
<td>Southern 1</td>
<td>&lt;50</td>
<td>&lt;87</td>
<td>55</td>
</tr>
<tr>
<td>Southern 2</td>
<td>&lt;50</td>
<td>&lt;87</td>
<td>58</td>
</tr>
<tr>
<td>Northern</td>
<td>64</td>
<td>104</td>
<td>74</td>
</tr>
</tbody>
</table>

Legend: dB = decibels; dBA = A-weighted decibels; dBC = C-weighted decibels; DNL = day-night average sound level; Peak-n = Peak noise level under neutral weather conditions; Peak-u = Peak noise level under unfavorable weather conditions; < = less than; > = greater than.
Sources: Army Public Health Command 2014; DoN 2014b.

To mitigate for impacts to Mariana fruit bat habitat quality on northern Pagan due to noise from operations, the Department of Defense may facilitate forest regeneration on southern Pagan by implementing feral goat and pig removal. This would consist of active control (i.e. trapping, snaring, shooting) of animals, with the goal of eradicating all feral ungulates from southern Pagan. The Department of Defense may also implement monitoring and control of non-native invasive species within forest habitat on Pagan, including control of invasive plant, mammal, and insect species. These potential mitigations would improve roosting and foraging habitat on southern Pagan for the Mariana fruit bat population. Impacts to individual fruit bats from proposed operations associated with Pagan Alternative 2 will be addressed during Endangered Species Act consultation with the U.S. Fish and Wildlife Service.

4.9.4.2.2.4 Special-status Species: Migratory Bird Treaty Act-listed Species

Impacts to Migratory Bird Treaty Act-listed species from training operations associated with Pagan Alternative 2 would be the similar to those previously discussed for Pagan Alternative 1 (see Section 4.9.4.1). Therefore, implementation of Pagan Alternative 2 would result in less than significant direct impacts to Migratory Bird Treaty Act-listed species. Potential indirect impacts associated with potential introduction of non-native species and wildfires would be avoided and minimized through the implementation of resource management measures (see Section 4.9.2).
4.9.4.2.2.5  **Special-status Species: CNMI-listed Species**

As described in Section 3.9, *Terrestrial Biology*, the federally listed Micronesian megapode, Mariana fruit bat, and green and hawksbill sea turtles are also listed as threatened/endangered by the CNMI. Impacts to these species are discussed previously in the *Special-status Species: Endangered Species Act-listed and Proposed Species* section. No other CNMI-listed species occur on Pagan.

4.9.4.3  **Pagan No-Action Alternative**

Under the no-action alternative, there would be infrequent and minor disturbance type activities on Pagan. Periodic visits for eco-tourism, scientific surveys and military training for search and rescue would be low impact and of short duration. Therefore, there would be no significant impacts associated with the no-action alternative on Pagan.

4.9.4.4  **Summary of Impacts for Pagan Alternatives**

Table 4.9-16 provides a comparison of the potential impacts to terrestrial biology resources for the two Pagan alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Table 4.9-16. Summary of Impacts for Pagan Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial Biology</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Vegetation Communities</td>
</tr>
<tr>
<td>Native Wildlife</td>
</tr>
<tr>
<td>Special-status Species: Endangered Species Act-listed and Proposed Species and CNMI-listed Species</td>
</tr>
<tr>
<td>Special-status Species: Migratory Bird Treaty Act-listed Species</td>
</tr>
</tbody>
</table>

*Legend: LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts.*
### 4.9.4.5 Summary of Potential Mitigation Measures for Pagan Alternatives

Table 4.9-17 provides a summary of the potential mitigation measures for terrestrial biology resources for the two Pagan alternatives.

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pagan Vegetation Communities</td>
<td>SI</td>
<td>To minimize the effects of construction on native vegetation communities on Pagan, Department of Defense may facilitate native habitat regeneration on Pagan by implementing feral ungulate removal. This would consist of active control (i.e. trapping, snaring, shooting) of animals, with the goal of eradicating all feral ungulates from southern Pagan.</td>
</tr>
<tr>
<td>Loss of 20 acres (8 hectares) of native forest habitat would result in an unavoidable impact.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Pagan Special-status Species, Endangered Species Act-listed and Proposed Species and CNMI-listed Species | SI       | • To minimize the effects of operations on Mariana fruit bats on Pagan, Department of Defense would facilitate native habitat regeneration on southern Pagan by implementing feral goat and pig removal. This would consist of active control (i.e. trapping, snaring, shooting) of animals, with the goal of eradicating all feral ungulates from southern Pagan.  
• To improve habitat quality for Mariana fruit bats on Pagan, Department of Defense may implement monitoring and control of non-native invasive species within forest habitat, including control of invasive plant, mammal, and insect species.  
• To avoid and minimize impacts to the Mariana fruit bat, Micronesian megapode, and tree snails, the Department of Defense will implement training restrictions within native forest on southern Pagan. All native forest habitat on southern Pagan will be designated as “No Wildlife Disturbance Areas,” with the following actions prohibited: vehicle maneuvers; firing of live or inert |
| Large-caliber weapons firing would result in direct impacts to Mariana fruit bats associated with the northeastern colony and on the isthmus colony. Impacts would be unavoidable. |          |                                                                                                                                                                                                                                                                                                                                                           |
### Table 4.9-17. Summary of Potential Mitigation Measures for Pagan Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; flights below 500 feet (152 meters) above ground level, with the exception of personnel insertion/extraction via helicopter; and aircraft landings. Any maneuvers conducted in native forest will be on foot. In addition to restricting aircraft flights to a minimum of 500 feet (152 meters) above ground level in southern Pagan, a 0.5-mile (0.8-kilometer) lateral buffer zone will be established for the two fruit bat colonies in southern Pagan. In addition to avoiding and minimizing noise disturbance to fruit bat colonies, the proposed 0.5-mile (0.8-kilometer) buffer zone around each colony will significantly reduce the potential for aircraft strikes of fruit bats. Native forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on southern Pagan.</td>
<td>Construction</td>
</tr>
</tbody>
</table>

**Legend:** SI = significant impact. Shading is used to highlight the significant impacts.

**Note:** Mitigation measures associated with terrestrial biology do not alter the significance of the impacts.
4.10 MARINE BIOLOGY

Section 4.10 describes the direct and indirect impacts to marine biology that could result from implementation of the proposed action. Both the construction and operations elements of the proposed action have the potential to impact marine biology on Tinian and Pagan. In-water construction would occur on Tinian at Unai Chulu. Construction and operations/training activities that may affect marine water quality in the region of influence are described in Section 4.3, Water Resources.

4.10.1 Approach to Analysis

A variety of laws, regulations, Executive Orders, plans, and policies, including the Clean Water Act, Endangered Species Act, Marine Mammal Protection Act, Magnuson-Stevens Fishery Conservation and Management Act, and Executive Order 13089 (Coral Reef Protection), are applicable to evaluating the proposed action impacts for marine biology. A complete listing of applicable regulations is provided in Appendix E, Applicable Federal and Local Regulations.

The marine biology impact analysis addresses potential effects to marine habitat and Essential Fish Habitat, marine flora, marine invertebrates, fish, and special-status species including sea turtles, marine mammals, and other legally protected species. Sources of impacts to marine biology include: physical disturbance to habitats; acoustic disturbance or injury due to underwater noise; injury or mortality to individuals due to being struck by vessels or construction equipment; and indirect impacts.

Under the proposed action, impacts may be either temporary (reversible) or permanent (irreversible). Direct and indirect impacts are distinguished as follows. Direct impacts may include, but are not limited to, the following:

- Permanent removal of coral and marine habitat at Unai Chulu due to dredging and underwater ramp construction
- Acoustic impacts to marine species from pile driving
- Temporary disturbance of habitat due to amphibious landings
- Disturbance or mortality to individuals resulting from in-water vessel movements

Indirect impacts are may include, but are not limited to, the following:

- Indirect impacts to marine habitats and coral (from rubble, etc.) during operation
- Sedimentation/siltation of marine habitat that occurs as a result of erosion and sediment transport from facilities construction on land
- Changes in the abundance, distribution, or behavior of one species, which in turn would affect other species and their interactions.

Factors used to assess the significance of impacts to marine resources include the context and intensity of the impact (40 CFR 1508.27). Context refers to the setting in which the impact occurs; intensity refers to severity of the impact, taking into account the characteristics of the affected resource and the consequences of the impact.
Important considerations determining whether an impact to marine resources would be significant include the following:

- The extent, if any, that the action would result in the substantial loss or degradation of a marine community, ecosystem functions (natural features and processes), or Essential Fish Habitat, relative to the abundance and importance of the resource in the marine ecosystems of Tinian and Pagan.
- The extent, if any, that the action would cause injury or mortality to individuals, and could diminish the population size, distribution, habitat, or prospects for conservation and recovery, of a special-status species, relative to the abundance of that species in the marine ecosystems of Tinian and Pagan.

Impact analysis methodologies specific to each marine resource component are summarized in Sections 4.10.1.1 through 4.10.1.5.

Based on the scope of operational activities and the characteristics and small quantities of expended materials from training (fragments from munitions/target use) that would enter the marine environment, other potential stressors such as energy, entanglement, or ingestion, are considered insignificant. It is also unlikely that sea turtles would accidentally ingest expended materials while foraging on algae or seagrass. These types of impacts are not discussed further in this analysis.

Airborne noise, including construction noise from pile driving and dredging, and operational noise from aircraft, vessels, and over-water gunfire, has the potential to affect marine species. The effects of airborne noise on sea turtles on land are considered in Section 4.9, Terrestrial Biology. Airborne noise impacts would be limited based on (1) the transitory nature of airborne noise sources; (2) the limited exposure of animals that spend most or all of their time underwater to noise above water; and (3) the physics of sound transmission from air into the water column, in which much of the sound is reflected off the surface of the water unless the source is at a near-vertical angle (Young 1973). In addition, quantitative data or thresholds relating airborne sound levels to important physiological or behavioral responses by marine animals other than pinnipeds (which are not present in the CNMI) are generally lacking (National Oceanic and Atmospheric Administration West Coast Region 2015). As a result, airborne noise is considered to have only temporary, if any, impacts to individuals (e.g., brief startle responses), which would be unlikely to result in reduced fitness to the individual or to have population-level effects. Accordingly, airborne noise impacts to marine resources are considered less than significant and not discussed further in this analysis.

**4.10.1.1 Marine Habitat and Essential Fish Habitat**

A geographic information systems analysis was used to determine the areas of direct impact to habitat, focusing on the substrate, the nature and duration of the impact, and the resulting direct and indirect impacts to the organisms associated with that habitat. Acoustic impacts from pile driving, and indirect impacts to habitat (e.g., from runoff) were also considered. The analysis determined the degree to which impacts would have more than minimal and/or temporary significant effects on the quantity or quality of Essential Fish Habitat, in which case consultation with National Marine Fisheries Service is required.
4.10.1.2  **Marine Flora**

Impacts to marine flora were determined as described for habitats above. This included quantifying areas of direct physical disturbance to habitats that support macroalgae and seagrasses, as well as the potential for indirect effects.

4.10.1.3  **Marine Invertebrates**

Although a wide diversity of marine invertebrates live within the region of influence, the impact analysis focuses on corals since the integrity of the corals would be critical to the survival of other invertebrates (as well as turtles and fish). Impacts to corals are expected to affect other invertebrates because coral provides habitat for these species and measures to protect corals are expected to protect other invertebrates as well. The amount of coral impact due to construction of the Amphibious Assault Vehicle landing area at Unai Chulu was calculated based on the data from the *Coral Marine Resources Survey Report* conducted in support of this EIS/OEIS (Appendix M) (DoN 2014a).

4.10.1.4  **Fish**

Impacts to fish were evaluated in terms of direct and indirect impacts to habitat as described in the previous sections, as well as the spatial extent and duration of acoustic disturbance and injury to individual fish.

4.10.1.5  **Special-status Species**

Special-status marine species of the project action area include species that are listed under the Endangered Species Act and under the Marine Mammal Protection Act. Impacts to special-status species were evaluated on the presence of these species and the anticipated level of disturbance to the areas where they are present. The presence of species and their estimated population densities were determined based on field surveys conducted in support of this EIS/OEIS as well as reviews of applicable data and scientific literature.

4.10.1.5.1  **Endangered Species Act-listed Species**

In accordance with section 7 of the Endangered Species Act of 1973 (16 U.S. Code 1531 et seq.), a Biological Assessment is being prepared to analyze the potential effects of Department of Defense actions on threatened and endangered species under the jurisdiction of the National Marine Fisheries Service. Section 7(a)(2) of the Endangered Species Act requires federal agencies to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any federally threatened or endangered species or result in the destruction or significant modification of critical habitat. In accordance with Section 102 of NEPA, the Department of Defense is in section 7 consultation with the National Marine Fisheries Service on actions proposed under the preferred alternative presented in this EIS/OEIS.

Based on the information provided in Section 3.10, *Marine Biology*, listed marine species with a reasonable possibility of occurrence in the project region of influence, and thus likely to be impacted, are considered in this section. These include the coral species, *Acropora globiceps*, the green and hawksbill sea turtles, and the blue, fin, sei, humpback and sperm whale. Impacts to other listed species...
that are unknown or remotely possible in the project region of influence and whose exposure to direct
or indirect impacts, if any, would be rare, brief, and unlikely to have any important biological
consequences, are not considered further in this document. However, these impacts will be considered
as required during the section 7 consultation.

Impacts of the proposed action under section 7 of the Endangered Species Act are analyzed as impacts
to individuals (as defined by “take” under the Endangered Species Act). In contrast, analysis of impacts
to species under NEPA, presented here, relates to the impacts to populations of these species. The
potential mitigation measures proposed in this EIS/OEIS to benefit Endangered Species Act-listed and
proposed species are preliminary and may be revised or augmented during Endangered Species Act
section 7 consultation.

4.10.1.5.2 Marine Mammal Protection Act-listed Species

Section 3.10, Marine Biology, identifies the marine mammal species that could occur in the project
region of influence. Due to underwater noise from pile driving, the Department of Defense will apply for
an Incidental Harassment Authorization from the National Marine Fisheries Service in advance of
construction. The application will fully detail potential effects to individuals of various species based on
the acoustic analysis and marine mammal data provided in Appendix M, Marine Biology Technical Memo
and Survey Reports. The NEPA analysis in this document summarizes the information from Appendix M,
Marine Biology Technical Memo and Survey Reports and considers the effects of acoustics and other
potential impacts to individuals and populations of marine mammals.

4.10.2 Resource Management Measures

Resource management measures applicable to marine biological resources are described below.

4.10.2.1 Avoidance and Minimization Measures

4.10.2.1.1 Tinian

All beaches within the Military Lease Area were considered for amphibious training operations;
however, a careful selection process was employed based on analysis and environmental factors.
Beaches on the windward side of the Military Lease Area, including Unai Chiget, Unai Dankulo, and Unai
Masalok, were not considered for use of Amphibious Assault Vehicle landings due to wind and wave
action. Unai Dankulo was eliminated for amphibious training due to the coral habitat and high tourist
use. Unai Masalok was the only windward beach identified as a feasible location for amphibious training
with Landing Craft Air Cushion vessels, small boats, and swimmers. On the leeward side, Unai Lam Lam,
Unai Babui, and Unai Chulu were considered for amphibious training. Unai Lam Lam was considered too
small for Amphibious Assault Vehicle and Landing Craft Air Cushion vessel training, but suitable for small
boats and swimmers. Based on environmental criteria including analysis of bathymetry and coral cover,
Unai Babui and Unai Chulu were both considered for Amphibious Assault Vehicle and Landing Craft Air
Cushion vessel training. A detailed engineering analysis of construction alternatives was conducted for
these two locations (see Appendix J, Amphibious Beach Landing Site Engineering and Coastal Processes
Analyses). After careful consideration it was determined that the tactical amphibious landing training
beach requirements could be met at one beach. Unai Chulu was chosen as the single beach for
Amphibious Assault Vehicle landings because of its wider configuration. Unai Babui was dismissed for Amphibious Assault Vehicle training to lessen environmental impacts; however, it would still support training for Landing Craft Air Cushion vessels, small boat, and swimmer training. The selection of one beach for Amphibious Assault Vehicles results in fewer environmental impacts to coral and other important marine resources.

Three different methods for constructing amphibious landing ramps were considered; a dredge only option, a pile-armored ramp, and a tribar-armored ramp. The dredge only option was dismissed, as the longevity of the exposed reef surface with no armoring was uncertain. The tribar alternative was also dismissed due to uncertainty of the tribar surface compatibility with Amphibious Assault Vehicle operations. The pile-armored ramp alternative was chosen for its stable design and long-term durability of the surface.

4.10.2.1.2 Pagan

All beaches on Pagan were considered for amphibious training operations. A careful selection process was employed based on training operations and environmental factors. Beaches on the windward side were not considered for use of Amphibious Assault Vehicle landings due to wind and wave action. Based on environmental criteria, including analysis of bathymetry, bottom type and coral cover, Blue, Green and Red Beach were considered for Amphibious Assault Vehicle landings. Adjustments were made in the approach zone to lessen potential effects to coral. Blue, Green, Red, and South were also considered for Landing Craft Air Cushion vessel training.

4.10.2.2 Best Management Practices and Standard Operating Procedures

Best management practices and standard operating procedures that are applicable for marine biological resources are listed below and described in Appendix D, Best Management Practices.

4.10.2.2.1 Construction

- All project-related materials and equipment (e.g., dredges) placed in the water should be clear of pollutants prior to use. No project-related materials (fill, revetment rock, etc.) should be stockpiled in the water (intertidal zones, reef flats, etc.).
- Construction contracts would include appropriate biosecurity measures.
- Erosion Control Measures. The erosion control measures such as retention ponds, swales, silt fences, fiber rolls, gravel bag berms, mulch, and erosion control blankets would be implemented during construction and operations to eliminate and/or minimize nonpoint source pollution in surface waters due to sediment.
- Clean Water Act National Pollutant Discharge Elimination System Program. A Stormwater Management Plan and Stormwater Pollution Prevention Plan would be prepared and implemented in compliance with the CNMI Stormwater Management Manual. Best management practices could include:
  - Soil stabilization (such as mulch and erosion control blankets).
o Perimeter and sediment control (such as silt fences, fiber rolls, gravel bag berms, and sediment traps).

o Management and covering of material, waste, and soil stockpiles when not in use.

o Storage of fuels and hazardous materials with proper secondary containment, and establishment of designated vehicle and equipment maintenance and fueling areas.

- Management of spills and leaks from vehicles and equipment through inspections and use of drip pans, absorbent pads, and spill kits.

- A contingency plan to control petroleum products accidentally spilled during the project would be developed.

- Contractor Education Program. The DoN has developed an education program to ensure construction contractor personnel are informed of the biological resources in the project area, including special-status species, avoidance measures, and reporting requirements.

- If sea turtles or marine mammals are noticed within 150 feet (46 meters) after in-water construction work has begun, that work may continue only if the activity would not affect the animal(s). For example, divers performing surveys or underwater work would likely be permissible, whereas operation of heavy equipment is likely not.

- Personnel shall remain alert for marine mammals before and during pile driving. Pile driving will not commence if a marine mammal is observed within 300 feet (90 meters) or a sea turtle is observed within 50 feet (15 meters) of operation. Pile driving can begin 30 minutes after the last sighting of the marine mammal or sea turtle. If pile driving is already started and a marine mammal or sea turtle is sighted within 300 feet (90 meters) after drilling has commenced, drilling can continue unless the marine mammal or sea turtle comes within 210 feet (64 meters) during drilling; operations should then cease until the animal leaves the area of its own volition or after 30 minutes have passed since the last sighting.

- During pile driving and removal, the shutdown zone will be sized and established to avoid injury to marine mammals.

- Soft Start – The use of a soft-start procedure is believed to provide additional protection to marine mammals, sea turtles, and fish by providing a warning and/or giving marine species a chance to leave the area prior to the hammer operating at full capacity. Soft start shall be conducted at the beginning of each day’s activity and at any time pile driving has ceased for more than 30 minutes. If vibratory pile driving has been occurring but impact has not for more than 30 minutes, soft start for the impact hammer must occur. The soft start requires contractors to initiate noise from vibratory hammers for 15 seconds at reduced energy followed by a 30-second waiting period. This procedure should be repeated two additional times. If an impact hammer is used, contractors are required to provide an initial set of three strikes from the impact hammer at 40% energy, followed by a 30-second waiting period, then two subsequent 3-strike sets.
4.10.2.2.2 Operation

- All established harbor navigation rules are observed during amphibious operations occurring within an established harbor. During amphibious operations (landings and departures) occurring outside of an established harbor, Landing Craft Air Cushion vessels stay fully on-cushion or hover when over shallow reefs to avoid corals, hard bottom, and other substrate that could potentially damage equipment.
- Flagging or marking of particular coral heads at Green Beach to avoid during training operations.
- Amphibious vehicles and small boats would avoid approaching marine mammals and sea turtles head on, to the greatest extent practical given operational need and vessel safety (necessary steerage, sea state, navigational need).
- A contingency plan to control petroleum products accidentally spilled during the project would be developed.
- *Biosecurity Outreach and Education.* A biosecurity outreach and education program would be implemented to inform contractors and Department of Defense civilian and military personnel about native versus non-native invasive species and the impacts of non-native invasive species on native ecosystems.

4.10.3 Tinian

4.10.3.1 Tinian Alternative 1

4.10.3.1.1 Construction Impacts

The majority of the land-based construction activities would take place inland and away from the nearshore environment. However, some construction activities would take place near the shore including port improvements, portions of road improvements, some observation posts, and construction of an amphibious beach landing area. An amphibious landing ramp would be constructed at Unai Chulu to create a safe landing surface for training operations. Causes of impact would include physical disturbance to the habitat, potential indirect effects, and, for some of the marine species, the underwater acoustic effects of pile driving. In-water construction activities would disturb sediment and increase turbidity and thus impact water quality. Best management practices would be utilized to capture sediment and debris caused by in-water construction activities. See Appendix J, *Amphibious Beach Landing Site Engineering and Coastal Processes Analyses* for additional details on the proposed construction methods for the amphibious landing ramp. An assessment of the potential impacts of construction of Unai Chulu to coastal processes was completed. The assessment concluded that construction of the proposed amphibious landing ramp would not significantly modify shoreline coastal processes or trigger erosion of the beach.

4.10.3.1.1.1 Marine Habitat and Essential Fish Habitat

Construction of the in-water amphibious landing ramp for Amphibious Assault Vehicles would modify the seafloor (i.e., limestone, coral reef) by contouring the approach zone (landing area) to create a flat shelf in the substrate and a pile-armed ramp at a 15-degree slope. The pile-armed ramp would consist of a gravel bed atop the coral base and a durable grooved concrete slab surface designed to be...
stable under severe wave conditions. Trenches with concrete anchors would secure the toe and top of
the ramp and join the ramp with existing substrate surfaces.

During construction, temporary causeways would be constructed to allow an excavator access over the
water. The temporary causeways would be created using pile-supported trestles through the surf zone
and out to 12 feet (4 meters) depth. Steel sheet piles and steel pipe piles would be installed into the reef
and penetrate approximately 40 feet (12 meters) into the substrate. The causeways would be
constructed using dredged material and would be removed after amphibious landing ramp construction
was complete. After the removal of the causeways, excess fill material (i.e., dredge material) would be
reused or disposed of at an approved in-water or upland disposal site.

The construction would create a stable landing area for the Amphibious Assault Vehicles to safely come
ashore on a repeated basis. The amphibious landing ramp at Unai Chulu would be approximately 656
feet (200 meters) long and average 160 feet (50 meters) wide with an anticipated dredge volume of
798,111 cubic feet (22,600 cubic meters). Construction is anticipated to take approximately 36 weeks.

Construction of the amphibious landing ramp and temporary construction causeways would
permanently change the habitat of the nearshore areas of the beach at Unai Chulu (see Figures 4.10-1
and 4.10-2). During and subsequent to construction, coral rubble and sediments generated by the
activities would be dispersed by wave action and currents, resulting in the abrasion and burial of
adjacent habitats and increasing suspended sediments in the water column. Underwater noise levels
would be increased during pile driving and dredging. The areas affected include soft shore habitats and
reef flat and hard bottom habitat at depth. The entire water column and seafloor within the affected
area is designated as Essential Fish Habitat Area for bottomfish, crustaceans, coral reef ecosystems, and
pelagics. In-water construction would result in a reduction in the quality and quantity of Essential Fish
Habitat within the nearshore area.

Table 4.10-1 presents the areas of potential direct and indirect impacts to marine habitats during
construction of the proposed action on Tinian. The direct impacts include permanent removal of marine
habitat to create the amphibious landing ramp at Unai Chulu. The analysis assumes that in addition to
the area exposed to direct physical disturbance during construction, an additional area surrounding the
construction footprint would be exposed to indirect physical impacts associated with mobilized rubble
generated by the construction activities. When mobilized by water motion, any mobile rubble can strike
or smother corals and degrade coral habitat. In this context, mobilized rubble includes living and dead
coral colonies that are broken off of the substrate and reduced to a size that can be mobilized by water
motion; reef substrate itself that is broken off; and preexisting unattached fragments. Smaller fragments
are likely to be transported farther than larger fragments. Both upslope and downslope transport would
occur but transport downslope is more likely. Transport alongshore would occur but this is likely to be
less than downslope transport. Reef flats and topographic lows (grooves in the coral reef) are more
likely to be affected than topographic highs. The likelihood of an unattached fragment becoming
mobilized is a function of its density, shape, water depth, and intensity of the water motion.
Figure 4.10-1
Unai Chulu Training Impact Area
Depth
Sources: Fugro Pelagos 2013a, 2013b

1 Depth values based on mean-mean low water and grouped to distinguish between the following depths of concern:
- Maximum Potential Impact Depth (-12 feet)
- In-water Draft of AAV (-7 feet)
- Wave Surge Potential Track Impact (-5 feet)
- Track Engagement (-3 feet)
- Reef Flat Maneuver (-1 feet or above)

2 Unai Chulu will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.
Figure 4.10-2
Unai Chulu Training Impact Area
Coral Cover

Legend

<table>
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<th>Coral Cover (%)</th>
<th>0%</th>
<th>1-10%</th>
<th>10-20%</th>
<th>20-30%</th>
<th>30-40%</th>
<th>40-50%</th>
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<th>60-70%</th>
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1 Unai Chulu will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.

Sources: Fugro Pelagos 2013a, 2013b
### Table 4.10-1. Summary of Potential Direct and Indirect Impacts to Marine Habitat at Unai Chulu

<table>
<thead>
<tr>
<th>Parcel and Activity</th>
<th>Area of Direct Effects (acres)</th>
<th>Area of Indirect Effects (acres)</th>
<th>Total Area of Likely Direct and Indirect Effects (acres)</th>
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</thead>
<tbody>
<tr>
<td>Unai Chulu Landing</td>
<td>10.3</td>
<td>10.3</td>
<td>20.6</td>
</tr>
</tbody>
</table>

*Note: This analysis estimates the size of the area exposed to indirect effects of mobile rubble would be equal to the area exposed to direct effects.*

The size of the area exposed to indirect effects of mobile rubble (outside of the direct physical disturbance footprint), is conservatively estimated to be equal to the area exposed to direct effects. The shape of the indirectly affected area cannot be quantitatively estimated. There will be a gradient of disturbance within the area of indirect effect. The effects of mobilized rubble would be greater closer to the construction area and reduced at increasing distances from construction based on the assumptions for rubble movement.

A coastal processes analysis was completed to assess the potential impacts from construction of an amphibious landing ramp at Unai Chulu to coastal processes (see Appendix J, Amphibious Beach Landing Site Engineering and Coastal Processes Analyses). Model results comparing the existing condition with the Amphibious Assault Vehicle landing zone configuration suggest that the alteration of the nearshore bathymetry by dredging the Amphibious Assault Vehicle approach area and ramp would not significantly modify shoreline coastal processes and/or trigger erosion of the beach.

Construction impacts to the water column, as well as acoustic impacts, would be intermittent during construction, resulting in only short-term effects. Turbidity would be briefly and locally increased, but suspended sediments would either settle or be rapidly dispersed, with no long-term effects on photosynthesis. Potential impacts to water quality characteristics of the marine environment during coastal and inland construction activities would be minimized by implementing best management practices to control fugitive dust, stormwater runoff, and eutrophication (the process by which a body of water acquires a high concentration of nutrients).

The primary physical impact of in-water construction would be to permanently convert complex and variable reef habitat to an essentially flat surface bordered by disturbed areas of coral rubble, sand, and scoured rock. The diverse microhabitats associated with the topographic complexity of the reef would be eliminated. Substrate that currently supports a relatively high cover of macroalgae would be removed or buried. The mosaic-like character of the habitat, which includes patches of sand, macroalgae, and varying amounts of coral cover, would be replaced by a more homogeneous area consisting of the ramp and adjacent disturbed areas. With the loss of structural diversity, biological diversity and productivity within the impacted area would be diminished. Construction impacts would directly or indirectly affect all of the species that occur in or would otherwise utilize the habitat.

The impacted water column constitutes Essential Fish Habitat for the egg, larval, juvenile, and adult life stages for all of the species or groups of species that are managed under the Mariana Archipelago Fishery Ecosystem Plan (Western Pacific Regional Fishery Management Council 2009). Impacts to the water column would be temporary as noted previously. The substrate, which would be more severely impacted, constitutes Essential Fish Habitat for the juvenile and adult life stages of shallow water bottomfish and crustaceans, as well as the harvested and potentially harvested species of coral reef ecosystems.
The area impacted by physical disturbance at Unai Chulu during construction represents 0.34% of the total reef habitat on Tinian (see Table 3.10-1). The reef flat at Unai Chulu has high taxa richness for algae but lower taxa richness for fish and invertebrates (Minton et al. 2009). The reef flat at Unai Chulu also supports a relatively high cover of algae, which would be removed or subject to burial within the construction area. Use of this area during operations would prevent the recovery of marine algae. The loss of marine flora habitat would impact the invertebrates, fish, and sea turtles that use marine flora species as shelter or as a food source.

Essential Fish Habitat for juvenile and adult spiny lobsters includes the substrate from the shoreline to a depth of 492 feet (150 meters). Adult and juvenile spiny lobsters move onto the reef flats from rocky shelters in the surf zone at night to forage. Physical disturbance to the reef flat would permanently reduce algal cover in the impacted area, and a loss of reef flat habitat may impact both larval and adult spiny lobsters through loss of nursery and foraging habitat. This would result in permanent impacts to larval spiny lobsters, but juvenile and adult spiny lobsters in the immediate vicinity of the construction would be expected to move to more suitable foraging areas.

The estimated noise levels and areas affected by impact pile driving and vibratory pile driving and extraction are described in Appendix M, *Marine Biology Technical Memo and Survey Reports*. These noise levels would result in temporary impacts to Essential Fish Habitat, with increased noise potentially causing some fish to move out of the loudest areas closest to the source. The noise levels would also affect fish behaviors such as detection of predators and prey, schooling, mating, navigating, and in the case of coral larvae, settlement over a much larger area. Given the shallow depths and the uneven topography, any underwater noise as a result of the pile driving/extraction and coral dredging would likely dissipate quickly within the surf zone, but it may extend laterally along the coast as well as into the deeper nearshore environment, depending on environmental variables such as tide or weather patterns in the area. The distances within which various effects on fish are predicted to occur are as follows:

- Behavioral effects on fish during impact pile driving could extend to a distance of 20,695 feet (6.31 kilometers) from the pile. Corresponding effects during vibratory driving or extraction would extend a smaller distance of 243 feet (74 meters).
- Injury due to peak sound pressure levels during impact pile driving would occur to fish within 30 feet (9 meters) of the pile being driven.
- Injury due to an accumulated sound exposure level during impact pile driving would occur to fish that remain within a distance of 928 feet (283 meters) for fish weighing more than 0.07 ounces (2 grams), or 1,715 feet (523 meters) for smaller fish, throughout an entire day of pile driving activity. The corresponding distances during vibratory driving or extraction are smaller, 52 feet (16 meters) for fish weighing more than 0.07 ounces (2 grams), and 95 feet (29 meters) for smaller fish.

Pile driving activities at Tinian would occur during the daytime, and the effects would occur for a maximum of 105 days. Adherence to best management practices such as the soft-start procedure would minimize potential impacts by giving individuals a chance to leave the area to avoid injury prior to the impact hammer operating at full capacity. This would lessen the potential for fish to experience permanent injury or death and would reduce temporary or short-term and recoverable hearing loss due to acoustic impacts from pile driving. The likelihood of impacts from underwater noise are further
reduced by the fact that proposed construction operations would not be in deep water but would occur in the shallow intertidal environment of Unai Chulu (approximately 5.0 to 20 feet [1.5 to 6.0 meters]).

The use of an underwater excavator to break up coral and remove sediments from the location of the proposed ramp would also generate underwater sound. Based on comparable operations that measured underwater excavation noise in an area with a limestone bottom, the loudest sounds would be associated with the bottom impact during rock fracturing and excavation (Reine et al. 2014). These sounds would be intermittent, not continuous, and would be substantially less than those predicted for impact pile driving (see Appendix M, Marine Biology Technical Memo and Survey Reports).

Potential impacts to water quality characteristics of the marine environment during coastal and inland construction activities would be minimized by implementing resource management measures (see Section 4.3, Water Resources for details) to control fugitive dust, stormwater runoff, and eutrophication (the process by which a body of water acquires a high concentration of nutrients). In-water construction would cause temporary water quality impacts, including increased turbidity. Increases in turbidity could temporarily decrease the foraging efficiency of species using Essential Fish Habitat at Unai Chulu. However, given the dynamic nature of the habitat and the grain size of the material, turbidity is expected to be minimal and localized. Impacts would be minimized to the maximum extent practicable through adherence to best management practices. Post-development stormwater management would mainly focus on a combination of natural and engineered features (i.e., Low Impact Development) that control the volume and rate of stormwater runoff and filter out pollutants.

In-water construction would cause temporary, as well as permanent, loss and degradation of coral reef habitat that comprises Essential Fish Habitat at Unai Chulu. Fish may be temporarily displaced for the duration of construction activities. Coral reef flat habitat at Unai Chulu would be permanently physically altered and removed. Due to loss of habitat, changes to local fish populations and management unit species would likely occur. Populations of reef-associated fish would be expected to decrease in rough proportion to the relative area of reef that would be impacted. While this represents a small percentage of the total, it would be more than minor and/or temporary. It would reduce the quality and quantity of Essential Fish Habitat for the coral reef ecosystem and the complex trophic (i.e., feeding and nutrition) structure of the reef ecosystem. The high levels of primary (plant) and secondary (animal) production of the reef itself would be largely eliminated.

Although the area impacted by in-water construction at Unai Chulu represents 0.34% of the total reef habitat on Tinian (see Table 3.10-1), it represents 20-30% of Tinian’s reef flat habitat. Unai Chulu is one of seven well-developed reef flats on Tinian (Analytical Laboratories of Hawaii 2004; National Oceanic and Atmospheric Administration, National Centers for Coastal Ocean Science 2005; Bearden et al. 2008; Riegl and Dodge 2008; Brainard et al. 2011). Therefore, given the importance of this habitat as Essential Fish Habitat and its limited availability on Tinian, the removal of the coral reef at this beach during Tinian Alternative 1 construction activities would result in significant impacts to marine habitat and Essential Fish Habitat.

### 4.10.3.1.1.2 Marine Flora

Marine flora would be removed and otherwise negatively impacted by mobilized rubble within the areas of direct and indirect physical disturbance to habitat by in-water construction at Unai Chulu (see Table 4.10-1). Alteration of marine flora habitat would impact ecological function at Unai Chulu and eliminate
habitat and food sources for other species. Marine flora, such as seagrasses, provide a food source for sea turtles and habitat for fishes within the region of influence (Spalding et al. 2003). Seagrasses also play a major role in fisheries production and have been shown to provide protection from coastal erosion (Spalding et al. 2003). In-water construction would also temporarily increase sedimentation within the nearshore waters, thereby increasing turbidity, reducing light availability, photosynthesis, and primary production by marine flora. However, as described in Section 3.10, Marine Biology, marine flora are abundant in Tinian waters, and in-water construction at Unai Chulu would eliminate approximately 0.34% of Tinian’s reef habitat that could support marine flora. Therefore, Tinian Alternative 1 construction activities would result in less than significant impacts to marine flora.

4.10.3.1.1.3 Marine Invertebrates

Based on the Marine Resource Surveys of Tinian, Volume I (Minton et al. 2009), the reef slope at Unai Chulu is far more diverse than the reef flat. The surveys documented at least 79 coral and 89 non-coral invertebrate taxa (distinct species, genera, or families) on the reef slope, versus 15 coral and 28 non-coral taxa on the reef flat. The most abundant non-coral invertebrates on the reef slope were rock-boring urchins; on the reef flat, sea cucumbers, sea stars, and tube worms were the most abundant. Individual coral and coral colonies at Unai Chulu within the construction area would be exposed to direct physical removal and disturbance during construction. Coral located adjacent to the amphibious landing ramp would be exposed to indirect impacts associated with mobilized rubble generated by the construction activities. Non-coral marine invertebrates (starfish, sea urchins, sea cucumbers, mollusks, and tube worms) would also be subject to direct and indirect impacts associated with in-water construction. Some non-coral marine invertebrates would be directly impacted (i.e. mortality) during in-water construction. Non-coral marine invertebrates not directly impacted during in-water construction would experience temporary as well as permanent habitat loss in the construction footprint.

The in-water construction of the amphibious landing area would also result in the impacts associated effects of sedimentation. In addition, coastal construction could lead to increased runoff from supporting land-based construction activities (e.g., construction equipment staged on the beach). Sediments created and/or mobilized during dredging or other construction activities would be expected to occur within and adjacent to the construction area. When mobilized by water motion, mobile rubble can strike or smother marine invertebrates. These effects would be relatively localized and constrained to the time of construction.

In addition, underwater noise from construction equipment, vibratory and impact pile-driving, and the sounds of the substrate fragmenting and moving during the dredging process could mask the natural reef sounds that coral larvae use as settlement cues (Vermeij et al. 2010). The nature of coral larvae’s use of acoustic information is related to navigation towards suitable reef habitat for settlement (Vermeij et al. 2010). Coral larvae could be anywhere in the water column to at least as deep as each species’ typical depth range, and typical larval stage durations range from a few days to a few weeks (Baird et al. 2009). A possible consequence of construction noise is that coral larvae may avoid settling and remain in the water column for a slightly longer time, drifting until the sound-generating activity subsides. Based on the level of disturbance at the construction site, it is unlikely that natural reef sounds like those made by snapping shrimp and reef fish would be present, where the habitat would be degraded and inhospitable for larval settlement. Coral larvae that do not settle because of construction noise or degraded habitat conditions would drift to other nearby locations with suitable habitat within a short
time (possibly minutes, depending on currents), which would be expected to have a small effect on larval survival given the duration of the planktonic phase (Baird et al. 2009). Accordingly, acoustic effects on larvae would be local, temporary, and less than significant. The proposed construction methods would permanently introduce concrete to the marine environment. Concrete sometimes inhibits settlement of coral larvae, which would be beneficial in this context, and cured concrete is not known to have effects on post-settlement corals (Jaap 2000; Southeast Florida Coral Reef Initiative 2011; Tan and Chou 2012). Apart from the physical destruction and degradation of coral reef habitat, which is already recognized as a significant impact under Marine Habitat and Essential Fish Habitat, the additional impact to adjacent coral reef habitat, the associated coral and non-coral invertebrates, and coral larvae would be relatively localized and temporary.

In the vicinity of Unai Chulu, coral populations would experience a population discontinuity within the construction footprint. Currently, this location is a continuous coral reef. It is expected the permanent loss of 0.34% of the Tinian reef habitat within and adjacent to the construction area at Unai Chulu would reduce non-coral marine invertebrates by a roughly equivalent amount. Therefore, Tinian Alternative 1 construction activities would result in significant impacts to coral and less than significant impacts to non-coral marine invertebrates.

4.10.3.1.1.4 Fish

In-water construction would cause temporary, as well as permanent, habitat disturbance and loss for fish species as fish may be temporarily or permanently displaced. Since reef flat coral habitat at Unai Chulu would be permanently physically altered and removed, changes to local fish populations dependent on this habitat would likely occur. Populations of reef fish would decrease, and trophic (i.e., feeding and nutrition) structure would be affected. Because many individual fish depend on specific coral habitats for survival, mortality would likely occur in these areas. Given the loss of approximately 0.34% of Tinian reef habitat during construction at Unai Chulu, a roughly equivalent reduction in populations of reef-associated fish can be anticipated.

During in-water construction, construction equipment could potentially strike any fish species found within the construction area, although some fish may be more susceptible to strike potential than others. Potential responses to physical strikes are varied, but include physiological stress, physical injury or mortality, and behavioral changes such as avoidance of the area, altered swimming speed and direction, and reduced performance of key behaviors such as eating, hiding, and predator avoidance. Construction equipment would interact with species that inhabit the seafloor, and the water column above the seafloor in the construction area. Early life stages of fish (including fish eggs, larvae, and juveniles) that inhabit the construction impact area would be the most vulnerable and could suffer mortality if they do not vacate the area during construction.

Fish are susceptible to acoustic stressors in multiple ways. Fish exposed to short-duration, high-intensity signals, such as those that emanate from pile driving, could result in injury, long-term consequences (A. N. Popper et al. 2006; Stadler and Woodbury 2009), and hearing loss, also known as a noise-induced threshold shift, or simply a threshold shift (Miller 1974). A temporary threshold shift is a temporary, recoverable loss of hearing sensitivity. Fish with hearing specializations (i.e., greater sensitivity to lower sound pressures and higher frequencies) experience some hearing loss after several days or weeks of exposure to increased background sounds, although the hearing loss seems to recover (e.g., Scholik and
When human-generated noise interferes with natural sounds associated with behaviors such as detection of predators and prey, schooling, mating, and navigating (Myrberg 1980; A. Popper et al. 2003), such auditory masking could have impacts to fish by reducing their ability to perform these biological functions. Human-generated noise has also been documented to cause behavioral reactions such as avoidance or fleeing the area. In addition to potential effects on hearing and behavior, fish that have swim bladders are susceptible to injury by the rapid expansion/decompression of their swim bladders that is caused by pressure waves from underwater noises (Hastings and Popper 2005). At a sufficient pressure level (a measure closely related to the loudness of the sound), this exposure can be fatal.

To minimize the potential for fish to be present in the immediate vicinity of the impact or vibratory pile driving, the equipment operators would use a soft-start procedure that involves a slow increase in intensity of noise and allows individuals in the area to disperse and avoid injury before maximum noise levels are reached. It is expected that during the soft start and as the activity progresses, fish would move farther away or into sheltered locations where sound would be less intense. Hence, although there would be temporary behavioral effects, the likelihood of injury to individual fish would be low.

Currently accepted thresholds for behavioral and physiological effects to fish from underwater sound generated by activities such as pile driving are summarized below (Fisheries Hydroacoustic Working Group 2008).

- Behavioral disturbance is assumed to be likely when fish are exposed to a sound pressure level (root mean square – a mathematical process used to measure the typical magnitude of a set of numbers, regardless of whether the values are positive or negative) greater than 150 decibels (referenced to 1 micro Pascal, a measure of pressure).
- Injuries are assumed to occur when fish are: a) exposed to a peak sound pressure level (which is the greatest absolute instantaneous sound pressure during a stated time interval) of 206 decibels (referenced to 1 micro Pascal); or b) when they receive a cumulative sound exposure level (a mathematical way of summing the effects of sound over a duration of time) during a single day of 187 decibels (referenced to 1 micro Pascal squared-second). For fish that weigh less than 0.07 ounces (2 grams), the latter threshold is 183 decibels (referenced to 1 micro Pascal squared-second).

Appendix M.1, *Marine Biology Technical Memo*, provides the estimated sound levels that would be produced by impact and vibratory pile driving and vibratory pile extraction during the construction and removal of temporary causeways at Unai Chulu. Using the model described in Appendix M.1 to estimate the decrease in sound levels with distance from the pile, and estimating 10 minutes of impact pile driving (600 pile strikes) per day, the distances within which the above thresholds would be exceeded can be calculated. Output from the model showed that the potential for injury due to peak sound pressure level would exist within 30 feet (9 meters), and the sound exposure level thresholds for injury to small and large fish would only be exceeded for fish that remain exposed within distances of 1,715 feet (523 meters) and 928 feet (283 meters), respectively, for the entire 600 pile strikes. It is considered unlikely that fish would remain within these distances where injuries could occur. Small life stages that drift passively in the water column could drift through the area but would be unlikely to remain within these distances long enough to be impacted. Finally, the behavioral effects threshold would be
exceeded within a distance of 120,695 feet (6,310 meters), but this would accumulate over a period that is estimated to be a total of 10 minutes distributed over the day that the pile is being hammered by the impact pile driver. This amount of behavioral disturbance is unlikely to have important biological consequences. In-water construction would cause temporary water quality impacts including increased turbidity. Increases in turbidity could temporarily decrease the foraging efficiency of fish. In sandy areas, given the dynamic nature of the habitat and the grain size of the material, turbidity is expected to be minimal and localized. Potential impacts from run-off from land-based construction could degrade water quality, particularly the construction of impervious access roads built close to the shoreline. These impacts would be minimized through adherence to best management practices (Appendix D, Best Management Practices).

The permanent loss of 0.34% of Tinian reef habitat within and adjacent to the construction area at Unai Chulu would reduce populations of reef-associated fish by a roughly equivalent amount. With the implementation of a soft start during pile driving, the likelihood of injuries to fish would be low, although behavioral effects would occur. Apart from the loss of coral reef and Essential Fish Habitat already discussed, the additional impact to fish populations and communities would be relatively small. Therefore, Tinian Alternative 1 construction activities would result in less than significant impacts to fish.

### 4.10.3.1.1.5 Special-status Species

#### Corals

The Coral Marine Resource Survey conducted in support of this EIS/OEIS recorded the presence of one coral species, *Acropora globiceps*, listed under the Endangered Species Act (National Marine Fisheries Service 2012; DoN 2014a). Other listed species are considered unlikely to occur or be affected. Table 4.10-2 presents an estimate of the number of *Acropora globiceps* that will be directly impacted and removed during in-water construction at Unai Chulu. In addition, Table 4.10-2 lists the total estimated area of coral loss. Tables for Unai Babui, Unai Masalok and Unai Lam Lam can be found in Section 4.10.3.1.2, Operation Impacts.

<table>
<thead>
<tr>
<th>Unai Chulu2</th>
<th>Unai Chulu2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extrapolated number of <em>Acropora globiceps</em> colonies in the Approach Zone</td>
<td>1,344</td>
</tr>
<tr>
<td>Density of <em>Acropora globiceps</em> colonies in the Approach Zone (colonies per square meter)</td>
<td>0.09</td>
</tr>
<tr>
<td>Extrapolated area (square meter) covered by <em>Acropora globiceps</em> in the Approach Zone</td>
<td>49.2</td>
</tr>
</tbody>
</table>

Notes: 1Calculations assume that the entire susceptible area of each Approach Zone (based on depth of construction or training activity: 5 feet (1.5 meters) for small boat landings and swimmers, 12 feet (4 meters) for Amphibious Assault Vehicles) is subject to physical effects. Effects to corals/seafloor outside of these depths in each area (e.g., deep grooves) and potential effects outside of the Approach Zone are excluded from this analysis, but are considered separately as potential indirect physical effects.

2Includes all areas that construction will have direct physical impacts - also including temporary structures.

Due to the number of colonies that will be removed in relation to the rarity of the species, the destruction of the established colonies of *Acropora globiceps* within the construction footprint, Tinian Alternative 1 construction activities would result in significant impacts to special-status coral species.

Since there is no evidence of differential susceptibility among coral species to acoustic and indirect effects, the effects on *Acropora globiceps* are considered to be the same as were discussed previously for corals in general under Marine Invertebrates and would be less than significant.
Sea Turtles

The sea turtle survey conducted in support of this EIS/OEIS (DoN 2014b) confirmed the presence of sea turtles within the construction area. At the time of the survey, the density within the study area was estimated at 65 turtles per square mile (25 turtles per square kilometer), approximately one quarter the density of other areas around Tinian. Using the highest estimated density available (based on swimming transects [DoN 2014b]), this equates to an average of less than one turtle within the 10.3 acre (4.1 hectare) in-water construction footprint at any given time. However, it can reasonably be assumed that turtles move through the area and that numbers would vary from zero to several individuals. Construction impacts related to sea turtles include habitat disturbance, acoustic impacts, and physical disturbance and strike.

In-water construction of the amphibious landing area at Unai Chulu would cause temporary and permanent effects to sea turtle foraging and resting habitat within the 10.3 acre (4.1 hectare) construction footprint, and possibly a small area of degraded habitat adjacent to the construction footprint. Sea turtles could be displaced from these waters for the duration of construction activities. Coral habitat at Unai Chulu would be physically altered and permanently removed during the proposed construction activities. Sea turtles depend on this nearshore coral reef habitat for food and shelter. The loss of this coral habitat may temporarily affect sea turtles within the project footprint, as coral habitat in the surrounding areas has similar characteristics and the sea turtle population density appears low enough for relocation without overcrowding or displacement. As a result, nearshore habitat loss at Unai Chulu resulting from Tinian Alternative 1 construction activities would not be likely to impact the current population or future recovery of green and hawksbill sea turtles, and is considered a less than significant impact.

Sea turtles occurring in the shallow waters of the Unai Chulu construction area would be subject to construction noise. In most cases, during the soft start procedure, sea turtles would either surface or swim away from the noise source and therefore avoid injury before maximum noise levels are reached. Over the course of construction, sea turtles may relocate at a distance where the noise would not further affect their behavior, or individual turtles may become habituated to the noise at disturbance levels between 160-190 decibels (Moein et al. 1994). Designating a zone to where behavioral impacts can occur to 1,000 feet (309 meters) from the source noise would indicate approximately twelve turtles could be impacted from construction noise. Based on past (Kolinski et al. 2004) and recent transects (DoN 2014b), the density of sea turtles within the construction area at Unai Chulu is the lowest calculated density across the island (Kolinski et al. 2004; DoN 2014b). Sea turtles in the southern Mariana Islands, including Tinian, are locally harvested, and as a result, many have developed a conditioned response to flee or vacate an area due to the presence of people or other human disturbances. The presence of personnel, equipment and vessels in the water during construction are likely to cause a flight response in sea turtles. As such, injury and behavior impacts from pile driving or other construction noise resulting from implementation of Tinian Alternative 1 would result in less than significant impacts.

Sea turtles, especially juveniles, could be struck by construction equipment, which could cause mortality or injury. Smaller, younger turtles require refuge from predators, primarily sharks, and occupy crevices in the spur and groove coral habitat. There is a possibility that these animals could use the specific habitat within the proposed construction footprint at the time of construction. However, a direct strike
would be unlikely due to the low density of turtles in the construction footprint and expected flight response from construction noise. Proper surveillance would also be implemented during construction activities to further reduce the potential for a sea turtle strike from construction equipment. Therefore, Tinian Alternative 1 construction activities would result in less than significant impacts to sea turtles.

Through the Endangered Species Act section 7 consultation process, potential effects to individual sea turtles and on the continued existence of the species would be evaluated and detailed in the Biological Assessment. Best management practices, such as implementation of a soft start during pile driving, would be implemented during construction to reduce potential impacts. Additional mitigation measures may be recommended during agency consultations.

**Marine Mammals**

As discussed in 3.10.4.6, *Marine Mammals*, no marine mammals were sighted in the Tinian region of influence during the Marine Mammal Survey conducted in support of this EIS/OEIS (DoN 2014c). However, marine mammals have been previously documented in the region of influence and may travel through the region of influence during proposed construction. Based on an analysis of the marine species surveys associated with Tinian, sightings data provided in Hill et al. (2014) shows that the marine mammal most often sighted in the nearshore environment (less than 3 nautical miles [5.6 kilometers]) was the spinner dolphin (54% of encounters). However, sightings around Tinian primarily occurred on the eastern side of the island, away from areas currently proposed for construction or operations. Ligon et al. (2011) did not sight spinner dolphins off Tinian during a survey around the island, but did report anecdotal evidence of spinner dolphins off Tinian Harbor on the southwestern coast of the island. While a lack of sightings specific to the region of influence does not preclude the species from being present, it does indicate that spinner dolphins appear to use other areas around Tinian more regularly, and would likely be transmitting through the region of influence.

Proposed construction would involve construction equipment and human activity on the beach in the shallow-water environment for approximately 36 weeks. Pile driving/extraction would occur intermittently and for relatively brief periods during daylight hours throughout this period. Since there would be considerable noise and human activity with the construction area at Unai Chulu, it is unlikely that a marine mammal would closely approach this area during construction. Best management practices, such as implementation of a soft start during pile driving, would be implemented during construction. Construction personnel would not commence pile driving if a marine mammal was observed within 300 feet (90 meters). Acoustic impacts to marine mammals would be limited to temporary physiological and behavioral effects that would be considered non-injury disturbance. For these reasons, it is assumed that construction at Unai Chulu would result in non-injurious behavioral impacts due to acoustic harassment of a relatively small numbers of cetaceans as a result of pile driving and pile removal during construction activities; however, no injury or mortality are anticipated. Any effects experienced by individual marine mammals are anticipated to be limited to short-term disturbance of normal behavior or temporary displacement of animals near the source of the noise. Appendix M, *Marine Biology Technical Memo and Survey Reports*, provides a general discussion of marine mammal hearing and communication and potential acoustic effects on marine mammal hearing, communication, and behavior. Impacts to marine mammals resulting from Tinian Alternative 1 construction activities would be limited to temporary physiological and behavioral effects and result in less than significant impacts to marine mammals.
4.10.3.1.2 Operation Impacts

As described in Chapter 2, Tactical Amphibious Beach Landings (non-live-fire) would occur on Tinian up to 20 weeks per year. Table 4.10-3 gives an overview of each operational/training activity per beach. Figures 4.10-1 to 4.10-8 show proposed amphibious training activities for the beaches on Tinian. Each pair of figures presents proposed activities for a specific beach in relation to bathymetry (Figures 4.10-3, 4.10-5, 4.10-7) and coral cover (Figures 4.10-4, 4.10-6, 4.10-8). The number of daily landings may vary based on factors such as the training scenario and objectives, weather/sea state, and vehicle availability. In general, amphibious training on Tinian would be spread evenly throughout the 20 weeks of military training, consistent with the unit level of training emphasis, with daily variations as noted below.

<table>
<thead>
<tr>
<th>Beach</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unai Chulu</td>
<td>• Amphibious Assault Vehicle landings</td>
</tr>
<tr>
<td></td>
<td>• Landing Craft Air Cushion vessel landings</td>
</tr>
<tr>
<td></td>
<td>• Small boat landings</td>
</tr>
<tr>
<td></td>
<td>• Swimmer insertions</td>
</tr>
<tr>
<td>Unai Babui</td>
<td>• Landing Craft Air Cushion vessel landings</td>
</tr>
<tr>
<td></td>
<td>• Small boat landings</td>
</tr>
<tr>
<td></td>
<td>• Swimmer insertions</td>
</tr>
<tr>
<td>Unai Masalok</td>
<td>• Landing Craft Air Cushion vessel landings</td>
</tr>
<tr>
<td></td>
<td>• Small boat landings</td>
</tr>
<tr>
<td></td>
<td>• Swimmer insertions</td>
</tr>
<tr>
<td>Unai Lam Lam</td>
<td>• Small boat landings</td>
</tr>
<tr>
<td></td>
<td>• Swimmer insertions</td>
</tr>
</tbody>
</table>

Potential impacts to marine water quality as a result of land-based training activities in support of the proposed action would be limited by the best management practices described in Section 4.3, Water Resources, and would be less than significant.

4.10.3.1.2.1 Marine Habitat and Essential Fish Habitat

At Unai Chulu, four main activities would directly affect marine habitat as deep as 12 feet (4 meters) below mean low water: Amphibious Assault Vehicle landings, Landing Craft Air Cushion vessel landings, small boat landings, and swimmer landings. Due to the turbulent nature within this area, the mobile rubble would be distributed and transported outside of the landing zone, with the potential to cause damage to the deeper reef over time, particularly during storm events. Landings at Unai Chulu would occur within the construction footprint already accounted for (see Table 4.10-1). The additional disturbance associated with operations in the degraded footprint would be less than significant, although it would prevent the long-term recovery of the coral reef ecosystem that could eventually occur in the absence of disturbance. Indirect impacts may include future impact by mobilized rubble from training operations associated with the proposed facilities and training areas.
Unai Babui Training Impact Area

Legend

- Proposed Tracked Vehicle Route
- Proposed Wheeled Vehicle Route
- Approach Zone¹
- Notional Landing Craft Air Cushion - Landing Site (150-feet diameter)
- Notional Landing Craft Air Cushion Landing Footprint

Depth Relative to Mean Lower Low Water

- Greater than 40 feet Depth
- -40 to -20 feet Depth
- -20 to -12 feet Depth
- -12 to -7 feet Depth
- -7 to -5 feet Depth
- -5 to -3 feet Depth
- -3 to -1 feet Depth
- -1 to 0 feet Depth
- 0 to 3 feet
- 3 to 5 feet
- Greater than 5 feet

¹Unai Babui will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.

Figure 4.10-3

Unai Babui Training Impact Area

Sources: Fugro Pelagos 2013a, 2013b
Unai Babui Training Impact Area

Coral Cover

Sources: DoN 2014, Fugro Pelagos 2013a, 2013b

1Unai Babui will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.
Figure 4.10-5
Unai Lam Lam Training Impact Area
Depth

Legend
- Proposed Wheeled Vehicle Route
- Proposed Tracked Vehicle Route
- Approach Zone¹

Depth Relative to Mean Lower Low Water
- Greater than 40 feet Depth
- 40 to -20 feet Depth
- 20 to -12 feet Depth
- 12 to -7 feet Depth
- 7 to -5 feet Depth
- 5 to -3 feet Depth
- 3 to -1 feet Depth
- 1 to 0 feet Depth
- 0 to 3 feet
- 3 to 5 feet
- Greater than 5 feet

Sources: Fugro Pelagos 2013a, 2013b

¹Unai Lam Lam will be used for: small boat, and swimmer insertions approach training.
Figure 4.10-6
Unai Lam Lam Training Impact Area
Coral Cover

Legend
- Proposed Wheeled Vehicle Route
- Proposed Tracked Vehicle Route
- Approach Zone¹

Coral Cover (%)
- 0%
- 1-10%
- 10-20%
- 20-30%
- 30-40%
- 40-50%
- 50-60%
- 60-70%
- 70-80%
- 80-100%

¹Unai Lam Lam will be used for: small boat, and swimmer insertions approach training.

Sources: Fugro Pelagos 2013a, 2013b
Steep Grade
Access Road
Masalok Beach
Road
Landing Craft
Air Cushion
Reef Flat Landing

Legend
- Proposed Tracked Vehicle Route
- Proposed Wheeled Vehicle Route
- Approach Zone¹
- Notional Landing Craft Air Cushion - Landing Site (150-feet diameter)
- Notional Landing Craft Air Cushion Landing Footprint

Depth Relative to Mean Lower Low Water
- Greater than 40 feet Depth
- -40 to -20 feet Depth
- -20 to -12 feet Depth
- -12 to -7 feet Depth
- -7 to -5 feet Depth
- -5 to -3 feet Depth
- -3 to -1 feet Depth
- -1 to 0 feet Depth
- 0 to 3 feet
- 3 to 5 feet
- Greater than 5 feet

¹Unai Masalok will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.

Figure 4.10-7
Unai Masalok Training Impact Area
Depth

Sources: Fugro Pelagos 2013a, 2013b
Unai Masalok will be used for landing craft air cushion, small boat, and swimmer insertions approach training.
At Unai Babui, three training activities would directly affect marine habitat: Landing Craft Air Cushion vessels landings, small boat landings, and swimmer landings. Landing Craft Air Cushion vessels landings would affect coral colonies and coral reef habitat where habitat occurs within the set-down circle(s), which could occur anywhere along the beach at Unai Babui. Inflatable boats and swimmer landings could affect coral colonies and coral reef habitat to as deep as 5 feet (1.5 meters) below mean low water (see Figures 4.10-3 and 4.10-4). The area of reef substrate shallower than 5 feet (1.5 meters) in the landing area at Unai Babui is 3.05 acres (1.2 hectares).

At Unai Lam Lam, the two main activities with the potential to directly affect marine habitat are small boat landings and swimmer landings. Small boats and swimmer landings could affect coral colonies and coral reef habitat to as deep as 5 feet (1.5 meters) below mean low water (see Figures 4.10-5 and 4.10-6). The area of reef substrate shallower than 5 feet (1.5 meters) in the Approach Zone at Unai Lam Lam is 3.83 acres (1.54 hectares). These operational activities could affect marine habitats by disturbing or altering the seafloor, water quality, or physical environment. The primary effect would be physical strike and disturbance from equipment such as boat hulls and swimmers boots that could break or abrade corals and could create mobile rubble that is capable of being transported outside of the small boat and swimmer landing areas with the potential to cause damage to the deeper reef over time. Consequences of these potential effects would reduce the volume and complexity of Essential Fish Habitat in the affected areas. These activities would result in periodic short-term and long-term/permanent impacts to Essential Fish Habitat.

At Unai Masalok, the three main activities with the potential to directly affect marine habitat include Landing Craft Air Cushion vessels landings, small boat landings, and swimmer landings. Landing Craft Air Cushion vessels landings would affect coral colonies and marine habitat where habitat occurs within the set-down circle(s) which could occur anywhere along the beach at Unai Masalok. Inflatable boats and swimmer landings could affect coral colonies and marine habitat to as deep as 5 feet (1.5 meters) below mean low water (see Figures 4.10-7 and 4.10-8). The area of reef substrate shallower than 5 feet (1.5 meters) at Unai Masalok is 4.5 acres (1.8 hectares).

At any one time, a small fraction of the total area, corresponding to the area of disturbance by individual vehicles/vessels would be impacted. Over time, some portions would likely be used more frequently and intensively than others, but the cumulative areas disturbed would approach the acreages shown in Table 4.10-4. Operations could create sediment and mobile rubble that is capable of causing ongoing indirect effect (physical disturbance outside the amphibious landing area), both along-shore and downslope. The size of the area exposed to indirect effects of mobile rubble is conservatively estimated to be equal to the area exposed to direct effects. The shape of the indirectly affected area cannot be quantitatively estimated as there would be a gradient of disturbance within the area of indirect effect. The effects of mobilized rubble would be greater closer to the area of operation and reduced at increasing distances from operation activities based on the assumptions for rubble movement.

Consequences of these potential effects would reduce the volume and complexity of Essential Fish Habitat in the affected areas. Table 4.10-4 presents the areas of the potential direct and indirect impacts to marine habitat with implementation of the proposed action on Tinian.
Table 4.10-4. Summary of Potential Direct and Indirect Impacts to Marine Habitat on Tinian

<table>
<thead>
<tr>
<th>Beach and Activity</th>
<th>Area of Direct Effects (acres)</th>
<th>Area of Indirect Effects*</th>
<th>Total Area of Likely Direct and Indirect Effects (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unai Chulu</td>
<td>10.3</td>
<td>10.3</td>
<td>20.6</td>
</tr>
<tr>
<td>Unai Babui</td>
<td>3.05</td>
<td>3.05</td>
<td>6.10</td>
</tr>
<tr>
<td>Unai Lam Lam</td>
<td>3.83</td>
<td>3.83</td>
<td>7.66</td>
</tr>
<tr>
<td>Unai Masalok</td>
<td>4.50</td>
<td>4.50</td>
<td>9.00</td>
</tr>
</tbody>
</table>

*This analysis assumes the size of the area exposed to indirect effects of mobile rubble is assumed to be equal to the area exposed to direct effects.

Impacts at Unai Chulu were analyzed under construction impacts; see Section 4.10.3.1.1.1, Marine Habitat and Essential Fish Habitat

Operational activities may impact the water quality and introduce noise in the water column within the designated Essential Fish Habitat area for pelagics, bottomfish, crustaceans, and coral reef ecosystems. Potential impacts to the water column habitat by vessel noise during the proposed operational activities would mainly include impacts to prey species, including fish and invertebrates. Vessel movements have the potential to expose fish and invertebrates to sound and general disturbance, which could result in short-term behavioral or physiological responses (e.g., avoidance, stress, increased heart rate). However, this would not be expected to compromise the general health or condition of individual fish or populations of invertebrates. Given typical underwater vessel noise of about 160 decibels at 3.3 feet (1 meter), the 150-decibel threshold for behavioral effects to fish would be exceeded within about 15 feet (4.6 meters) of the vessel. Such effects would be brief and infrequent, resulting in relatively minor, temporary effects on the quantity and quality of Essential Fish Habitat in the water column. There would be no effects on the substrate. As a result, vessel noise during operations of Tinian Alternative 1 would not have a significant impact to marine habitat or Essential Fish Habitat.

Operational activities would cause temporary water quality impacts including increased turbidity. Increases in turbidity could temporarily decrease the foraging efficiency of Essential Fish Habitat at the proposed tactical amphibious landing beaches. In sandy areas, given the dynamic nature of the habitat and the grain size of the material, turbidity is expected to be minimal and localized. Potential impacts from run-off from land-based construction could degrade water quality, particularly the construction of impervious access roads built close to the shoreline. Training activities are not expected to cause long-term erosion or to modify marine habitat outside of the footprints identified in Table 4.10-4. Impacts would be minimized to the maximum extent practicable through adherence to resources management measures.

Approximately 3.05 acres (1.2 hectares) of marine habitat, including corals and coral reef habitat would be directly impacted at Unai Babui, 3.83 acres (1.55 hectares) would be directly impacted at Unai Lam Lam, and 4.50 acres (1.82 hectares) would be directly impacted at Unai Masalok (see Table 4.10-3). As stated in Chapter 3, Table 3.10-1, 65,920 acres (26,676 hectares) of total reef habitat are present across the Mariana Islands, 5,696 acres (2,305 hectares), which is present around Tinian (Analytical Laboratories of Hawaii 2004; National Oceanic and Atmospheric Administration, National Centers for Coastal Ocean Science 2005; Bearden et al. 2008; Riegl and Dodge 2008; Brainard et al. 2011). Based on the sum of the area shallow enough to be affected by the in-water training activities at Unai Babui, Unai Lam Lam, and Unai Masalok (as deep as 5 feet [1.5 meters]), Tinian Alternative 1 operations would directly and indirectly impact approximately 0.44% of total reef habitat from Tinian during operations.
is expected the permanent loss of 0.34% of the Tinian reef habitat within and adjacent to the construction area at Unai Chulu and the additional disturbance associated with operations would prevent the long-term recovery of the coral reef ecosystem that could eventually occur in the absence of disturbance. Total reef habitat around Tinian, which may include marine flora habitat or potential habitat, totals 5,696 acres (2,305 hectares). Based on the low percentage of marine habitat loss in comparison to the total available marine habitat around Tinian, Tinian Alternative 1 operations would result in less than significant impacts to marine habitat and Essential Fish Habitat.

4.10.3.1.2.2 Marine Flora

The actions that could potentially impact marine flora during operation include in-water training, landings of Amphibious Assault Vehicles, Landing Craft Air Cushion vessels and small inflatable boats, and operation of vessels in nearshore waters. Marine flora that could be impacted from training activities would be reef substrate shallower than 12 feet (4 meters) below mean low water. Vessels conducting or supporting training could impact marine flora by disturbing the bottom and swimmers could impact marine flora through disturbance of the nearshore environment. Small boats and swimmer landings could affect marine flora to as deep as 5 feet (1.5 meters) below mean low water.

Operational impacts would be periodic. Marine flora already impacted during construction at Unai Chulu would continue to be impacted during operation. With recurring operations and disturbance of the substrate, limited regrowth of marine flora would occur following construction activities, and it would then be directly impacted from vessels or swimmers disturbing or uprooting any marine flora habitat shallower than 12 feet (4 meters).

Marine flora habitat would not be directly removed at Unai Babui, Unai Lam Lam, or Unai Masalok as a result of Tinian Alternative 1, but habitat may be disturbed during training activities. As described in Section 3.10, Marine Biology, marine flora is abundant in Tinian waters as Tinian has one of the highest mean macroalgal covers of all the islands in the Marianas Archipelago (Brainard 2012).

As stated in Chapter 3, total reef habitat around Tinian, which may include marine flora habitat or potential habitat, totals 5,696 acres (2,305 hectares) (Analytical Laboratories of Hawaii 2004; National Oceanic and Atmospheric Administration, National Centers for Coastal Ocean Science 2005; Bearden et al. 2008; Riegl and Dodge 2008; Brainard et al. 2011). The total area potentially disturbed at these three beaches during training activities is equal to 0.44% of the total reef habitat area. It is expected the permanent loss of 0.34% of the Tinian reef habitat within and adjacent to the construction area at Unai Chulu and the additional disturbance associated with operations would prevent the long-term recovery of the marine flora that could eventually occur in the absence of disturbance. Marine flora is plentiful at various locations and depths around the training area and across Tinian nearshore waters and there are no known special-status species. As a result, Tinian Alternative 1 operations would result in less than significant impacts to marine flora.

4.10.3.1.2.3 Marine Invertebrates

Landings at Unai Chulu would occur within the construction footprint already accounted for (see Table 4.10-1). The reefs at Unai Babui, Unai Lam Lam, and Unai Masalok show moderate to high topographic complexity and moderate (Unai Babui and Unai Lam Lam) to high (Unai Masalok) coral cover with little sand. The reef flat at Unai Lam Lam is rich with high coral cover (90%), whereas the reef flat on Unai Masalok has low coral cover (DoN 2014a). Swimmers and small boats transitioning through the reef flat
at Unai Lam Lam are expected to impact corals, and it is assumed that those corals would be permanently impacted or destroyed. Landing Craft Air Cushion vessels landings, small boat landings, and swimmer landing would occur at Unai Masalok and would also result in loss of existing corals, but the limited density of corals would limit the total amount of coral loss. Non-coral invertebrate communities dominated by tube worms, sea urchins, and sea cucumbers (Minton et al. 2009), would also be impacted to the extent that the coral habitat is degraded, although sea cucumbers would be less affected because they burrow and feed on detritus in the sediments rather than living on the reef.

It is expected the permanent loss of 0.34% of the Tinian reef habitat within and adjacent to the construction area at Unai Chulu and the additional disturbance associated with operations would prevent the long-term recovery of the coral reef ecosystem that could eventually occur in the absence of disturbance. As describe in *Marine Habitat and Essential Fish Habitat*, training activities at Unai Babui, Unai Lam Lam, and Unai Masalok (as deep as 5 feet [1.5 meters]) would directly and indirectly impact an additional 0.44% of total reef habitat at these three beaches on Tinian. Based on the low percentage of marine habitat loss in comparison to the total available marine habitat available to support marine invertebrates around Tinian, Tinian Alternative 1 operations would result in less than significant to marine invertebrates.

### 4.10.3.1.2.4 Fish

Actions that could potentially impact fish during proposed operations include landings of Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, and small inflatable boats. Fish may be temporarily displaced for the duration of training activities at these beaches. The coral section above details the loss of coral habitat that would occur during training activities. Coral impacts would directly and indirectly impact fish, as many fish species depend on this coral habitat for shelter, feeding, and reproduction. The overall impact to reef-associated fish populations on Tinian would be roughly proportional to the area of impact by the in-water training activities at Unai Chulu, Unai Babui, Unai Lam Lam, and Unai Masalok.

In-air noise has no potential to affect fish. As described previously (Section 4.10.3.1.2.1, Marine Habitat and Essential Fish Habitat) the underwater noise from vessels engaged in training would be brief, infrequent, and would not exceed levels likely to cause behavioral reactions in fish more than about 15 feet (4.6 meters) from the vessel. As a result, no significant impacts would result from underwater noise during operations. In addition, the potential for direct strikes to fish as a result of the proposed training is low as the noise and presence of vessels would likely cause fish to temporarily flee the area, and the resulting impact would be less than significant.

Tinian operation activities could cause temporary water quality impacts including increased turbidity, erosion, and sediment transport. Increases in turbidity could temporarily decrease the foraging efficiency of fish. In sandy areas, given the dynamic nature of the habitat and the grain size of the material, turbidity is expected to be minimal and localized. Potential impacts from run-off from land-based operational activity, such as the landing of amphibious and small craft vehicles on beaches, could degrade water quality; however, any impacts would be localized, temporary in nature and be limited to training periods.

The use of beaches on Tinian for training operations would impact reef habitat through recurring disturbance and the resulting degradation of habitat. It is expected the permanent loss of 0.34% of the Tinian reef habitat within and adjacent to the construction area at Unai Chulu and the additional
disturbance associated with operations would prevent the long-term recovery of the marine habitat that could eventually occur in the absence of disturbance. As described in *Marine Habitat and Essential Fish Habitat*, training activities at Unai Babui, Unai Lam Lam, and Unai Masalok (as deep as 5 feet [1.5 meters]) would directly and indirectly impact an additional 0.44% of total reef habitat at these three beaches on Tinian. Based on the low percentage of fish habitat loss in comparison to the total available marine habitat available to support fish around Tinian, Tinian Alternative 1 operations would result in less than significant to fish.

### 4.10.3.1.2.5 Special-status Species

#### Corals

The *Coral Marine Resource Survey* (provided in Appendix M, *Marine Biology Technical Memo and Survey Reports*) conducted in support of this EIS/OEIS recorded the presence of one Endangered Species Act-listed coral species, *Acropora globiceps*, at each beach (DoN 2014a). The three other Endangered Species Act-listed coral species discussed in Chapter 3 are not known to occur, and would be unlikely to occur, in appreciable numbers or areas within the training area footprints. Therefore, impacts to these other coral species are unlikely and considered less than significant.

*Table 4.10-5* describes the impacts to *Acropora globiceps* in the Approach Zone at Unai Chulu, Unai Babui, Unai Masalok and Unai Lam Lam during operation/training activities. Vessels have the potential to impact marine species by disturbing the water column. Wash from vessel movement (water displaced by propellers/impellers used for propulsion) and water displaced from vessel hulls can potentially impact eggs and pelagic larvae of Endangered Species Act-listed corals (Bishop 2008; Bickel et al. 2011; Marshall 2012). Amphibious craft may affect the water column to a depth of approximately 12 feet (4 meters). Disturbance caused by propeller wash could extend to approximately twice this depth.

<table>
<thead>
<tr>
<th>Unai Chulu</th>
<th>Unai Babui</th>
<th>Unai Lam Lam</th>
<th>Unai Masalok</th>
</tr>
</thead>
<tbody>
<tr>
<td>388</td>
<td>187.4</td>
<td>107.4</td>
<td>1.9</td>
</tr>
</tbody>
</table>

#### Table 4.10-5. Potential Impacts to *Acropora globiceps* at Unai Chulu, Unai Babui, Unai Masalok, and Unai Lam Lam During Operation/Training Activities

<table>
<thead>
<tr>
<th>Total extrapolated <em>Acropora globiceps</em> coral area (square feet) in the Approach Zone</th>
<th>Unai Chulu</th>
<th>Unai Babui</th>
<th>Unai Lam Lam</th>
<th>Unai Masalok</th>
</tr>
</thead>
<tbody>
<tr>
<td>388</td>
<td>187.4</td>
<td>107.4</td>
<td>1.9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exaggerated number of <em>Acropora globiceps</em> colonies in the Approach Zone</th>
<th>Unai Chulu</th>
<th>Unai Babui</th>
<th>Unai Lam Lam</th>
<th>Unai Masalok</th>
</tr>
</thead>
<tbody>
<tr>
<td>995</td>
<td>381</td>
<td>550</td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Density of <em>Acropora globiceps</em> colonies in the Approach Zone (per square meter)</th>
<th>Unai Chulu</th>
<th>Unai Babui</th>
<th>Unai Lam Lam</th>
<th>Unai Masalok</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.09</td>
<td>0.06</td>
<td>0.04</td>
<td>&lt; 0.005</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extrapolated area (square meter) covered by <em>Acropora globiceps</em> in the Approach Zone</th>
<th>Unai Chulu</th>
<th>Unai Babui</th>
<th>Unai Lam Lam</th>
<th>Unai Masalok</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.1</td>
<td>17.4</td>
<td>10.0</td>
<td>0.2</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

1. Calculations assume that the entire susceptible area of each Approach Zone (based on depth of construction or training activity: 5 feet [1.5 meters] for small boat landings and swimmers, 12 feet [4 meters] for Amphibious Assault Vehicles) is subject to physical effects. Effects to corals/seafloor outside of these depths in each area (e.g., deep grooves) and potential effects outside of the Approach Zone are excluded from this analysis, but are considered separately as potential indirect physical effects.

2. Excludes entire Unai Chulu construction area to prevent double-counting.

3. No Amphibious Assault Vehicles at Unai Babui or Unai Masalok. Calculation includes swimmers, small boat landings, and Landing Craft Air Cushion vessels set-down/turning circles.

4. No Amphibious Assault Vehicles or Landing Craft Air Cushion vessels at Unai Lam Lam. Calculation includes swimmers and small boat landings.

5. Species presence is based on recent high-intensity surveys of the Approach Zone (Minton et al. 2009; Sukhrjaj et al. 2010; DoN 2014d). Quantitative estimates of the numbers of Endangered Species Act-listed coral species are based on the most recent high-intensity survey (DoN 2014d). Calculations are based on in situ data that intersects with the proposed action areas to develop quantitative extrapolations for each reef zone. The values in the table are weighted sums.
Landing activities that contact the seafloor during operation include Amphibious Assault Vehicles, Landing Craft Air Cushion vessels and small boat landings. At the level of the individual coral, the consequences of physical strike by heavy equipment would be functionally equivalent to the consequences of physical strike by a swimmer’s boot. However, at the level of coral reef habitat, the consequences of physical strike by an Amphibious Assault Vehicle would be greater than Landing Craft Air Cushion vessels, small boat, and swimmer landings because of the increased potential to reduce larger corals and reef substrate to smaller pieces of mobile rubble. In reef habitats, mobile fragments are transported up and down slope with greater amplitude than when they are transported laterally (Allingham and Neil 1995; Erftemeijer et al. 2012). Rubble mobilized from inside the area of direct physical impact would be transported outside the area of direct impact (Allingham and Neil 1995; Chew III 1999). The consequences of physical strike by an Amphibious Assault Vehicle would be greater in magnitude than the consequences of physical strike by rubble.

Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, and small boat landing activities all would generate underwater sound during Tinian operations. Although vessel noise could theoretically mask natural reef sounds that coral larvae use as settlement cues (Vermeij et al. 2010; Simpson et al. 2011), this would occur briefly, infrequently, and on a small scale. Therefore, noise impacts associated with Tinian Alternative 1 operations are not expected to impact Acropora globiceps.

However, in combination with the impact to Acropora globiceps from construction at Unai Chulu, the impact of physical disturbance on this species resulting from Tinian Alternative 1 operations would result in significant impacts to this species.

**Sea Turtles**

Training activities could cause sea turtles to avoid habitat or cause habitat to be unavailable since turtles may be temporarily displaced for the duration of training activities during operational activities. This would directly impact the local sea turtle population, as they depend on algae, sponges, and hiding locations on the reef for survival. In-water habitat disturbance during operations would be caused by Amphibious Assault Vehicles (at Unai Chulu) and Landing Craft Air Cushion vessels, which may contact the reef or otherwise alter the nearshore habitat. The regrowth of marine flora at Unai Chulu would be disrupted by periodic training activities, thus sea turtles would be disturbed or limited from foraging or resting in the low-relief habitat during training. As such, habitat disturbance from activities associated with Tinian Alternative 1 operations would have limited impacts to sea turtles. See Section 4.9, Terrestrial Biology, for potential impacts to nesting sea turtles.

Sea turtles cannot hear high frequency noises and have the greatest sensitivity between 200 to 400 hertz (Ridgway et al. 1969; Bartol and Ketten 2006). As sea turtles generally cannot hear well in air (Lenhardt et al. 1983), in-air noise is unlikely to cause any behavioral modification. Vessel noise could disturb sea turtles and potentially elicit an alerting, avoidance, or other behavioral reaction. Sea turtles are frequently exposed to research, ecotourism, commercial, government, and private vessel traffic. Some sea turtles may have habituated to vessel noise, and may be more likely to respond to the sight of a vessel rather than the noise of a vessel, although both may play a role in prompting reactions (Hazel et al. 2007). Any reactions are likely to be minor and short-term avoidance reactions, leading to no long-term consequences for the individual or population. Such disturbances would be brief, infrequent, and relatively isolated, affecting a small number of individuals at any one time, based on the size of the
vessels (a small portion of the Approach Zone would be impacted at any one time) and turtle densities described in Section 3.10, Marine Biology. As such, acoustic disturbance by vessels resulting from Tinian Alternative 1 operations is considered less than significant.

Research suggests that sea turtles may not react quickly enough to move out of the way of vessels going faster than about 2.2 knots (4.0 kilometers per hour) (Hazel et al. 2007). Accordingly, there would be a risk of vessel strikes for turtles within the approach zones. The likelihood of vessel strikes to sea turtles is considered low given relatively few sea turtles in the approach zones and infrequent and localized vessel activity within these zones. While the risk would be low, some mortality due to vessel strikes cannot be ruled out and should be anticipated. Given the dynamic wave environment, increased turbidity and sedimentation would be temporary effects and unlikely to have any lasting impact to photosynthesis and food supply.

Overall, training activities may impact a small number of sea turtles due to the unavoidable risk of vessel strikes; however, this would be minimized due to the relatively few sea turtles in the approach zones and infrequent and localized vessel activity within these zones. Therefore, Tinian Alternative 1 operations would have a less than significant impact to sea turtle populations.

Marine Mammals

Vessel noise has the potential to cause minor disturbance to marine mammals and elicit an alerting, avoidance, or other behavioral reaction. Most studies have reported that marine mammals react to vessel noise and traffic with short-term interruption of behavior or social interactions (Watkins 1981; Richardson et al. 1995; Magalhaes et al. 2002; Noren et al. 2009). Some species respond negatively by retreating or responding to the vessel aggressively, while other animals ignore vessel noises altogether (Watkins 1986).

In conventional vessels, the sounds of the engine, transmission, and drive shaft(s) are conducted through the hull and into the water. When small, fast vessels are operated at high speeds, considerably less hull is exposed to the water, thus less sound is transmitted into the water. When a vessel planes above the water surface air is sucked under the hull as it travels. These bubbles of air, as well as the flow of water under the hull, produce some noise but also attenuate and scatter sounds for the engine. The bubbles of the wake also mask, scatter, and absorb sounds. When the Amphibious Assault Vehicles would be launched, they begin maneuvering in the idle mode, using jets only. Once they reach high speeds, planing above the water surface, a matter of seconds, the sound level drops off rapidly. When traveling, the sound increases as the Amphibious Assault Vehicle approaches, then falls off after it passes, like any moving sound source.

Given low densities of marine mammals in the surrounding waters (Section 3.10, Marine Biology), and the infrequent, localized occurrence of training activities, disturbance by vessels would be less than significant. Sightings data presented in Hill et al. (2014) shows that the spinner dolphin was the most often seen marine mammal species in the nearshore environment, with 54% of all encounters including sightings of the species. While Ligon et al. (2011) did not observe spinner dolphins during a concerted survey around Tinian; they did report anecdotal evidence of spinner dolphins off Tinian Harbor.
However, while this species was the most often sighted species by Hill et al. (2014), the locations of sightings indicated a greater presence in areas not associated with the region of influence. Based on these data, spinner dolphins that would be exposed to vessel traffic during operations would likely be transmitting through the region of influence, and their exposure would result in less than significant impacts. While other marine mammal species are present in the region of influence, their densities are lower than spinner dolphins, and impacts would be expected to be less than that for spinner dolphins. Furthermore, there are no known vessel strikes to marine mammals attributed to or by the U.S. Navy or U.S. Coast Guard vessels or amphibious vehicles in the region of influence or for Department of Defense amphibious vehicles at other training locations. Along with exposure to vessel traffic, marine mammals may detect and react to aircraft, but no more than momentary reactions would be anticipated, with negligible impacts to important behaviors.

In conclusion, Tinian Alternative 1 operations would result in less than significant impacts to marine mammals.

**4.10.3.2 Tinian Alternative 2**

**4.10.3.2.1 Construction Impacts**

The impacts to marine biological resources from construction activities associated with Tinian Alternative 2 would be the same as those described for Tinian Alternative 1. See Section 4.10.3.1, Tinian Alternative 1, for a discussion of impacts.

**4.10.3.2.2 Operation Impacts**

The impacts to marine biological resources from operational activities associated with Tinian Alternative 2 would be the same as those described for Tinian Alternative 1. See Section 4.10.3.1, Tinian Alternative 1, for a discussion of impacts.

**4.10.3.3 Tinian Alternative 3**

**4.10.3.3.1 Construction Impacts**

The impacts to marine biological resources from construction activities associated with Tinian Alternative 3 would be the same as those described for Tinian Alternative 1. See Section 4.10.3.1, Tinian Alternative 1, for a discussion of impacts.

**4.10.3.3.2 Operation Impacts**

The impacts to marine biological resources from operational activities associated with Tinian Alternative 3 would be the same as those described for Tinian Alternative 1. See Section 4.10.3.1, Tinian Alternative 1, for a discussion of impacts.
4.10.3.4 Tinian No-Action Alternative

The periodic non-live-fire military training exercises that have and would continue to occur in the Military Lease Area on Tinian would be primarily land based and not involve substantial activities in the nearshore marine environment. Vessel traffic would also carry some troops and equipment to Tinian causing minor turbidity from prop wash and other vessel actions. Additionally, activities covered in the Guam and CNMI Military Relocation EIS (DoN 2010a) and associated with constructing and operating four live-fire training ranges on Tinian would have less than significant impacts to marine biology (see Table 11.2-5, DoN 2010a). No significant impacts to marine biology would occur due to Mariana Islands Range Complex operations (see Table 3.7-21; DoN 2010b). Therefore, the no-action alternative would result in less than significant impacts to marine resources around Tinian.
4.10.3.5 Summary of Impacts for Tinian Alternatives

Table 4.10-6 provides a comparison of the potential impacts to marine biological resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>Marine Habitat/Essential Fish Habitat (Coral Reef)</td>
<td>SI</td>
<td>LSI</td>
<td>SI</td>
<td>LSI</td>
</tr>
<tr>
<td>Marine Flora</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Marine Invertebrates (Coral)</td>
<td>SI</td>
<td>LSI</td>
<td>SI</td>
<td>LSI</td>
</tr>
<tr>
<td>Marine Invertebrates (Non-coral)</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Fish</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Special-status Corals</td>
<td>SI</td>
<td>SI</td>
<td>SI</td>
<td>SI</td>
</tr>
<tr>
<td>Sea Turtles</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Marine Mammals</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.
### 4.10.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives

Unlike resource management measures, which are implemented as part of the proposed action, commitment to the mitigation measures would be documented through the Record of Decision, a permit/approval, programmatic agreement or other formal agreement. Department of Defense may implement the following mitigation measures specifically for marine biological resources. Table 4.10-7 summarizes these measures.

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
</tr>
</thead>
</table>
| Marine Habitat and Essential Fish Habitat | SI | - DoD may consider transplantation of coral species.  
- DoD may consider debris removal and disposal as a one-time effort to collect large quantities of debris from an area such as Dankulo Beach on Tinian.  
- DoD may consider recreational mooring Buoys and/or Fish Aggregation Devices to avoid impacts to coral by dropping anchors and to reduce the potential effects on access to fishing areas.  
- Implementation of Marine Species Awareness Training for all lookouts and other key personnel.  
- Additional measures may be recommended during agency consultations. |

| Marine Invertebrates | SI | See above, Potential Mitigation Projects to Offset Impacts to Coral. |

<table>
<thead>
<tr>
<th>Tinian Phase</th>
<th>Construction</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
### Table 4.10-7. Summary of Potential Mitigation Measures for Tinian Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>Tinian Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubble, and from the movement of mobile species out of the construction area. Construction would cause direct loss of coral reef substrate: 10.3 acres (4.1 hectares).</td>
<td><strong>SI</strong></td>
<td>See above, Potential Mitigation Projects to Offset Impacts to Coral.</td>
<td>X  X</td>
</tr>
<tr>
<td>Amphibious training activities at Unai Babui would directly impact 3.05 acres (1.2 hectares), 3.83 acres (1.55 hectares) would be directly impacted at Unai Lam Lam, and 4.50 acres (1.82 hectares) of marine habitat, including corals and coral reef habitat, would be directly impacted at Unai Masalok.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special-status Coral Species</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Construction of the Amphibious Assault Vehicle landing area would cause a loss of 1,344 <em>Acropora globiceps</em> coral colonies at Unai Chulu.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- At Unai Chulu, an estimate of 995 colonies of <em>Acropora globiceps</em> would be likely to be directly affected by training activities. At Unai Babui, an estimate of 381 colonies of <em>Acropora globiceps</em> would be likely to be directly affected by amphibious landings; at Unai Lam Lam, an estimate of 550 colonies of <em>Acropora globiceps</em> would likely be directly affected by amphibious landings; and at Unai Masalok, an estimate of 22 colonies of <em>Acropora globiceps</em> would likely be directly affected by amphibious landings.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:** SI = significant impact. Shading is used to highlight the significant impacts.

**Note:** Mitigation measures associated with marine biology do not alter the significance of the impacts.
4.10.4 Pagan

As described in Chapter 2, up to six beaches would be used to conduct amphibious landings including Green, Red, Blue, South, Gold, and North Beach. No in-water construction activities would occur at proposed amphibious landing beaches. Table 4.10-8 provides a summary of the proposed training activities on Pagan.

<table>
<thead>
<tr>
<th>Beach</th>
<th>Activity</th>
</tr>
</thead>
</table>
| Green Beach| • Amphibious Assault Vehicle landings  
          | • Landing Craft Air Cushion vessel landings  
          | • Small boat landings  
          | • Swimmer insertions |
| Red Beach  | • Amphibious Assault Vehicle landings  
          | • Landing Craft Air Cushion vessel landings  
          | • Small boat landings  
          | • Swimmer insertions |
| Blue Beach | • Amphibious Assault Vehicle landings  
          | • Landing Craft Air Cushion vessel landings  
          | • Small boat landings  
          | • Swimmer insertions |
| South Beach| • Landing Craft Air Cushion vessel landings  
          | • Small boat landings  
          | • Swimmer insertions |
| Gold Beach | • Small boat landings  
          | • Swimmer insertions |
| North Beach| • Small boat landings  
          | • Swimmer insertions |

The operational activities associated with the Pagan Alternatives may result in impacts to marine resources at Green, Red, Blue, South, Gold, and North Beach. Sources of potential impact vary in intensity, frequency, duration, and location within the region of influence and would include: physical disturbance and vessel strikes, acoustic, and indirect impacts.

The approach to analysis for Pagan follows the methodology described in Section 4.10.1, Approach to Analysis. Section 4.10.2, Resource Management Measures, also applies to Pagan.

4.10.4.1 Pagan Alternative 1

4.10.4.1.1 Construction Impacts

No in-water construction is proposed under Pagan Alternative 1. The amphibious landing areas would not include any construction improvements (i.e., grading, drainage, or permanent improvements). Potential short-term impacts related to land-based construction include erosion, sedimentation, turbidity, and decreased water clarity. Storage and maintenance of construction equipment and supplies is anticipated to occur away from nearshore waters to reduce potential for impacts. In addition, best management practices including silt fence, turbidity barriers, tracking pads, filter strips, and other forms of temporary erosion/sedimentation control would be utilized to minimize impacts to nearshore waters resulting from construction activities. Based upon the above analysis and the implementation of
resource management measures, Pagan Alternative 1 construction activities would result in less than significant impacts to marine biological resources.

### 4.10.4.1.2 Operation Impacts

Vessel-to-shore firing would occur in Pagan waters during live-fire amphibious training. As vessels (e.g., Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, and inflatable boat landings) come ashore, personnel would fire at targets on land. These vessels would use the same Approach Zones as non-live-fire activities. There would be a small chance (a tiny fraction of a percent) that an expended projectile would fall outside of the immediate range footprint, within the surface danger zone. There would be an even smaller chance for an expended projectile to fall within the nearshore waters portion or the fringes of the surface danger zone.

The landing of amphibious and small craft vehicles on beaches, beach and amphibious training maneuvers, and the use of Amphibious Assault Vehicles could impact nearshore water quality. Potential impacts include erosion, sedimentation, turbidity, decreased water clarity, and accidental discharge of pollutants. Stormwater runoff from High Hazard Impact Areas could also transport munitions constituents to nearshore waters resulting in indirect water quality impacts. Targets in the northern High Hazard Impact Area and most of the isthmus High Hazard Impact Area would be placed away from coastal cliff lines on relatively flat terrain that is visible from the firing positions. However, proposed targets on the steep slopes along the isthmus High Hazard Impact Area are close enough to the coast that dislodged rock, soil, or target material could fall into the nearshore waters below.

Potential indirect impacts would be reduced through the implementation of a stormwater management system, which would include the use of integrated management practices (Low Impact Development/best management practices), for the proposed development. The post-development stormwater management system for Pagan Alternative 1 would be developed, and Low Impact Development features would be utilized to control stormwater runoff from the Pagan RTA. Best management practices could include filter strips, bio-retention, vegetated swales and other forms of permanent erosion/sedimentation control and management measures. Implementation of a Range Environmental Vulnerability Assessment program would reduce potential impacts to water quality. Reevaluation of the effectiveness of management techniques being used would occur at a minimum every 5 years. Munitions and explosives constituents from munitions expended on land and the impacts to surface water runoff into the ocean are discussed in Section 4.3, Water Resources, and Section 4.16, Hazardous Materials and Waste.

#### 4.10.4.1.2.1 Marine Habitat and Essential Fish Habitat

Table 4.10-9 presents the potential impacts to marine communities with implementation of the proposed action on Pagan. In addition to direct impacts, there are also potential indirect impacts associated with the proposed facilities and training areas.
Table 4.10-9. Summary of Potential Direct and Indirect Impacts to Marine Habitat on Pagan

<table>
<thead>
<tr>
<th>Beach</th>
<th>Area of Direct Effects (acres)</th>
<th>Area of Indirect Effects (acres)</th>
<th>Total Area of Likely Direct and Indirect Effects (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Beach Landings</td>
<td>10.98</td>
<td>*</td>
<td>10.98</td>
</tr>
<tr>
<td>Red Beach Landings</td>
<td>6.56</td>
<td>*</td>
<td>6.56</td>
</tr>
<tr>
<td>Blue Beach Landings</td>
<td>19.10</td>
<td>*</td>
<td>19.10</td>
</tr>
<tr>
<td>South Beach Landings</td>
<td>36.18</td>
<td>36.18 (**</td>
<td>72.35</td>
</tr>
<tr>
<td>Gold Beach Landings</td>
<td>2.11</td>
<td>2.11 (**</td>
<td>4.22</td>
</tr>
<tr>
<td>North Beach Landings</td>
<td>4.03</td>
<td>4.03 (**</td>
<td>8.06</td>
</tr>
</tbody>
</table>

Note: * Mobile rubble would not be generated at these beaches and indirect effects would be limited to temporary increases in suspended sediments.

**This analysis assumes mobile rubble would be generated at South, Gold, and North Beach. The size of the area exposed to indirect effects of mobile rubble generated by operations is conservatively estimated to be equal to the area of reef that would be exposed to direct effects.

The marine habitat at Green, Red, and Blue Beach consists of unconsolidated sediment (sand). Mobile rubble would not be generated at these beaches and indirect effects would be limited to temporary increases in suspended sediments in the water column rather than an increase in the acreage of impact.

The marine habitat at South, Gold, and North Beach is different in character (as described in Chapter 3) and mobile rubble could be generated during operation/training activities. When mobilized by water motion, any mobile rubble can strike or smother corals and degrade coral habitat. In this context, mobilized rubble includes living and dead coral colonies that are broken off the substrate and reduced to a size that can be mobilized by water motion; reef substrate itself that is broken off; and preexisting unattached fragments.

This analysis makes reasonable qualitative assumptions about the movement of mobile rubble including: smaller fragments would be likely transported farther than larger fragments; both upslope and downslope transport would occur but net transport downslope would be likely; transport alongshore would occur but this would likely be smaller than downslope transport; flats and topographic lows (grooves in the coral reef) would be more likely to be affected than topographic highs; the likelihood of an unattached fragment becoming mobilized would be a function of its density, shape, water depth, and intensity of the water motion. The size of the area exposed to indirect effects of mobile rubble (outside of the direct physical disturbance from training) is conservatively estimated to be equal to the area exposed to direct effects. The shape of the indirectly affected area cannot be quantitatively estimated. There would be a gradient of disturbance within the area of indirect effect. The effects of mobilized rubble would be greater closer to locations where vehicles and personnel contact the bottom and reduced at increasing distances from the location of direct impacts based on the assumptions for rubble movement.

Operation and training activities would result in minor short- and long-term impacts to Marine Habitat and Essential Fish Habitat. A small portion of the entire landing area would be subject to impact during a given exercise. The physical disturbance impact would be limited to the immediate area of the vessels, and if landings are conducted in different parts of the beach at different times, areas of previous disturbance would recover to varying degrees. Recurring disturbance in the same locations would result in more severe impacts but within smaller areas. Thus the acreages in Table 4.10-9 represent the maximum cumulative extent of physical disturbance to marine habitats over time.
Operational activities may impact the water quality and introduce noise in the water column within the designated Essential Fish Habitat area for pelagics, bottomfish, crustaceans, and coral reef ecosystems. Potential impacts to the water column habitat by vessel noise during the proposed operational activities would mainly include impacts to prey species, including fish and invertebrates. Vessel movements have the potential to expose fish and invertebrates to sound and general disturbance, which could result in short-term behavioral or physiological responses (e.g., avoidance, stress, increased heart rate) by fish that happen to be in close proximity to training. The effects would not be expected to compromise the general health or condition of individual fish or populations of invertebrates. It is expected that during training, fish would move away from the area of activity into sheltered or adjacent Essential Fish Habitat. Fish within Essential Fish Habitat may be affected by auditory masking or behavioral responses to vessel noise during operations, but these impacts to individuals would be temporary and occasional. As a result, vessel noise during operations would result in less than significant impacts to marine habitat or Essential Fish Habitat from implementation of Pagan Alternative 1.

Additional acoustic elements for combined level training on Pagan include weapons firing that would occur during amphibious training. Noise-generating activities would include live-firing, explosions within High Hazard Impact Areas, aircraft, land-based vehicles, and other ground-based acoustic sources. There would be land-based target areas inside of the High Hazard Impact Area(s) for high explosives. Small caliber weapons would fire at the Battle Sight Zero range and during live-fire amphibious beach training, less than 50-caliber munitions would be shot from amphibious craft at nearshore targets at Red, Blue, and Green Beach. Exposure of fish to noise generated from these activities would be negligible due to the distance of many of these operations from marine habitats and the limited transmission of airborne sound across the air-water boundary (Young 1973).

Increases in turbidity could occur at the proposed tactical amphibious landing beaches. However, given the dynamic nature of the habitat and the grain size of the material, turbidity would be expected to be minimal and localized. Potential impacts to water quality characteristics of the marine environment during coastal and inland operational activities would be reduced to the maximum extent practicable by implementing best management practices to control stormwater runoff and eutrophication (the process by which a body of water acquires a high concentration of nutrients). Potential impacts to water quality as a result of beach and amphibious training maneuvers, the use of Amphibious Assault Vehicles, and stormwater runoff from High Hazard Impact Areas are addressed in 4.3, Water Resources.

A minimal amount of total reef habitat at the beaches on Pagan would be affected by the in-water training activities. Current habitat types (hard bottom and, to a lesser degree, soft shore) would be impacted on a periodic basis over an area of currently undisturbed marine habitat whereby current habitat types and ecosystem functions could be lost or degraded, and recovery prevented. Therefore, Pagan Alternative 1 operational activities would result in less than significant impacts to marine habitats, including Essential Fish Habitat, on Pagan.
4.10.4.1.2.2 Marine Flora

The periodic training activities would temporarily disturb and alter the seafloor, water quality, and physical environment, but most of the seafloor in the training areas is sand and cobble, thus lacking in marine flora.

The actions that could potentially impact marine flora during the proposed operations include in-water training, landings of Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, and small boats, and operation of vessels in nearshore waters. Marine flora that could be impacted from the proposed training activities would be reef substrate shallower than 12 feet (4 meters) below mean low water. Vessels conducting or supporting training could impact marine flora by disturbing the bottom and uprooting marine flora. Swimmers could impact flora through disturbance of the near shore environment. Operational impacts would be periodic.

Marine flora habitat may be directly and indirectly disturbed at Green, Red, Blue, South Beach, North, and Gold Beaches respectively during training activities associated with Pagan Alternative 1 (see Table 4.10-9). Based on the sum of the area shallow enough to be affected by the in-water training activities at the identified Pagan training beaches, implementation of Pagan Alternative 1 would impact approximately 1.37% of total reef habitat where marine flora could grow around Pagan through direct and indirect effects from operational activities.

Therefore, given the limited extent of marine flora and reef habitat that would be affected, Pagan Alternative 1 operations would result in less than significant impacts to marine flora.

4.10.4.1.2.3 Marine Invertebrates

The primary actions that could impact marine invertebrates during training activities would be operation of Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, inflatable boat landings, and swimmers in nearshore waters.

Overall, Pagan has low coral densities across the proposed action beaches; therefore, the overall total coral loss would be limited. The coral communities at Green Beach, Red Beach, and Blue Beach are primarily confined to the rocky headlands adjacent to the proposed landing areas. Sand and turf covered rubble dominate much of the sea floor at Red and Blue Beach (DoN 2014a). Gold and South Beach are rich and complex reefs and proposed operation activities would impact a larger number of coral colonies and species as discussed below.

Non-coral marine invertebrates (starfish, sea urchins, sea cucumbers, mollusks, and tube worms) could also be subject to direct and indirect impacts associated with operations and training. Some non-coral marine invertebrates would be directly impacted (i.e. mortality) during training. Non-coral invertebrate communities dominated by mollusks snails, sea slugs, clams and sea urchins (Sukhraj et al. 2010), could also be impacted to the extent that the coral habitat is affected on Pagan. Sea cucumbers are a significant part of the invertebrate community on Pagan, but would be less affected because they burrow and feed on detritus in the sediments rather than living on the hard coral reef.
**Green Beach**

Most of the seafloor in the Approach Zone at Green Beach is sand and cobble, while reef substrate is uncommon (DoN 2014a). At Green Beach, landings of Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, small boat landings, and swimmers could directly affect coral colonies and coral reef habitat shallower than 12 feet (4 meters), but the total loss would be limited because of low coral densities in these areas (see Figures 4.10-9 and 4.10-10). The area of seafloor shallower than 12 feet (4 meters) in the Approach Zone at Green Beach is 10.9 acres (4.4 hectares).

**Red Beach**

Most of the seafloor in the Approach Zone at Red Beach is sand and cobble, while reef substrate shallower than 12 feet (4 meters) is absent (DoN 2014a). At Red Beach, landings of Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, small boats, and swimmers could directly affect coral colonies and coral reef habitat, but the total loss would be limited because of low coral densities in these areas (see Figures 4.10-11 and 4.10-12). No portions of the Red Beach seafloor were of high complexity or high coral cover. The majority of the coral at Red Beach was observed at the headlands to the north and south of Red Beach at depths shallower than 12 feet (4 meters), but not directly in front of the sandy beach. The area of seafloor shallower than 12 feet (4 meters) in the Approach Zone at Red Beach is 6.5 acres (2.6 hectares).

**Blue Beach**

Most of the seafloor in the Approach Zone at Blue Beach is sand and cobble, while substrate suitable for coral is uncommon (DoN 2014a). At Blue Beach, Amphibious Assault Vehicles landings, Landing Craft Air Cushion vessels landings, small boat landings, and swimmer landings could directly affect the seafloor and impact coral, but the total loss would be limited because of low coral densities in these areas (see Figures 4.10-13 and 4.10-14). The majority of the coral at Blue Beach was observed at the headlands to the north and south of Blue Beach, but not directly in front of the sandy beach. The area of seafloor shallower than 12 feet (4 meters) in the Approach Zone at Blue Beach is 19.0 acres (7.6 hectares).

**South Beach**

The area of reef habitat shallower than 5 feet (1.5 meters) in the bounds of the Approach Zone at South Beach is 36 acres (14.5 hectares). At South Beach, Landing Craft Air Cushion vessels landings, small boat landings, and swimmer landings would directly affect coral colonies and coral reef habitat shallower than 5 feet (1.5 meters), but the total loss would be limited because of low coral densities in these areas (see Figures 4.10-15 and 4.10-16).

**North Beach**

The coral species at North Beach are less diverse relative to other sites on Pagan (DoN 2014a) (Figure 4.10-17). At North Beach, small boat landings, and swimmer landings could directly affect coral colonies and coral reef habitat as deep as 5 feet (1.5 meters) below mean low water.
Green Beach will be used for amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.

Depth values based on mean lower low water and grouped to distinguish between the following depths of concern:
- Maximum Potential Impact Depth (-12 feet)
- In-water Draft of AAV (-7 feet)
- Wave Surge Potential Track Impact (-5 feet)
- Track Engagement (-3 feet)
- Reef Flat Maneuver (-1 feet or above)
Figure 4.10-10
Green Beach Training Impact Area
Coral Cover

Legend
- Proposed Wheeled and Tracked Vehicle Route
- Approach Zone
- Notional Landing Craft Air Cushion - Landing Site (150-feet diameter)
- Notional Landing Craft Air Cushion Landing Footprint

Coral Cover (%)
- 0%
- 1-10%
- 10-20%
- 20-30%
- 30-40%
- 40-50%
- 50-60%
- 60-70%
- 70-80%
- 80-100%

1 Green Beach will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.

Sources: DoN 2014, Fugro Pelagos 2013a, 2013b
Red Beach will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.

Depth values based on mean lower low water and grouped to distinguish between the following depths of concern:
- Maximum Potential Impact Depth (-12 feet)
- In-water Draft of AAV (-7 feet)
- Wave Surge Potential Track Impact (-5 feet)
- Track Engagement (-3 feet)
- Reef Flat Maneuver (-1 feet or above)

Sources: Fugro Pelagos 2013a, 2013b
Figure 4.10-12
Red Beach Training Impact Area
Coral Cover

Sources: Fugro Pelagos 2013a, 2013b

Legend
- Proposed Wheeled and Tracked Vehicle Route
- Approach Zone
- Notional Landing Craft Air Cushion - Landing Site (150-feet diameter)
- Notional Landing Craft Air Cushion Landing Footprint

Coral Cover (%)
- 0%
- 1-10%
- 10-20%
- 20-30%
- 30-40%
- 40-50%
- 50-60%
- 60-70%
- 70-80%
- 80-100%

Red Beach will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.

1 Red Beach will be used for: amphibious assault vehicle landings, landing craft air cushion, small boat, and swimmer insertions approach training.
Blue Beach will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.

1 Depth values based on mean lower low water and grouped to distinguish between the following depths of concern:
- Maximum Potential Impact Depth (-12 feet)
- In-water Draft of AAV (-7 feet)
- Wave Surge Potential Track Impact (-5 feet)
- Track Engagement (-3 feet)
- Reef Flat Maneuver (-1 feet or above)
To Red Beach and Bivouac Site

Multiple Landing Craft Air Cushion Landing Sites

Blue Beach Training Impact Area
Coral Cover

Legend

0% 1-10% 10-20% 20-30% 30-40% 40-50% 50-60% 60-70% 70-80% 80-100%

0 500 1,000 Feet
0 100 200 Meters

1 Blue Beach will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.

Sources: Fugro Pelagos 2013a, 2013b
Figure 4.10-15
South Beach Training Impact Area
Depth

Sources: Fugro Pelagos 2013a, 2013b

\(^1\) South Beach will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.
South Beach will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.
Figure 4.10-17
North Beach Training Impact Area
Depth

Sources: Fugro Pelagos 2013a, 2013b

¹North Beach will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.
Gold Beach

Coral species richness was relatively high at Gold Beach (see Figures 4.10-18 and 4.10-19). At Gold Beach, small boat landings, and swimmer landings could directly affect coral colonies and coral reef habitat shallower than 5 feet (1.5 meters) below mean lower low water. The habitat is more similar to South Beach than to Green, Red, or Blue Beaches. Because of challenging sea states affecting this beach much of the time, Gold Beach is likely to accommodate draining less often than any other training beach on Pagan.

Marine habitat at Pagan beaches, including some corals and coral reef habitat, would be directly impacted by Pagan Alternative 1 operations (see Table 4.10-9). The beaches are relatively species-rich; however, the coral communities are confined to the rocky headlands adjacent to the proposed landing areas that would receive the largest training activity and would be largely unaffected. As stated in Chapter 3, Table 3.10-1, 65,920 acres (26,676 hectares) of total reef habitat are present across the Mariana Islands, 4,416 acres (1,787 hectares) of which is present around Pagan. Based on the sum of the area shallow enough to be affected by the in-water training activities at the identified Pagan training beaches, Pagan Alternative 1 operations would impact approximately 1.37% of total reef habitat around Pagan through direct and indirect effects. Therefore, based on the relatively small areas of impact to marine habitat and corals, Pagan Alternative 1 operations would result in less than significant impacts to marine invertebrates.

4.10.4.1.2.4 Fish

Actions that could potentially impact fish during proposed operations include landings of Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, and small inflatable boats; in-water training, increased vessel traffic, increased noise levels from vessels and weapons fire, and operation of vessels in nearshore waters. Fish may be temporarily displaced for the duration of training activities at these beaches. The coral section above details the loss of coral habitat that would occur during training activities. Coral impacts would directly and indirectly impact fish, as many fish species depend on this coral habitat for shelter, feeding, and reproduction. The overall impact to reef-associated fish populations on Pagan would be expected to be less than proportional to the area of impact, which is 1.37% of the reef habitat on Pagan. This impact would be less than significant.

In-air noise has no potential to affect fish. As described previously in Section 4.10.4.1.2.1, Marine Habitat and Essential Fish Habitat the underwater noise from vessels engaged in training would be brief, infrequent, and would not exceed levels likely to cause behavioral reactions in fish more than about 15 feet (4.6 meters) from the vessel. As a result, no significant impacts would result from underwater noise during operations. Additional acoustic elements for combined level training on Pagan include weapons firing that would occur during amphibious training. Weapons firing activities would occur as Amphibious Assault Vehicles approach the shoreline for proposed training beaches on Pagan. Firing of these weapons could have acoustic effects from sound generated by firing the gun and vibration propagating through the vessel hull. It is anticipated that the acoustic effect of weapons firing would be temporary and minimal.
To South Beach

Multiple LCAC Landing Sites

Legend

- Greater than 40 feet Depth
- -40 to -20 feet Depth
- -20 to -12 feet Depth
- -12 to -7 feet Depth
- -7 to -5 feet Depth
- -5 to -3 feet Depth
- -3 to -1 feet Depth

Proposed Wheeled Vehicle Route
Approach Zone¹
LCAC - Craft Landing Site (75 ft radius)
LCAC Landing Footprint

Sources: Fugro Pelagos 2013a, 2013b

¹Gold Beach will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.

Figure 4.10-18
Gold Beach Training Impact Area
Depth

Sources: Fugro Pelagos 2013a, 2013b
Gold Beach will be used for: landing craft air cushion, small boat, and swimmer insertions approach training.
The potential for direct strikes to fish as a result of the proposed training is low as the noise and presence of vessels would likely cause fish to temporarily flee the area, and the resulting impact would be less than significant. As Amphibious Assault Vehicles plane along on the surface of the water, these vessels have a low chance of striking fish at or near the surface. Landing Craft Air Cushion vehicles operate above the surface and would not be likely to strike fish. It is assumed that small inflatable boats used for combat swimmer training would be similar to other small vessel activity in nearshore waters and would not have a high likelihood of striking fish. Most adult fish can detect and avoid vessels in response to engine noise and would likely flee the area during training activities.

Operational activities at Pagan may expose fish to sounds and general disturbance that could result in short-term behavioral or physiological responses (e.g., avoidance, stress, increased heart rate), but would not be expected to compromise the general health or condition of individual fish or populations. The underwater noise from vessels engaged in training activities would be brief, infrequent, and would not exceed levels likely to cause behavioral reactions in fish more than about 15 feet (4.6 meters) from the vessel.

Potential impacts to water quality characteristics of the marine environment during coastal and inland operational activities would be reduced but not avoided by implementing resource management measures to control stormwater runoff, and eutrophication. Pagan operational activities could cause temporary water quality impacts including increased turbidity, erosion, and sediment transport. Increases in turbidity could temporarily decrease the foraging efficiency of fish. Habitat disturbance is expected to be minimal at the proposed landing beaches given the predominance of sand in the nearshore environment. Significant direct impacts to the reef at South and Gold Beaches are possible, which could adversely impact fish habitat and food sources (see Section 4.10.4.1.2.1, Marine Habitat and Essential Fish Habitat). The impact would be, at most, directly proportional to the total area altered. However, these impacts would be temporary in nature and limited to training activities. These impacts would be minimized through adherence to best management practices (Appendix D, Best Management Practices). Potential impacts to water quality as a result of beach and amphibious training maneuvers, the use of Amphibious Assault Vehicles, and stormwater runoff from High Hazard Impact Areas are addressed in 4.3, Water Resources.

The operational use of beaches on Pagan would impact approximately 1.37% of the reef habitat on Pagan through recurring disturbance and the resulting degradation of fish habitat. Therefore, Pagan Alternative 1 operations would result in less than significant impacts to fish.

4.10.4.1.2.5 Special-status Species

Corals

The Coral Marine Resources Survey conducted in support of this EIS/OEIS recorded the presence of one Endangered Species Act-listed coral species, Acropora globiceps, at all beaches on Pagan proposed for training (National Marine Fisheries Service 2012; DoN 2014a).

Table 4.10-10 lists the number of individual special-status coral colonies that would be directly affected at Green, Red, Blue, and South Beaches under the proposed action. In addition, the table lists the total area of coral loss.

---

Table 4.10-10

<table>
<thead>
<tr>
<th>Beach</th>
<th>Number of Colonies</th>
<th>Total Area of Coral Loss (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---
Table 4.10-10. Potential Impacts to *Acropora globiceps* at Green, Red, Blue, South, Gold, and North Beach on Pagan

<table>
<thead>
<tr>
<th></th>
<th>Green Beach</th>
<th>Red Beach</th>
<th>Blue Beach</th>
<th>South Beach</th>
<th>Gold Beach</th>
<th>North Beach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total extrapolated <em>Acropora globiceps</em> coral area (square feet) in the Approach Zone*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2,242.2</td>
<td>‡</td>
<td>‡</td>
</tr>
<tr>
<td>Extrapolated number of <em>Acropora globiceps</em> colonies in the Approach Zone</td>
<td>1</td>
<td>†</td>
<td>†</td>
<td>10,609</td>
<td>‡</td>
<td>‡</td>
</tr>
<tr>
<td>Density of <em>Acropora globiceps</em> colonies in the Approach Zone (per square meter)</td>
<td>&lt; 0.005</td>
<td>†</td>
<td>†</td>
<td>0.07</td>
<td>‡</td>
<td>‡</td>
</tr>
<tr>
<td>Extrapolated area (square meter) covered by <em>Acropora globiceps</em> in the Approach Zone</td>
<td>&lt; 0.05</td>
<td>†</td>
<td>†</td>
<td>208</td>
<td>‡</td>
<td>‡</td>
</tr>
</tbody>
</table>

Notes: † Species is confirmed adjacent to the Approach Zone but not within.
‡ Species in confirmed within and adjacent to the Approach Zone, but no population data are available for effect calculations.
* Species presence is based on recent high-intensity surveys of the Action Area (Minton et al. 2009; Sukhraj et al. 2010; DoN 2014d). Quantitative estimates of the numbers of Endangered Species Act-listed coral species are based on the most recent high-intensity survey (DoN 2014d). Calculations are based on in situ data that intersects with the proposed action areas to develop quantitative extrapolations for each reef zone. The values in the table are weighted sums.
1 Calculations assume that the entire susceptible area of each Approach Zone (based on depth of construction or training activity: 5 feet (1.5 meters) for small boat landings and swimmers, 12 feet (4 meters) for Amphibious Assault Vehicles) is subject to physical effects. Effects to corals/seafloor outside of these depths in each area (e.g., deep grooves) and potential effects outside of the Approach Zone are excluded from this analysis, but are considered separately as potential indirect physical effects.
2 Green Beach, Red Beach, and Blue Beach are nearly 100% sand inside and adjacent to the proposed action areas. Consequently, corals in the areas are extremely uncommon.
3 No Amphibious Assault Vehicles at South Beach. Calculation includes small boat landings and one Landing Craft Air Cushion vehicles set-down/turning circle. In a cursory survey of the shore-attached reef crest where Landing Craft Air Cushion vehicles set-down would occur, no Endangered Species Act corals were noted.
4 No Amphibious Assault Vehicles or Landing Craft Air Cushion vehicles at North Beach, and Gold Beach.

Vessels have the potential to impact eggs and pelagic larvae of Endangered Species Act-listed corals by disturbing the water column (Bishop 2008; Marshall 2012). Wash from vessel movement (water displaced by propellers/impellers used for propulsion) and water displaced from vessel hulls can potentially impact eggs and pelagic larvae of Endangered Species Act-listed corals (Bickel et al. 2011). Amphibious craft may affect the water column to a depth of approximately 12 feet (4 meters). Disturbance caused by propeller wash could extend to approximately twice this depth.

Landing activities that contact the seafloor during operation include Amphibious Assault Vehicles, Landing Craft Air Cushion vessels and small boat landings. At the level of the individual coral, the consequences of physical strike by heavy equipment would be functionally equivalent to the consequences of physical strike by a swimmer’s boot. However, at the level of coral reef habitat, the consequences of physical strike by an Amphibious Assault Vehicle would be greater than Landing Craft Air Cushion vessels, small boat, and swimmer landings because of the increased potential to reduce larger corals and reef substrate to smaller pieces of mobile rubble. Little to no coral is expected in the landing areas where Amphibious Assault Vehicles would be operating, so damage to Endangered Species Act-listed corals from Amphibious Assault Vehicles is expected to be negligible.

The marine habitat at Green, Red, and Blue Beach consists of unconsolidated sediment. Mobile rubble would not be generated at these beaches and indirect effects would be limited to temporary increases in suspended sediments in the water column rather than an increase in the acreage of impact.
The marine habitat at South, Gold, and North Beach is different in character (as described in Chapter 3), and mobile rubble could be generated. Mobile fragments are transported up and down slope with greater amplitude than when they are transported laterally (Allingham and Neil 1995; Erftemeijer et al. 2012). Rubble mobilized from inside the area of direct physical impact would be transported outside the area of direct impact (Allingham and Neil 1995; Chew III 1999).

Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, and small boat landing activities all would generate underwater sound during Pagan operations. Although vessel noise could mask natural reef sounds that coral larvae use as settlement cues (Vermeij et al. 2010; Simpson et al. 2011), this would occur briefly, infrequently, and on a small scale. As such, the impact would be less than significant.

Green Beach has a single colony of *Acropora globiceps* and South Beach has an estimated 10,609 colonies. Coral heads at Green Beach would be flagged or marked to alert vessel operators and swimmers to avoid the area during training operations. No Endangered Species Act-listed corals are present in habitats shallower than 12 feet (4 meters) at Red and Blue Beach. Therefore, given the number of colonies of *Acropora globiceps* that would be impacted, primarily at South Beach, Pagan Alternative 1 operations would have a significant impact to this Endangered Species Act-listed species.

**Sea Turtles**

Red, Green, and Blue Beaches provide relatively limited foraging and resting habitat for sea turtles. High quality habitat occurs adjacent to these operational areas and sea turtles are likely to migrate through these zones. In-water operation of Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, and small craft vehicles at Green, Red, and Blue Beaches could cause sea turtles to avoid habitat or cause habitat to be unavailable since turtles may be temporarily displaced for the duration of training activities. Sea turtle resting and foraging habitat disturbance from operations in the region of influence would be expected to be temporary and inconsequential. Impacts from underwater noise would likely result in a temporary fleeing response from turtles. Such impacts would be less than significant.

Sea turtles primarily hear low frequency sounds and have the greatest sensitivity between 200 to 400 hertz (Ridgway et al. 1969; Bartol and Ketten 2006). They generally cannot hear well in air (Lenhardt et al. 1983); therefore, in-air noise is unlikely to cause any behavioral modification. Vessel noise could disturb sea turtles and potentially elicit an alerting, avoidance, or other behavioral reaction. Such disturbances would be brief, infrequent, and relatively isolated, affecting a small number of individuals at any one time, based on turtle densities described in Section 3.10, *Marine Biology*. As such, acoustic disturbance by vessels resulting from Pagan Alternative 1 operations is considered less than significant.

Physical strike and disturbance of sea turtles could occur from the proposed operation actions on Pagan. Direct physical strike could cause death or injury and physical disturbance could negatively affect foraging, resting, and mating behavior as a result of the proposed action. Physical strikes from vessels would be the most significant in-water threat to sea turtles at Pagan, as it often causes serious injury or mortality. Research suggests that sea turtles may not react quickly enough to move out of the way of vessels going faster than about 2.2 knots (4.0 kilometers per hour) (Hazel et al. 2007). Accordingly, there would be a risk of vessel strikes for turtles within the approach zones. While the risk would be low, some mortality due to vessel strikes cannot be ruled out, and should be anticipated. Increased turbidity and
sedimentation would be temporary effects due to the dynamic wave environment and would be unlikely to have any lasting impact to photosynthesis and food supply.

The total area of the Approach Zone at Green Beach is approximately 0.01 square mile (0.03 square kilometer), 0.08 square mile (0.21 square kilometer) at Red Beach, and 0.36 square mile (0.93 square kilometers) at Blue Beach. The area is 0.45 square mile (0.117 square kilometer) in total, which corresponds to approximately 50 sea turtles in the cumulative operations footprint. Amphibious Assault Vehicles and Landing Craft Air Cushion vessels, as well as small boats, would be operating at all locations. Therefore, it has been assumed that the entire Approach Zone presents a potential threat for vessel strikes. The turtles within this footprint, as well as any turtles migrating through the area, would be at risk of vessel strike.

Landing Craft Air Cushion vessels and small vessels would be operating at South Beach, while small inflatable boats would operate at North and Gold Beaches. There is a limited possibility of a Landing Craft Air Cushion vessel striking a sea turtle, so South Beach is discounted as a possible threat. Turtles within the footprint of North and Gold Beach would be at risk of vessel strike.

Hawksbill sea turtles contributes to approximately 33% of the total sea turtle population on Pagan (DoN 2014b). In addition, the island wide population of sea turtles is estimated at approximately 50% of Tinian’s population, while total available habitat is similar between the two islands (DoN 2014b). As such, Pagan’s average sea turtle density is approximately half of Tinian’s average sea turtle density. As a result of the increase in total number of vehicles per landing associated with Combined Level Training over Unit Level Training, there may be an increase in the likelihood of impacts (particularly direct vessel strikes) to sea turtles due to the increase in training assets and complexity associated with this proposed training. However, this risk would be negated by the relatively few sea turtles in the approach zones and infrequent and localized vessel activity within these zones. Therefore, Pagan Alternative 1 operations would have less than significant impacts to sea turtles.

Marine Mammals

Vessel noise has the potential to cause minor disturbance to marine mammals and elicit an alerting, avoidance, or other behavioral reaction. Most studies have reported that marine mammals react to vessel noise and traffic with short-term interruption of behavior or social interactions (Watkins 1981; Richardson et al. 1995; Magalhaes et al. 2002; Noren et al. 2009).

In conventional vessels, the sounds of the engine, transmission, and drive shaft(s) are conducted through the hull and into the water. When small, fast vessels are operated at high speeds, considerably less hull is exposed to the water, thus less sound is transmitted into the water. When a vessel planes above the water surface air is sucked under the hull as it travels. These bubbles of air, as well as the flow of water under the hull, produce some noise but also attenuate and scatter sounds for the engine. The bubbles of the wake also mask, scatter, and absorb sounds. When the Amphibious Assault Vehicles would be launched, they begin maneuvering in the idle mode, using jets only. Once they reach high speeds, planing above the water surface, a matter of seconds, the sound level drops off rapidly. When traveling, the sound increases as the Amphibious Assault Vehicle approaches, then falls off after it passes, like any moving sound source.

Vessel-to-shore firing would occur in Pagan waters during live-fire amphibious training. Marine mammals in the vicinity of these activities would be expected to have an initial startle response.
Because these events are short-term, localized, and infrequent, they would not be expected to have long-term consequences for individuals or populations.

There is an increased potential for noise in the water from training vessels, but there would be no anticipated long-term consequences to the individual or populations. Short-term behavioral responses to noise associated with vessels is not likely to disrupt major behavior patterns such as migrating, breeding, feeding, and sheltering, or to result in serious injury to marine mammals. Along with exposure to vessel traffic, marine mammals may detect and react to aircraft, but no more than momentary reactions would be anticipated, with negligible impacts to important behaviors.

Given low densities of marine mammals in the surrounding waters (Section 3.10, Marine Biology), and the infrequent, localized occurrence of training activities, disturbance by vessels would be less than significant.

Based on data provided in the Marine Mammal Survey conducted in support of this EIS/OEIS (DoN 2014c) spinner dolphins were the marine mammal species most often observed (54% of encounters) around Pagan, with five of the groups seen on the eastern side of the island, and two on the western side of the island off Green Beach. All sightings were within 0.54 nautical miles (1 kilometer) of the shoreline, and the sightings were at depths of less than 686 feet (212 meters). Bottlenose dolphins and Cuvier’s beaked whales were also encountered around the island. The bottlenose dolphins were sighted off the northwest coast and the Cuvier’s beaked whale was encountered in over 2,000 feet (606 meters) of water. Based on their presence in the region of influence, spinner dolphins and the bottlenose dolphins would be the species most likely impacted by operations. However, short-term reactions to vessels are not likely to disrupt major behavior patterns such as migrating, breeding, feeding, and sheltering, or to result in serious injury to marine mammals. Furthermore, both spinner dolphins and bottlenose dolphins are highly mobile species that would likely leave the area in the event that operations were to occur in close proximity to individuals. Marine mammals being struck by vessels is not expected to occur in association with training around Pagan. There are no known ship strikes of marine mammals by U.S. Navy or U.S. Coast Guard vessels in the region of influence or for Department of Defense amphibious vessels at other training locations.

Military training activities could result in indirect impacts to marine mammals via habitat degradation or an effect on prey availability. Effects to prey items for marine mammals are less likely given that a large portion of their prey consist of pelagic plankton and fishes. Any effects to prey would be temporary, occurring during training activities involving direct use of landing area. No lasting impact to prey availability or the pelagic food web would be expected.

The overall impact to marine mammals from the proposed training activities during Pagan Alternative 1 operations would be less than significant.

4.10.4.2 Pagan Alternative 2

4.10.4.2.1 Construction Impacts

The impacts to marine biological resources from construction activities associated with Pagan Alternative 2 would be the same as those described for Pagan Alternative 1. See Section 4.10.4.1, Pagan Alternative 1, for a discussion of impacts.
4.10.4.2.2 Operation Impacts

The impacts to marine biological resources from operational activities associated with Pagan Alternative 2 would be the same as those described for Pagan Alternative 1. See Section 4.10.4.1, Pagan Alternative 1, for a discussion of impacts.

4.10.4.3 Pagan No-Action Alternative

Under the no-action alternative, there would be infrequent and minor DoD activities (i.e., search and rescue) around Pagan would be low impact and short duration. These activities would present less than significant impacts to Pagan’s marine resources. Non-DoD activities include periodic visits for eco-tourism and scientific surveys.

4.10.4.4 Summary of Impacts for Pagan Alternatives

Table 4.10-11 provides a comparison of the potential impacts to marine biological resources for the two Pagan alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Biology</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Marine Habitat/Essential Fish Habitat</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Marine Flora</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Marine Invertebrates (Coral)</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Marine Invertebrates (Non-Coral)</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Fish</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Special-status Coral Species</td>
<td>LSI</td>
<td>SI</td>
<td>LSI</td>
</tr>
<tr>
<td>Sea Turtles</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Marine Mammals</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; SI = Significant impact. Shading is used to highlight the significant impacts.
4.10.4.5 Summary of Potential Mitigation Measures for Pagan Alternatives

Table 4.10-12 provides a summary of the potential mitigation measures for marine biology resources for the two Pagan alternatives.

Table 4.10-12. Summary of Potential Mitigation Measures for Pagan Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>Pagan Phase</th>
</tr>
</thead>
</table>
| Special-status Coral Species | SI | • DoD may consider transplantation of coral species.  
• DoD may consider debris removal and disposal as a one-time effort to collect large quantities of debris from an area such as Gold Beach.  
• DoD may consider recreational mooring Buoys and/or Fish Aggregation Devices to avoid impacts to coral by dropping anchors and to reduce the potential effects on access to fishing areas.  
• Implementation of Marine Species Awareness Training for all lookouts and other key personnel.  
• Additional measures may be recommended during agency consultations. | X |

Legend: SI = significant impact. Shading is used to highlight the significant impacts.

Note: Mitigation measures associated with marine biology do not alter the significance of the impacts.
4.11 **CULTURAL RESOURCES**

Section 4.11 describes the specific direct and indirect impacts on cultural resources that could result from implementation of the proposed action or other action alternatives. Both the construction and operation elements of the proposed action have the potential to impact the cultural resources of both Tinian and Pagan.

As noted in Section 3.11, Department of Defense actions within this area are covered by two Programmatic Agreements—one for military training activities relating to the Mariana Islands Range Complex EIS/OEIS (DoN 2010a), and one for the Guam and CNMI Military Relocation EIS (DoN 2010b) to establish four ranges on Tinian. If an action alternative is selected, then a new Section 106 of the National Historic Preservation Act programmatic agreement would be signed and implemented to resolve adverse effects to historic properties. The programmatic agreement for this proposed action would reference the Mariana Islands Range Complex EIS/OEIS programmatic agreement and supersede the Tinian-specific portions of the Guam and CNMI Military Relocation EIS programmatic agreement. If the no-action alternative were selected, then Tinian-specific stipulations in the Guam and CNMI Military Relocation programmatic agreement (Department of Defense 2011) would be implemented. Section 106 consultation for the current proposed action was initiated on April 20, 2013 and will be completed prior to publication of this Final EIS/OEIS.

4.11.1 **Approach to Analysis**

The cultural resources impact analysis addresses potential effects to historic properties (districts, sites, buildings, structures, or objects that are listed in or considered eligible for listing in the National Register of Historic Places). The analysis also considers potential impacts to other kinds of resources that may not be eligible for the National Register of Historic Places, including cultural practices, cemeteries, memorials, sacred sites, or medicinal plants. The Tinian and Pagan RTAs and their associated support facilities/infrastructure construction footprints (described in Chapter 2, *Proposed Action and Alternatives*) were examined in relation to locations of historic properties and resources of cultural importance using Geographic Information System to identify potential impacts due to construction and operations. Training area disturbance footprints were also accounted for to ensure that the full range of potential impacts was identified. Under the proposed action, impacts may be either direct or indirect and are distinguished as follows.

Direct impacts occur at the same place and/or time as actions generated by proposed construction (e.g., ground-disturbing activities) and operations (e.g., range use). These impacts may include, but are not limited to, the following:

- Physical destruction, damage, or alteration
- Ground disturbances such as excavating, filling, grubbing (i.e., use of heavy equipment to remove vegetation), and vegetation maintenance (i.e., trimming vegetation, mowing grass, limbing trees)
- Demolition

Direct impacts from construction ground disturbance and operational vegetation clearing were assumed within all areas labeled as facility footprints in Chapter 2, *Proposed Action and Alternatives*, and as...
“Vegetation Maintenance” in Appendix F, Geology and Soils Technical Memo. Vegetation clearance, including grubbing, would occur in areas such as along roads, Convoy Course engagement areas, Tracked Vehicle Driver’s Course, objective areas, and target areas (Range Complex A).

Indirect impacts are caused by or result from project- or operation-related activities, occur usually later in time or space, and are reasonably foreseeable. Potential causes of indirect impacts include, but are not limited to, the following:

- Reducing public access to historic properties and resources of cultural importance
- Changes in setting through visual or audible intrusions when these characteristics are important to the significance of the resource
- Potential increase in erosion and ground disturbance related to project-related activities
- Deferred monitoring or stabilization of sites, if needed, while ranges are in operation

The process for identifying and evaluating the significance of the impact is determined by the magnitude and nature of the action; the nature and extent of potential effects on historic properties and resources of cultural importance; and the likely nature and location of historic properties and resources of cultural importance within areas that may be impacted. Under the National Historic Preservation Act, adverse effects result from the direct loss of character-defining features and/or aspects of integrity of a historic property. Under NEPA, significant impacts to resources of cultural importance could occur if the characteristics that make the resource important to the culture are altered. If significant impacts were determined, then mitigation may be proposed to minimize or mitigate the adverse effects or impacts. A discussion of impacts to historic properties at the Tinian International Airport in accordance with Section 4(f) of the Department of Transportation Act of 1966 is included in Section 4.19.

4.11.2 Resource Management Measures

Resource management measures applicable to cultural resources include the following:

4.11.2.1 Avoidance and Minimization Measures

- To the degree possible, historic properties and resources of cultural importance were avoided when planning initial construction and operations areas for the proposed action. This included moving target locations, firing positions, engagement zones, and surface radar sites, as well as moving the High Hazard Impact Area boundaries to avoid the North Field National Historic Landmark. Department of Defense also minimized construction associated with the use of Amphibious Assault Vehicles to certain beaches and sited roads and construction laydown areas to avoid impacting historic properties where feasible. Construction was avoided on the historic runways in the North Field National Historic Landmark and use of tracked vehicles was avoided on historic roads associated with the landmark. Department of Defense would further avoid impacts to historic properties and resources of cultural importance during construction and operations through troop education, marking of sensitive areas, repairing roads, and policing areas at the completion of exercises.
- On Tinian and Pagan, if beach sand is compacted or displaced by landing craft so that the natural appearance of the beach has been altered, the beach topography will be restored within 3 days of the exercise using non-mechanized methods (e.g., rakes or other hand tools).
Specific measures for avoiding and minimizing impacts to historic properties would be stipulated in a Programmatic Agreement regarding the current undertaking. These measures include implementation of the Secretary of the Interior’s Standards for Rehabilitation for all maintenance and repair of runways for the North Field Historic Landmark and the evaluation of archaeological resources found during construction or operations. Department of Defense would follow standard operating procedures as outlined in the agreement document for inventorying areas or properties that have not been inventoried.

4.11.2.2 Best Management Practices and Standard Operating Procedures

Best management practices and standard operating procedures that are applicable to cultural resources are listed below and a complete listing is provided in Appendix D, *Best Management Practices*.

- Best management practices for erosion control, Spill Prevention, Control and Countermeasures Plans and Facility Response Plans, and Hazardous Materials Management Plans would be implemented to prevent indirect impacts to historic properties during construction and operations from potential contaminants and sediments. A Fire Prevention and Management plan would be implemented to minimize fire risk from training activities that could have an indirect impact to historic properties and resources of cultural importance.
- The Department of Defense would implement a Range Training Area Management Plan that would include stipulations to adhere to protection measures established in cultural resource management plans and implement a monitoring program for minimizing groundwater contamination. Through the Range Environmental Vulnerability Assessment program, the Marine Corps would identify potential release of munitions constituents and develop additional best management practices at the ranges to minimize off-site contamination.

4.11.3 Tinian

4.11.3.1 Tinian Alternative 1

4.11.3.1.1 Construction Impacts

As described in Section 2.4, *Tinian Alternatives*, Tinian Alternative 1 RTA development and construction would include construction and improvements for support facilities and infrastructure (e.g., base camp, airport, port, Munitions Storage Area, roadways, utilities) and training facilities (e.g., Range Complexes A, B, C, D, and Military Lease Area-wide training assets). These activities would result in ground disturbance (e.g., vegetation clearing, grubbing, grading, excavation, and filling), and potentially impact historic properties and resources of cultural importance.

In total, 1,902 acres (771 hectares) of ground disturbance would occur under Tinian Alternative 1 (see Table 2.4-8). Specific vegetation clearance areas within Range Complexes A, B, C, and D; the Landing Zone within Range Complex D; and the Military Lease Area-wide training assets are discussed in Section 4.2, *Geology and Soils* and Appendix F, *Geology and Soils Technical Memo*. Table 4.11-1 summarizes the historic properties impacted by construction activities associated with Tinian Alternative 1. Specific impacts to historic properties and resources of cultural importance are described in more detail by RTA or construction project and in Appendix N, *Cultural Resources Technical Memo*.
### Table 4.11-1. Tinian Alternative 1: Summary of Significant Direct Impacts on Historic Properties from Construction

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex A</td>
<td>High Hazard Impact Area</td>
<td>20</td>
</tr>
<tr>
<td>Range Complex B</td>
<td>Multi-purpose Training Range, Combat Pistol Range, Anti-armor Tracking Range, Battle Site Zero Range</td>
<td>9</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>Infantry Platoon Battle Course, Field Fire Range, Multi-Purpose Automated Unknown Distance Range</td>
<td>14</td>
</tr>
<tr>
<td>Range Complex D</td>
<td>Northern Battle Area Complex, Urban Assault Course</td>
<td>3</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes</td>
<td>Convoy Course Engagement Areas</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Munitions Storage Area</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Roads, Fences, and Utilities, Tracked Vehicle Driver’s Course</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Base Camp</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Tactical Amphibious Training Areas</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Landing Zones, Artillery Firing Points, Observation Posts, Surface Radar Sites</td>
<td>19</td>
</tr>
<tr>
<td>Outside Military Lease Area</td>
<td>Tinian International Airport</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Port of Tinian</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tracked Vehicle Transit Lanes/Supply Route</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>172</strong></td>
</tr>
</tbody>
</table>

**Range Complex A:** As described in Section 2.4.1, *Tinian Alternatives*, ground disturbance within Range Complex A would occur within the footprint of the ground ranges as well as within the target areas. Construction-related activities, such as grubbing, grading, excavation, and soil removal associated with construction of a perimeter road, an access road, and target areas, would significantly impact 20 historic properties. These 20 historic properties include 3 Pre-Contact sites (1 ceramic scatter and 2 cave sites), 7 pre-World War II Japanese Administration sites, 4 World War II-era Japanese defensive sites, and 6 World War II American military sites. Two of these sites are memorials, the Hinode American Memorial Shrine and the Nan’yo Kohatsu Kaisha Shrine. Significant direct impacts would occur to eight historic properties because of the construction of fences and roads around the perimeter of the High Hazard Impact Area. Since sites in this area tend to be large and dispersed, complete avoidance is not possible. However, in most cases only a portion of the site would be impacted by construction activities associated with Alternative 1.

Construction could also significantly impact 3 acres (1 hectare) of native limestone forest, which could contain resources of cultural importance, such as medicinal plants. Significant direct impacts to other cultural resources of cultural importance would include the disturbance of the two memorials described above.

Indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary. The roundabout, a portion of Broadway
Avenue, which is an entrance to the North Field National Historic Landscape and a contributing feature to the cultural landscape, would be closed during construction of Range Complex A target objectives. This closure would be temporary and the impact would be less than significant.

**Range Complex B:** As described in Section 2.4.1, Tinian Alternatives, ground ranges, objective areas, roadways, and pathways would be constructed as part of Range Complex B. Construction-related activities such as grubbing, excavation, and soil removal, as well as grubbing for vegetation clearance of interior roadways and target firing points would significantly impact 9 historic properties. These historic properties include 4 pre-World War II Japanese Administration sites, 2 World War II-era Japanese defensive sites, and 3 World War II American military sites. As stated above, indirect impacts to historic properties due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary. Broadway Avenue would be closed during construction of Range Complex B target objectives. This closure would be temporary and the impact would be less than significant.

No resources of cultural importance were identified within Range Complex B.

**Range Complex C:** As described in Section 2.4.1, Tinian Alternatives, ground ranges, roadways, and 20 temporary roofless structures would be constructed in Range Complex C. Construction-related activities such as grubbing, excavation, and soil removal would significantly impact 14 historic properties. These historic properties include 5 pre-World War II Japanese Administration sites, 2 World War II-era Japanese defensive sites, and 7 World War II American military sites. No impacts would occur to resources of cultural importance at Range Complex C due to construction. As stated above, indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary.

**Range Complex D:** As described in Section 2.4.1, Tinian Alternatives, ground ranges would be constructed and 20 temporary roofless structures would be installed at the Urban Assault Complex in Range Complex D. A Landing Zone, an Unmanned Aircraft Systems Ground Station, and the Forward Arming and Refueling Point would be located on existing cleared runways associated with North Field and would not require vegetation clearing or ground disturbance. The Drop Zone would be cleared of vegetation. Historic assets, such as runways and remnant structures, would be avoided during construction. However, ground disturbance from grading, grubbing, and soil removal would occur in between these assets along interior roadways and at proposed target areas. These construction-related activities would have a significant direct impact to three historic properties, all World War II American military archaeological sites. One of the properties, the North Field runways and associated surrounding areas, is a contributing feature to the North Field National Historic Landscape. Although the runways themselves would be avoided, the surrounding area would be disturbed by construction and vegetation clearing. Therefore, the Landmark would be significantly impacted by ground disturbance associated with the construction of the target areas and a portion of the Convoy Course. The vegetation clearance at the existing runways, however, is considered to be a beneficial impact as it prevents deterioration of the pavement and restores the area to its historic appearance.

No resources of cultural importance were identified within Range Complex D. As stated above, indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access
restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary.

**Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes:** As described in Section 2.4.1, *Tinian Alternatives*, construction associated with Tinian Alternative 1 would include support facilities (e.g., base camp, Munitions Storage Area), road improvements, utility improvements, and Military Lease Area-wide training assets (e.g., Convoy Course, Tracked Vehicle Driver’s Course, Tactical Amphibious Training Areas). Construction-related activities would have a significant direct impact to the following 120 historic properties:

- Eight historic properties would be significantly impacted by grading, excavation, and soil removal associated with road construction and grubbing associated with vegetation clearance of the proposed Convoy Course Engagement Areas. These historic properties include three pre-World War II Japanese Administration sites, two World War II-era Japanese defensive sites, and three World War II American military sites.
- Three historic properties would be significantly impacted by grading, excavation and soil removal within the proposed Munitions Storage Area. These historic properties are pre-World War II Japanese Administration sites.
- Eighty-six historic properties would be significantly impacted by grading, excavation, and soil removal through widening of roads, trenching for utility lines, erection of fences, and improvements for the Tracked Vehicle Driver’s Course. These historic properties include 4 Pre-Contact *latte* sites, 5 Pre-Contact ceramic scatters, 2 Pre-Contact cave sites, 29 pre-World War II Japanese Administration sites, 17 World War II-era Japanese defensive sites, and 29 World War II American military sites.
- One historic property, West Field, would be significantly impacted by grading, excavation, and soil removal within the proposed base camp.
- Three historic properties at the tactical amphibious training areas would be significantly impacted by grading, excavation, and soil removal associated with road construction and heavy machinery use during construction activities, including the World War II landing beach at Unai Chulu, a traditional cultural property, and a *latte* site.
- Nineteen historic properties would be significantly impacted by grading, excavation, and soil removal associated with construction at artillery firing points, surface radar locations, and Observation Posts, and grubbing and clearing at the landing zones. These historic properties would include 1 Pre-Contact *latte* site, 8 pre-World War II Japanese Administration sites, 4 World War II-era Japanese defensive sites, and 6 World War II American military sites.

Most of the significant impacts associated with these properties occur because of the construction of fences and roads or the grubbing associated with the clearance of landing areas and Observation Posts. As these are large, dispersed sites occurring throughout the Military Lease Area, complete avoidance is not possible. However, in most cases, only a portion of the site would be impacted by the proposed action. Existing roads surrounding the North Field National Historic Landmark, which are recommended as contributing features to the cultural landscape, would be improved for public access and for use by the Convoy Course and the Tracked Vehicle Driver’s Course. Improvement of poorly maintained roads would be a beneficial impact to the Landmark; however, grubbing and clearing associated with the construction of the roads would have a significant direct impact to other historic properties.
Additionally, as described in Section 2.4.1, *Tinian Alternatives*, under Tinian Alternative 1, an amphibious landing area would be constructed at Unai Chulu. Construction would occur at the access roads leading to the beach and on an area off shore, where an amphibious landing ramp would be constructed to assist in Amphibious Assault Vehicle training operations. Heavy machinery would be used on the beach and a construction laydown area would be placed behind the beach in an area of low archaeological sensitivity as defined through archaeological testing (Athens 2009). Ground disturbance associated with the use of heavy machinery on the beach and on the existing access roads would have a significant direct impact on three historic properties. Unai Chulu, in addition to being a contributing feature of the North Field National Historic Landmark, also includes a Pre-Contact *latte* site and is considered a potential traditional cultural property. A permanent change in the setting of the beach would be a significant impact to these historic properties. An additional staging area would be located at North Field on an existing cleared runway, which would not impact the runways or the Landmark since it would be temporary and not involve ground disturbance.

An underwater study (Burns 2010) identified a series of magnetic anomalies that potentially represent a submerged cultural resource (e.g., an Amphibious Assault Vehicle, portions of a shipwreck, or historic debris) within the area of proposed dredging around the ramp at Unai Chulu. Marine biological surveys in the area have identified anchors and remnants of World War II-era amphibious assault vehicles. Depending upon the type of submerged cultural resource, it could be managed under the Sunken Military Craft Act, as well as the National Historic Preservation Act.

The purpose of the Sunken Military Craft Act is to protect sunken military vessels and aircraft and the remains of their crews from unauthorized disturbance. This statute confirms that these vessels are sovereign property and provides for archaeological research permits and civil enforcement measures, including substantial penalties, to prevent unauthorized disturbance. Under the Sunken Military Craft Act, a permit is required before any disturbance or investigations can occur to a sunken military craft. Wreck sites that are not entire aircraft or ships, but are parts strewn in a debris field are considered archaeological sites and are managed in accordance with the National Historic Preservation Act. Further investigation would be required to identify the nature of the anomalies. To the degree possible, these anomalies would be avoided during construction. If they cannot be avoided, identification efforts would be conducted to determine whether the anomalies represent a historic property. Therefore, construction of an amphibious landing ramp may impact submerged historic properties.

No resources of cultural importance were identified within the construction areas for these training assets. As stated above, indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary.

Construction of the amphibious landing ramp would likely cause a change in the local fish populations; some populations could decrease, while others may increase (see *Marine Biology*, Section 4.10.3.1). As this change would be temporary during the construction process, the impact would be less than significant.

**Outside the Military Lease Area:** As described in Section 2.4.1, *Tinian Alternatives*, construction-related activities outside of the Military Lease Area would occur in an area immediately north of the Tinian International Airport runways and at the Port of Tinian, as well as along roads modified to accommodate Tracked Vehicle Transit Lanes and a Supply Route. All of the areas proposed for development at the Port...
of Tinian and along the Tracked Vehicle Transit Lanes and Supply Route have been surveyed. Construction-related activities such as clearing, excavation, and soil removal as well as grubbing and vegetation clearance of roadways and port and aircraft support structures would have a significant direct impact to 6 historic properties, which include 2 Pre-Contact sites (ceramic/artifact scatters), 3 pre-World War II Japanese Administration sites, and 1 World War II American military site.

No resources of cultural importance were identified within the proposed construction areas for these training assets. As stated above, indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary.

Significant direct impacts to historic properties and resources of cultural importance would result from construction associated with Tinian Alternative 1. This alternative would have a significant direct impact to 172 historic properties in the Military Lease Area, immediately north of the Tinian International Airport runways, and at the Port of Tinian. Historic properties include the North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms (primarily concrete foundations, cisterns) and shrines; and World War II-era Japanese and American military sites. However, as RTA design is finalized, the Department of Defense will seek to further avoid or minimize impacts on historic properties and resources of cultural importance.

Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

4.11.3.1.2 Operation Impacts

As described in Section 2.4.1, Tinian Alternatives, under Tinian Alternative 1, training facility operations and maintenance would occur within the Military Lease Area, immediately north of the Tinian International Airport runways, and at the Port of Tinian. Live-fire and aviation training would occur at Range Complex A; vehicle-mounted and dismounted (i.e., foot) training involving firing at stationary and moving targets by rifles, machine guns and rocket launchers would occur at Range Complex B; platoon level training involving firing at targets with rifles and inert grenades, rockets, and mortars at Range Complex C; and aviation training and ground training would occur at Range Complex D. The ground training at Range Complex D would involve mostly foot traffic and use of rifles and inert ammunition for grenade launchers, mortars, and rockets.

Other operations within the Military Lease Area would include use of firing points into the High Hazard Impact Area, Convoy Course engagement areas, landing zones, Observation Posts and radar sites, and foot and vehicle traffic on roads and the Tracked Vehicle Driver’s Course. In general, the footprint for operations is very similar to construction footprints and most ground disturbance and impacts to historic properties and resources of cultural importance would occur during construction of the RTA. Therefore, since disturbance to historic properties has been accounted for in the ranges under construction impacts, impacts to historic properties from training operations at the Range Complexes B, C, and D will focus on training maneuvers. Training maneuvers concern vehicle and foot traffic within areas; no digging would occur within maneuver areas. However, potential ground disturbance to historic
properties in Range Complex A is larger than the footprint for construction and could occur throughout the High Hazard Impact Area.

Table 4.11-2 summarizes the historic properties impacted by operations for Tinian Alternative 1; impacts associated with construction are summarized in Table 4.11-1. In Range Complex A, 12 sites, also impacted by construction activities under Tinian Alternative 1, would be significantly impacted by operations.

During training events, foot and vehicle maneuvering would occur within range complexes, Tracked Vehicle Driver’s Course, Convoy Course, maneuver areas, and roads. Vehicle traffic would be confined to established roads and trails that are designed to avoid historic properties and, therefore, would not impact historic properties. Use of historic roads associated with the North Field National Historic Landmark by convoys and other vehicles would be in keeping with existing use and would not impact this historic property. Tracked vehicles would use newly constructed gravel roads adjacent to the historic roads to prevent damage. Impacts to historic properties from foot traffic would be minimal, as it would occur primarily on roads and designated pathways or sporadically throughout the maneuver areas.

Table 4.11-2. Tinian Alternative 1 Summary of Significant Direct Impacts on Historic Properties from Operations

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex A</td>
<td>High Hazard Impact Area</td>
<td>12*</td>
</tr>
<tr>
<td>Range Complex B</td>
<td>Multi-purpose Training Range, Combat Pistol Range, Anti-armor Tracking Range, Battle Site Zero Range</td>
<td>0</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>Infantry Platoon Battle Course, Field Fire Range, Multi-purpose Automated Unknown Distance Range</td>
<td>0</td>
</tr>
<tr>
<td>Range Complex D</td>
<td>Northern Battle Area Complex, Urban Assault Course</td>
<td>0</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes</td>
<td>Convoy Course Engagement Areas</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Munitions Storage Area</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Roads, Fences, and Utilities, Tracked Vehicle Driver’s Course</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Base Camp</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tactical Amphibious Training Areas</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Landing Zones, Artillery Firing Points, Observation Posts, Surface Radar Sites</td>
<td>0</td>
</tr>
<tr>
<td>Outside Military Lease Area</td>
<td>Tinian International Airport</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Port of Tinian</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tracked Vehicle Transit Lanes/Supply Route</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>15</td>
</tr>
</tbody>
</table>

Note: *All of these sites are also impacted under construction, but are located outside of the area of proposed ground disturbance for construction. Sites solely in the construction area are not included in this total.
Various types of tactical amphibious training would occur at four beaches—Unai Chulu, Unai Babui, Unai Masalok, and Unai Lam Lam. Training at Unai Chulu would involve Amphibious Assault Vehicles, Landing Craft Air Cushion vessels, inflatable boats, and combat swimmers. Training at Unai Babui and Unai Masalok would involve the use of Landing Craft Air Cushion vessels, combat swimmers, and inflatable boats. Amphibious training at Unai Lam Lam would involve inflatable boats and combat swimmers. No impacts would occur to historic properties associated with these beaches due to training operations.

Training and range management activities associated with Tinian Alternative 1 would have a significant direct impact to three historic properties, the landing beach at Unai Chulu, which is part of the North Field National Historic Landmark, a traditional cultural property, and a latte site due to ground disturbance caused by Amphibious Assault Vehicle traffic. However, the beach would be restored to its original appearance by contouring and cleaning up expended materials at the end of the exercises (see Section 4.11.2, Resource Management Measures). As much as possible impacts to the latte site would be avoided by using existing and newly constructed roads.

Within the surface danger zones, which are safety buffers that surround target areas and live-fire maneuver areas and would contain projectiles, fragments, debris and components resulting from the firing of weapons, the potential for direct impacts from strikes from stray rounds is extremely low. The ranges would be designed to contain live-fire inside the boundaries to minimize the potential for rounds landing outside the surface danger zones. Additionally, if a stray round were to escape the ranges, the chance of it hitting a historic property is remote, given the large size of the surface danger zones and dispersal of historic properties.

Resources of cultural importance, such as cemeteries, memorials, or potential areas with medicinal plants, would not be directly impacted at these training assets by training operations.

In general, public access would be allowed to all locations except for the High Hazard Impact Area, the Munitions Storage Area, the base camp, and the Observation Posts and Surface Radar sites, when training is not occurring. It is envisioned that public access to some or all areas of the RTA, with the exceptions mentioned above, would occur during a couple of daylight hours on a nearly daily basis during the 20 weeks of live-fire training. A range control facility and dedicated range scheduler would be in place to assess public access in real-time and to provide advance notice of public access dates, time frames, and areas. Range control and the scheduler would coordinate public access directly with the Tinian Mayor's Office and other interested parties, such as ranchers and entities within the tourism industry. Access procedures would be implemented to ensure safety and provide guidance and direction. Therefore, intermittent and temporary loss of public access is not considered a significant indirect impact to cultural resources. Historic properties within the High Hazard Impact Area, base camp, Munitions Storage Area, and the Observation Posts and Surface Radar sites would already have been significantly impacted by construction activities and loss of access to these areas would be a less than significant impact.

The roundabout, a portion of Broadway Avenue, which is an entrance to the North Field National Historic Landmark and a contributing feature to the cultural landscape, would be closed permanently by the use of the High Hazard Impact Area of Range Complex A. This closure would be permanent and would be a significant indirect impact to the Landmark.
The permanent presence of Observation Posts and surface radar sites would not be visible to most historic properties. However, towers associated with Surface Radar sites would be constructed at Unai Babui and near Unai Dankulo. As discussed in Section 4.12.3.1, Visual Resources, a Surface Radar site would be constructed adjacent and south of Unai Dankulo and would be visible from the beach, which is a traditional cultural property. Another Surface Radar Site would be constructed within a latte site at Unai Babui. The permanent location of these towers would have a significant indirect impact to these historic properties.

Construction of the amphibious landing ramp would likely cause a change in the local fish populations through a permanent loss in coral reef habitat. Some populations could decrease, while others may increase (see, Section 4.10.3.1, Marine Biology). As this shoreline is part of a traditional cultural property associated with fishing, this change would be a significant indirect impact to the historic property.

Significant direct impacts would result from operational activities under Tinian Alternative 1. Twelve historic properties, also impacted by construction, would be significantly impacted by operations in Range Complex A. Three historic properties at Unai Chulu may be significantly impacted by training operations. However, as RTA design is finalized, the Department of Defense would seek to further avoid or minimize impacts to historic properties and other resources of cultural importance.

Significant indirect impacts to historic properties would occur to the North Field National Historic Landmark due to closure of the roundabout on Broadway Avenue, to historic properties at Unai Babui and Unai Dankulo due to the permanent presence of surface radar towers, and to the traditional cultural property at Unai Chulu from changes in the fish populations from the landing ramp construction for amphibious training.

Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

4.11.3.2 Tinian Alternative 2

4.11.3.2.1 Construction Impacts

As described in Section 2.4.3, Tinian Alternative 2 construction activities would occur within the Military Lease Area, immediately north of Tinian International Airport runways, and at the Port of Tinian. Tinian Alternative 2 construction activities would occur within the same areas as Tinian Alternative 1, but would accommodate an additional Battle Area Complex (Range Complex C) and five additional Convoy Course Engagement Areas. This development and construction would result in 2,025 acres (820 hectares) (see Table 2.4-8) of ground disturbance (e.g., vegetation clearing, grubbing, grading, excavation, and filling), and impact historic properties and resources of cultural importance. Table 4.11-3 summarizes the 182 historic properties that would be impacted by construction-related activities for Tinian Alternative 2, which is slightly more than the 172 impacted under Tinian Alternative 1. Specific impacts to historic properties and resources of cultural importance are described in more detail by RTA or construction project below and in Appendix N, Cultural Resources Technical Memo.
Table 4.11-3. Tinian Alternative 2 Summary of Significant Direct Impacts on Historic Properties from Construction

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex A</td>
<td>High Hazard Impact Area</td>
<td>20</td>
</tr>
<tr>
<td>Range Complex B</td>
<td>Multi-purpose Training Range, Combat Pistol Range, Anti-armor Tracking Range, Battle Site Zero Range</td>
<td>9</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>Southern Battle Area Complex: Infantry Platoon Battle Course, Field Fire Range, Multi-purpose Automated Unknown Distance Range, Urban Assault Course</td>
<td>25</td>
</tr>
<tr>
<td>Range Complex D</td>
<td>Northern Battle Area Complex, Urban Assault Course</td>
<td>3</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes</td>
<td>Convoy Course Engagement Areas</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Munitions Storage Area</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Roads, Fences, and Utilities, Tracked Vehicle Driver’s Course</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Base Camp</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Tactical Amphibious Training Areas</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Landing Zones, Artillery Firing Points, Observation Posts, Surface Radar Sites</td>
<td>19</td>
</tr>
<tr>
<td>Outside Military Lease Area</td>
<td>Tinian International Airport</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Port of Tinian</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tracked Vehicle Transit Lanes/Supply Route</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>182</strong></td>
</tr>
</tbody>
</table>

Range Complex A: Construction-related activities such as grubbing, grading, excavation, and soil removal at Range Complex A under Tinian Alternative 2 would be the same as under Tinian Alternative 1 and would have a significant direct impact to the same 20 historic properties and the same resources of cultural importance (native limestone forest and two memorials) discussed in Section 4.11.3.1, Tinian Alternative 1. Indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary. The roundabout, a portion of Broadway Avenue, which is an entrance way to the North Field National Historic Landmark and a contributing feature to the cultural landscape, would be closed during construction of Range Complex A target objectives. This closure would be temporary and the impact would be less than significant.

Range Complex B: Construction-related activities at Range Complex B under Tinian Alternative 2 would be the same as under Tinian Alternative 1 and would have a significant direct impact to the same 9 historic properties as described in Section 4.11.3.1, Tinian Alternative 1. No resources of cultural importance were identified within Range Complex B.

Range Complex C: Construction-related activities at Range Complex C under Tinian Alternative 2 would be similar to those described under Tinian Alternative 1 except for the addition of a southern area Battle Complex and the associated Urban Assault Course. As described in Section 2.4.1, Tinian Alternatives, ground ranges, roadways, and 20 temporary roofless structures would be constructed in Range Complex C. Construction-related activities such as vegetation clearing, excavation, and soil removal would have a significant direct impact to 25 historic properties, compared to the 14 impacted under Tinian Alternative 1.
1. These historic properties would include 1 Pre-Contact site, 14 pre-World War II Japanese Administration sites, 1 World War II-era Japanese defensive site, and 9 World War II American military sites. Most of these significant impacts occur because of the construction of roads to the target areas. Since sites in this area tend to be large and dispersed, complete avoidance is not possible. However, in most cases only a portion of the site would be impacted by the proposed action. No resources of cultural importance were identified within Range Complex C. Indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary.

**Range Complex D:** Construction-related activities under Tinian Alternative 2 would be the same as under Tinian Alternative 1 and would have a significant direct impact to three historic properties, all World War II American military archaeological sites. One of the properties, the North Field runways and associated surrounding areas, is a contributing feature to the North Field National Historic Landmark. Although the runways themselves would be avoided, the surrounding area would be disturbed by construction and vegetation clearing. Therefore, the Landmark would be significantly impacted by ground disturbance associated with the construction of the target areas and a portion of the Convoy Course. Vegetation clearance at the existing runways within the proposed Drop Zone, however, is considered to be a beneficial impact as it prevents deterioration of the pavement and restores the area to its historic appearance.

No resources of cultural importance were identified within Range Complex D. Indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increases during construction would be less than significant as they would be intermittent and temporary.

**Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes:** Construction associated with Military Lease Area-wide assets under Tinian Alternative 2 would be similar to Tinian Alternative 1 (Section 4.11.3.1), but would also include five additional Convoy Engagement Areas. It would have a significant direct impact to 119 historic properties, one less than under Tinian Alternative 1. The historic properties would include 13 Pre-Contact sites (6 latte sites, 5 ceramic scatters, and 2 rock overhangs/caves), 43 pre-World War II Japanese Administration sites, 23 World War II-era Japanese defensive sites, 39 World War II American military sites, and 1 traditional cultural property. Most of these significant impacts occur because of the construction of roads. Since sites in this area tend to be large and dispersed, complete avoidance is not possible. However, in most cases only a portion of the site would be impacted by the proposed action. Existing roads surrounding the North Field National Historic Landmark, which are recommended as contributing features to the cultural landscape, would be improved for public access and for use by the Convoy Course and the Tracked Vehicle Driver’s Course. Improvement of poorly maintained roads would be a beneficial impact to the Landmark; however, grubbing and clearing associated with the construction of the roads would have a significant direct impact to other historic properties.

Additionally under Tinian Alternative 2, construction activities at the amphibious landing beach at Unai Chulu, would be the same as under Tinian Alternative 1 (Section 4.11.3.1) and would have a significant direct impact to the same three historic properties (the landing beach, which is part of the North Field National Historic Landmark and would constitute a significant impact to the Landmark, a potential
traditional cultural property, and a latte site) as described in Section 4.11.3.1, Tinian Alternative 1. A permanent change in the setting of the beach would be a significant impact to the potential traditional cultural property. An additional staging area would be located at North Field on an existing cleared runway, which would not impact the runways or the Landmark since it would be temporary and not involve ground disturbance. Construction of an amphibious landing ramp may impact submerged historic properties.

No resources of cultural importance were identified within these training asset areas. As stated above, indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary. Construction of the amphibious landing ramp would likely cause a change in the local fish populations; some populations could decrease, while others may increase (see Section 4.10.3.1, Marine Biology). As this change would be temporary during the construction process, the impact would be less than significant.

**Outside the Military Lease Area:** Construction-related activities outside of the Military Lease Area would occur in an area immediately north of the Tinian International Airport runways and at the Port of Tinian, as well as along roads modified to accommodate the Tracked Vehicle Transit Lanes and a Supply Route. These activities would be the same as under Tinian Alternative 1. Construction-related activities such as clearing, excavation, and soil removal as well as vegetation clearance of roadways and port and aircraft support structures would significantly impact the same six historic properties as described in Section 4.11.3.1, Tinian Alternative 1.

No resources of cultural importance were identified within these training asset areas. Indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary.

Tinian Alternative 2 construction activities would result in significant direct impacts to historic properties and resources of cultural importance. Construction would significantly impact 182 historic properties in the Military Lease Area, immediately north of the Tinian International Airport runways, and the Port of Tinian. Historic properties include the North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; and World War II-era Japanese and American military sites. However, as RTA design is finalized, the Department of Defense will seek to further avoid or minimize impacts to historic properties and resources of cultural importance.

Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

### 4.11.3.2.2 Operation Impacts

As described in Section 2.4.3, Tinian Alternative 2 operations and maintenance would occur within the Military Lease Area, immediately north of the Tinian International Airport runways, and at the Port of
Tinian. In general, the footprint for operations is very similar to construction footprints and most ground disturbance and impacts to historic properties and resources of cultural importance would occur during construction of the RTA. Therefore, since disturbance to historic properties has been accounted for in the ranges under construction impacts, impacts to historic properties from training operations at the Range Complexes B, C, and D will focus on training maneuvers. Training maneuvers concern vehicle and foot traffic within areas; no digging would occur within maneuver areas. However, potential ground disturbance to historic properties in Range Complex A is larger than the footprint for construction and could occur throughout the High Hazard Impact Area. Table 4.11-4 summarizes the historic properties impacted by operations for Tinian Alternative 1; impacts associated with construction are summarized in Table 4.11-3. In Range Complex A, 12 sites, also impacted by construction, would be significantly impacted by operations.

Use of historic roads associated with the North Field National Historic Landmark by convoys and other vehicles would be in keeping with existing use and would not impact this historic property. Tracked vehicles would use newly constructed gravel roads adjacent to the historic roads to prevent damage. Impacts to historic properties from foot traffic would be minimal, as it would occur primarily on roads and designated pathways or sporadically throughout the maneuver areas.

**Table 4.11-4. Tinian Alternative 2 Summary of Significant Direct Impacts on Historic Properties from Operations**

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex A</td>
<td>High Hazard Impact Area</td>
<td>12*</td>
</tr>
<tr>
<td>Range Complex B</td>
<td>Multi-purpose Training Range, Combat Pistol Range, Anti-armor Tracking Range, Battle Site Zero Range</td>
<td>0</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>Southern Battle Area Complex: Infantry Platoon Battle Course, Field Fire Range, Multi-purpose Automated Unknown Distance Range, Urban Assault Course</td>
<td>0</td>
</tr>
<tr>
<td>Range Complex D</td>
<td>Northern Battle Area Complex, Urban Assault Course</td>
<td>0</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes</td>
<td>Convoy Course Engagement Areas</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Munitions Storage Area</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Roads, Fences, and Utilities, Tracked Vehicle Driver’s Course</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Base Camp</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tactical Amphibious Training Areas</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Landing Zones, Artillery Firing Points, Observation Posts, Surface Radar Sites</td>
<td>0</td>
</tr>
<tr>
<td>Outside Military Lease Area</td>
<td>Tinian International Airport</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Port of Tinian</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tracked Vehicle Transit Lanes/Supply Route</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

*Note: *All of these sites are also impacted under construction, but are located outside of the area of proposed ground disturbance for construction. Sites solely in the construction area are not included in this total.

Training and range management activities associated with Tinian Alternative 2 would have a significant direct impact to three historic properties, the landing beach at Unai Chulu, which is part of the North Field National Historic Landmark a traditional cultural property, and a *lotte* site due to ground disturbance.
disturbance caused by Amphibious Assault Vehicle traffic. However, the beach would be restored to its original appearance by contouring and cleaning up expended materials at the end of the exercises (see Section 4.11.2, Resource Management Measures). As much as possible impacts to the latte site would be avoided by using existing and newly constructed roads.

Within the surface danger zones, which are safety buffers that surround target areas and live-fire maneuver areas and would contain projectiles, fragments, debris and components resulting from the firing of weapons, the potential for direct impacts from strikes from stray rounds is extremely low. The ranges would be designed to contain live-fire inside the boundaries to minimize the potential for rounds landing outside the surface danger zones. Additionally, if a stray round were to escape the ranges, the chance of it hitting a historic property is remote, given the size of the surface danger zones and dispersal of historic properties.

In general, public access would be allowed to all locations except for the High Hazard Impact Area, the Munitions Storage Area, the base camp, and the Observation Posts and Surface Radar sites, when training is not occurring. It is envisioned that public access to some or all areas of the RTA, with the exceptions mentioned above, would occur during a couple of daylight hours on a nearly daily basis during the 20 weeks of live-fire training. A range control facility and dedicated range scheduler would be in place to assess public access in real-time and to provide advance notice of public access dates, time frames, and areas. Range control and the scheduler would coordinate public access directly with the Tinian Mayor’s Office and other interested parties, such as ranchers and entities within the tourism industry. Access procedures would be implemented to ensure safety and provide guidance and direction. Therefore, intermittent and temporary loss of public access is not considered a significant indirect impact to cultural resources. Historic properties with the High Hazard Impact Area, base camp, Munitions Storage Area, and the Observation Posts and Surface Radar sites would already have been significantly impacted by construction activities and loss of access to these areas would be less than significant.

No resources of cultural importance were identified within these training asset areas.

The roundabout, a portion of Broadway Avenue, which is an entrance to the North Field National Historic Landmark and a contributing feature to the cultural landscape, would be closed permanently by the use of the High Hazard Impact Area of Range Complex A. This closure would be a significant indirect impact to the Landmark.

The permanent presence of Observation Posts and Surface Radar sites would not be visible to most historic properties. However, towers associated with Surface Radar sites would be constructed at Unai Babui and near Unai Dankulo. As discussed in Section 4.12.3.1, Visual Resources, a Surface Radar site would be constructed adjacent and south of Unai Dankulo and would be visible from the beach, which is a traditional cultural property. Another Surface Radar site would be constructed within a latte site at Unai Babui. The permanent location of these towers would have a significant indirect impact to these historic properties.
Construction of the ramp at Unai Chulu would likely cause a change in the local fish populations through a permanent loss in coral reef habitat. Some populations could decrease, while others may increase (see Section 4.10, *Marine Biology*). As this shoreline is part of a potential traditional cultural property associated with fishing, this change would be a significant indirect impact to the historic property.

Significant direct impacts would result from operational activities under Tinian Alternative 2. As discussed under Tinian Alternative 1, 12 historic properties within Range Complex A and three historic properties at Unai Chulu (the landing beach associated with the North Field National Historic Landmark, a potential traditional cultural property, and a *latte* site) would be significantly impacted in the area of potential effects. Significant indirect impacts would occur to the North Field National Historic Landmark from the permanent closure of the roundabout on Broadway Avenue, to a *latte* site and a potential traditional cultural property (Unai Dankulo) from visual impacts due to Surface Radar sites, and to a potential traditional cultural property (Unai Chulu) from changes in fish populations due to ramp construction. However, as RTA design is finalized, the Department of Defense would seek to further avoid or minimize impacts to historic properties and other resources of cultural importance.

Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

### 4.11.3.3 Tinian Alternative 3

#### 4.11.3.3.1 Construction Impacts

As described in Section 2.4.4, Tinian Alternative 3 RTA development and construction would result in 2,003 acres (811 hectares) (see Table 2.4-8) of ground disturbance (e.g., vegetation clearing, grubbing, grading, excavation, and filling), and impact historic properties and resources of cultural importance. Tinian Alternative 3 construction activities would occur within the same areas as Tinian Alternative 1, but would accommodate an additional Battle Area Complex (Range Complex C) and five additional Convoy Course Engagement Areas. Only a Drop Zone would be established in Range Complex D. *Table 4.11-5* summarizes the 179 historic properties that would be directly impacted by construction-related activities for Tinian Alternative 3; 7 more than under Tinian Alternative 1. Specific impacts to historic properties and resources of cultural importance are described in more detail by RTA or construction project below and in Appendix N, *Cultural Resources Technical Memo*. 
Table 4.11-5. Tinian Alternative 3 Summary of Significant Direct Impacts on Historic Properties from Construction

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex A</td>
<td>High Hazard Impact Area</td>
<td>20</td>
</tr>
<tr>
<td>Range Complex B</td>
<td>Multi-purpose Training Range, Combat Pistol Range, Anti-armor Tracking Range, Battle Site Zero Range</td>
<td>9</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>Southern Battle Area Complex: Infantry Platoon Battle Course, Field Fire Range, Multi-purpose Automated Unknown Distance Range, Urban Assault Course</td>
<td>25</td>
</tr>
<tr>
<td>Range Complex D</td>
<td>Drop Zone</td>
<td>0</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes</td>
<td>Convoy Course Engagement Areas</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Munitions Storage Area</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Roads, Fences, and Utilities, Tracked Vehicle Driver’s Course</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Base Camp</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Tactical Amphibious Training Areas</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Landing Zones, Artillery Firing Points, Observation Posts, Surface Radar Sites</td>
<td>19</td>
</tr>
<tr>
<td>Outside Military Lease Area</td>
<td>Tinian International Airport</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Port of Tinian</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tracked Vehicle Transit Lanes/Supply Route</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>179</strong></td>
</tr>
</tbody>
</table>

**Range Complex A.** Construction-related activities such as grubbing, grading, excavation, and filling at Range Complex A under Tinian Alternative 3 would be the same as under Tinian Alternative 1 and would have a significant direct impact to the same 20 historic properties and the same resources of cultural importance (native limestone forest and two memorials) as described in Section 4.11.3.1. Indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary. The roundabout, a portion of Broadway Avenue, which is an entrance to the North Field National Historic Landmark and a contributing feature to the cultural landscape, would be closed during construction of Range Complex A target objectives. This closure would be temporary and the impact would be less than significant.

**Range Complex B.** Construction-related activities at Range Complex B under Tinian Alternative 3 would be the same as under Tinian Alternative 1 and would have a significant impact to the same nine historic properties as described in Section 4.11.3.1. No resources of cultural importance were identified within Range Complex B.

**Range Complex C.** Construction-related activities under Tinian Alternative 3 would be similar to that under Tinian Alternative 1 except that there would be the construction of a southern Battle Area Complex and associated Urban Assault Course. Construction-related activities such as clearing, excavation, and soil removal would have a significant impact to 25 historic properties (see Table 4.11-5), compared to the 14 impacted under Tinian Alternative 1. Most of these impacts occur because of the construction of roads to the target areas. Since sites in this area tend to be large and dispersed,
complete avoidance is not possible. However, in most cases only a portion of the site would be impacted by the proposed action. No resources of cultural importance were identified within Range Complex C. Indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary.

**Range Complex D:** No construction would be conducted at Range Complex D under Tinian Alternative 3, although vegetation would be cleared around the runways similar to Tinian Alternative 1. This vegetation clearance is considered to be a beneficial impact as it prevents deterioration of the historic runways, which are a contributing feature to the North Field National Historic Landmark and restores the area to its historic appearance. Therefore, no significant impacts due to construction would occur at Range Complex D.

**Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes:** Construction associated with Military Lease Area-wide assets under Tinian Alternative 3 would be similar to Tinian Alternative 1 (Section 4.11.3.1), but would include additional road improvements. It would significantly impact 119 historic properties; one less than under Tinian Alternative 1 (see Table 4.11-5). The historic properties would include 13 Pre-Contact sites (6 latte sites, 5 ceramic scatters, and 2 rock overhangs/caves), 43 pre-World War II Japanese Administration sites, 23 World War II-era Japanese defensive sites, 39 World War II American military sites, and 1 potential traditional cultural property. Most of these significant impacts occur because of the construction of roads. Since sites in this area tend to be large and dispersed, complete avoidance is not possible. However, in most cases only a portion of the site would be impacted by the proposed action. Existing roads surrounding the North Field National Historic Landmark, which are recommended as contributing features to the cultural landscape, would be improved for public access and for use by the Convoy Course and the Tracked Vehicle Driver’s Course. Improvement of poorly maintained roads would be a beneficial impact to the Landmark; however, grubbing and clearing associated with the construction of the roads would have a significant direct impact to other historic properties.

Under Tinian Alternative 3, construction activities at the amphibious training area at Unai Chulu would be the same as under Tinian Alternative 1 and would have a significant direct impact to the same three historic properties (the landing beach, which is part of the North Field National Historic Landmark and would constitute a significant impact to the Landmark, a traditional cultural property, and a latte site) as described in Section 4.11.3.1. An additional staging area would be located at North Field on an existing cleared runway, which would not impact the runways or the Landmark since it would be temporary and not involve ground disturbance. Construction of an amphibious landing ramp may impact submerged historic properties.

No resources of cultural importance were identified within these training asset areas. As stated above, indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary. Construction of the amphibious landing ramp would likely cause a change in the local fish populations; some populations could decrease, while others may increase (see Section 4.10, Marine Biology). As this change would be temporary during the construction process, the impact would be less than significant.
**Outside the Military Lease Area:** Construction-related activities outside of the Military Lease Area would occur in an area immediately north of the Tinian International Airport runways and at the Port of Tinian, as well as along roads modified to accommodate the Tracked Vehicle Transit Lanes and a Supply Route. These activities would be the same as under Tinian Alternative 1. Construction-related activities such as clearing, excavation, and soil removal as well as vegetation clearance of roadways and port and aircraft support structures would significantly impact the same six historic properties as described in Section 4.11.3.1, Tinian Alternative 1.

No resources of cultural importance were identified within these training assets. Indirect impacts to historic properties and resources of cultural importance due to visual intrusions, access restrictions during construction, and noise increase during construction would be less than significant as they would be intermittent and temporary.

Significant direct impacts from construction would occur under Tinian Alternative 3 to historic properties and resources of cultural importance. Tinian Alternative 3 would significantly impact 179 historic properties in the Military Lease Area, immediately north of the Tinian International Airport runways, and at the Port of Tinian. Historic properties include the North Field National Historic Landmark; Pre-Contact *latte* sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; and World War II-era Japanese and American military sites. However, as RTA design is finalized, the Department of Defense will seek to further avoid or minimize impacts to historic properties and resources of cultural importance.

Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

### 4.11.3.3.2 Operation Impacts

As described in Section 2.4.4, Tinian Alternative 3 operations and maintenance would occur within the Military Lease Area, immediately north of the Tinian International Airport runways, and at the Port of Tinian. In general, the footprint for operations is very similar to construction footprints and most ground disturbance and impacts to historic properties and resources of cultural importance would occur during construction of the RTA. Therefore, since disturbance to historic properties has been accounted for in the ranges under construction impacts, impacts to historic properties from training operations at the Range Complexes B, C, and D will focus on training maneuvers. Training maneuvers concern vehicle and foot traffic within areas; no digging would occur within maneuver areas. However, potential ground disturbance to historic properties in Range Complex A is larger than the footprint for construction and could occur throughout the High Hazard Impact Area. Table 4.11-6 summarizes the historic properties impacted by operations for Tinian Alternative 3; impacts associated with construction are summarized in Table 4.11-5. In Range Complex A, 12 sites, also impacted by construction, would be significantly impacted by operations.

Use of historic roads associated with the North Field National Historic Landmark by convoys and other vehicles would be in keeping with existing use and would not impact this historic property. Tracked
vehicles would use newly constructed gravel roads adjacent to the historic roads to prevent damage. Impacts to historic properties from foot traffic would be minimal, as it would occur primarily on roads and designated pathways or sporadically throughout the maneuver areas.

### Table 4.11-6. Tinian Alternative 3 Summary of Significant Direct Impacts on Historic Properties from Operations

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex A</td>
<td>High Hazard Impact Area</td>
<td>12*</td>
</tr>
<tr>
<td>Range Complex B</td>
<td>Multi-purpose Training Range, Combat Pistol Range, Anti-armor Tracking Range, Battle Site Zero Range</td>
<td>0</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>Southern Battle Area Complex: Infantry Platoon Battle Course, Field Fire Range, Multi-purpose Automated Unknown Distance Range, Urban Assault Course</td>
<td>0</td>
</tr>
<tr>
<td>Range Complex D</td>
<td>Drop Zone</td>
<td>0</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes</td>
<td>Convoy Course Engagement Areas</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Munitions Storage Area</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Roads, Fences, and Utilities, Tracked Vehicle Driver’s Course</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Base Camp</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tactical Amphibious Training Areas</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Landing Zones, Artillery Firing Points, Observation Posts, Surface Radar Sites</td>
<td>0</td>
</tr>
<tr>
<td>Outside Military Lease Area</td>
<td>Tinian International Airport</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Port of Tinian</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Tracked Vehicle Transit Lanes/Supply Route</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

*Note: All of these sites are also impacted under construction, but are also located outside of the area of proposed ground disturbance for construction. Sites solely in the construction area are not included in this total.

Training and range management activities associated with Tinian Alternative 3 would have a significant direct impact to three historic properties, the landing beach at Unai Chulu, which is part of the North Field National Historic Landmark and a traditional cultural property, and a latte site due to ground disturbance caused by Amphibious Assault Vehicle traffic. However, the beach would be restored to its original appearance by contouring and cleaning up expended materials at the end of the exercises (see Section 4.11.2, Resource Management Measures). As much as possible impacts to the latte site would be avoided by using existing and newly constructed roads.

Within the surface danger zones, which are safety buffers that surround target areas and live-fire maneuver areas and would contain projectiles, fragments, debris and components resulting from the firing of weapons, the potential for direct impacts from strikes from stray rounds is extremely low. The ranges would be designed to contain live-fire inside the boundaries to minimize the potential for rounds landing outside the surface danger zones. Additionally, if a stray round were to escape the ranges, the chance of it hitting a historic property is remote, given the size of the surface danger zones and dispersal of historic properties.
In general, public access would be allowed to all locations except for the High Hazard Impact Area, the Munitions Storage Area, the base camp, and the Observation Posts and Surface Radar sites, when training is not occurring. It is envisioned that public access to some or all areas of the RTA, with the exceptions mentioned above, would occur during a couple of daylight hours on a nearly daily basis during the 20 weeks of live-fire training. A range control facility and dedicated range scheduler would be in place to assess public access in real-time and to provide advance notice of public access dates, time frames, and areas. Range control and the scheduler would coordinate public access directly with the Tinian Mayor’s Office and other interested parties, such as ranchers and entities within the tourism industry. Access procedures would be implemented to ensure safety and provide guidance and direction. Therefore, intermittent and temporary loss of public access is not considered a significant indirect impact to cultural resources. Historic properties with the High Hazard Impact Area, base camp, Munitions Storage Area, and the Observation Posts and Surface Radar sites would already have been significantly impacted by construction activities and loss of access to these areas would be less than significant.

No resources of cultural importance were identified within these training asset areas.

The roundabout, a portion of Broadway Avenue, which is an entrance to the North Field National Historic Landmark and a contributing feature to the cultural landscape, would be closed permanently by the use of the High Hazard Impact Area of Range Complex A. This closure would be a significant indirect impact to the Landmark.

The permanent presence of Observation Posts and Surface Radar sites would not be visible to most historic properties. However, towers associated with Surface Radar sites would be constructed at Unai Babui and near Unai Dankulo. As discussed in Visual Resources, Section 4.12.3.1, a Surface Radar Site would be constructed adjacent and south of Unai Dankulo and would be visible from the beach, which is a traditional cultural property. Another Surface Radar Site would be constructed within a latte site at Unai Babui. The permanent location of these towers would have a significant indirect impact to these historic properties.

Construction of the amphibious landing ramp at Unai Chulu would likely cause a change in the local fish populations through a permanent loss in coral reef habitat. Some populations could decrease, while others may increase (see Marine Biology, Section 4.10.3.1). As this shoreline is part of a potential traditional cultural property associated with fishing, this change would be a significant indirect impact to the property.

Significant direct impacts would result from operational activities under Tinian Alternative 3. As discussed under Tinian Alternative 1, 12 historic properties within Range Complex A and 3 historic properties at Unai Chulu would be significantly impacted in the area of potential effects. Significant indirect impacts would occur to the North Field National Historic Landmark from the permanent closure of the roundabout on Broadway Avenue, to a latte site, and a potential traditional cultural property (Unai Dankulo) from visual impacts due to Surface Radar sites, and to a potential traditional cultural property (Unai Chulu) from changes in fish populations due to ramp construction. However, as RTA design is finalized, the Department of Defense would seek to further avoid or minimized impacts to historic properties and other resources of cultural importance.
Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

4.11.3.4 Tinian No-Action Alternative

Activities during the periodic military non-live-fire training exercises on Tinian in the Military Lease Area would not impact historic properties and resources of cultural importance as these have been designed to avoid impacts by restricting ground disturbance and to improve historic runways and structures within the North Field National Historic Landmark. Establishing the four ranges on Tinian would result in significant impacts to cultural resources. These impacts were analyzed in the Guam and CNMI Military Relocation EIS and resolved through a Programmatic Agreement (Department of Defense 2011) that identified measures to mitigate significant impacts. Significant impacts to historic properties from the Mariana Islands Range Complex training were analyzed in the Mariana Islands Range Complex EIS and resolved through a Programmatic Agreement (Department of Defense 2009). Through the measures prescribed in these Programmatic Agreements, significant impacts to cultural resources would be resolved.
### 4.11.3.5 Summary of Impacts for Tinian Alternatives

Table 4.11-7 provides a comparison of the potential impacts to cultural resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural Resources</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>Range Complex A</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
</tr>
<tr>
<td>Range Complex B</td>
<td>SI mitigated to LSI</td>
<td>LSI</td>
<td>SI mitigated to LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>SI mitigated to LSI</td>
<td>LSI</td>
<td>SI mitigated to LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Range Complex D</td>
<td>SI mitigated to LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>NI</td>
</tr>
<tr>
<td>Military Lease Area-wide Training Assets and Support Facilities Outside of the Range Complexes</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
</tr>
<tr>
<td>Tinian International Airport</td>
<td>SI mitigated to LSI</td>
<td>LSI</td>
<td>SI mitigated to LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Outside Military Lease Area</td>
<td>SI mitigated to LSI</td>
<td>LSI</td>
<td>SI mitigated to LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Military Lease Area</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

*Legend: LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts.*
4.11.3.6 Summary of Potential Mitigation Measures for Tinian Alternatives

Table 4.11-8 provides a summary of the potential mitigation measures for cultural resources for the three Tinian alternatives.

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>CULTURAL RESOURCES</td>
<td></td>
<td>Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.</td>
</tr>
<tr>
<td>All Tinian alternatives would have a significant direct impact on historic properties in the Military Lease Area, immediately north of Tinian International Airport runways, and at the Port of Tinian.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>• Tinian Alternative 1 would have a significant direct impact to 172 historic properties from construction and to 15 historic properties from operations, as well as significant indirect impacts to 4 historic properties. These historic properties include the North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; World War II-era Japanese and American military sites; and potential traditional cultural properties.</td>
<td></td>
<td>SI mitigated to LSI</td>
</tr>
<tr>
<td>• Tinian Alternative 2 would have a significant direct impact to 182 historic properties from construction and to 15 historic properties from operations, as well as significant indirect impacts to 4 historic properties. These historic properties include. North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; World War II-era Japanese and American military sites; and potential traditional cultural properties.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4.11-8. Summary of Potential Mitigation Measures for Tinian Alternatives

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>Tinian Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Tinian Alternative 3 would have a significant direct impact to 179 historic properties from construction and to 15 historic properties from operation, as well as significant indirect impacts to 4 historic properties. These historic properties include the North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; World War II-era Japanese and American military sites; and potential traditional cultural properties.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.
4.11.4 Pagan

4.11.4.1 Pagan Alternative 1

4.11.4.1.1 Construction Impacts

As described in Section 2.5, Pagan Alternatives, two High Hazard Impact Areas would be established in the North Range Complex under Pagan Alternative 1. The expeditionary airfield, munitions storage area, and base camp would be developed north of the isthmus. This development and construction would result in 764 acres (310 hectares) (see Table 2.5-6) of ground disturbance (primarily due to vegetation clearance), and potentially impact historic properties and resources of cultural importance. Table 4.11-9 summarizes the historic properties impacted by construction-related activities for Pagan Alternative 1. Specific impacts to historic properties and resources of cultural importance are described in more detail below and in Appendix N, Cultural Resources Technical Memo.

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Range Complex</td>
<td>North High Hazard Impact Area</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Landing Zones</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Field Artillery Direct and Indirect Fire Ranges/Mortar Firing Positions</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Amphibious Training Areas</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Live-Fire Maneuver Area</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Isthmus High Hazard Impact Area</td>
<td>2*</td>
</tr>
<tr>
<td></td>
<td>Military Training Trails</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Airfield/Base Camp/Bivouac Area/Munitions Storage Area</td>
<td>10</td>
</tr>
<tr>
<td>South Range Complex</td>
<td>Non-Live-Fire Maneuver Area</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>27</strong></td>
</tr>
</tbody>
</table>

Note: *Although this area has not been surveyed, former residents indicate that two potential historic properties are located in the area of potential effects.

**North Range Complex:** As described in Section 2.5.2, Pagan Alternative 1, construction associated with the High Hazard Impact Area in the north would be minimal; however, 600 acres (243 hectares) would need to be cleared through grubbing for target placement, landing zones, and firing positions. Of this total, about 7 acres (3 hectares) is composed of native forest that would be removed (see Section 4.9, Terrestrial Biology). A firebreak would be established along the perimeter of the northern High Hazard Impact Area and eight targets put within the impact area. Although most of this area has not been surveyed, in general, the area is covered by lava to depths of over 30 feet (9.1 meters) from recent volcanic eruptions. Historic properties would not be found on the surface in this area. Outside of the lava area, historic properties tend to be found nearer to the coastal areas. Most of the area of potential effects for the firebreak has been surveyed. Construction-related activities associated with the firebreak under Pagan Alternative 1 would have a significant direct impact to two historic properties including one Pre-Contact artifact scatter and one World War II-era Japanese defensive site. Construction would also impact 7 acres (3 hectares) of native forest which could contain resources of cultural importance, such
as medicinal plants. No other resources of cultural importance, such as cemeteries or memorials, would be directly impacted by construction in this area.

Construction associated with High Hazard Impact Area located on the isthmus would likewise be minimal; however, 167 acres (68 hectares) would need to be cleared for target placement. Of this total, about 7 acres (3 hectares) is composed of native forest that would be removed (see Section 4.9, Terrestrial Biology). A firebreak would be established along the perimeter and one target would be cleared during construction within the isthmus High Hazard Impact Area. Because of thick vegetation and steep topography, the isthmus area has not been surveyed for archaeological resources, but it does contain two areas identified by former residents as the location of Kannathomhum, a latte village located close to the coast, and one unnamed location, which probably contained World War II-era Japanese military features. Other archaeological sites in the area are unlikely based on the steep topography and lack of accessibility to coastal resources. Construction of a firebreak would not significantly impact these resources, but grubbing during vegetation clearance associated with a target would have a significant direct impact to these resources. Construction would also significantly impact 7 acres (3 hectares) of native forest which could contain resources of cultural importance. A resource of cultural importance, a potential area for collecting betel nuts, also could be impacted by construction.

No construction would occur at the amphibious landing beaches or within the Live-Fire Maneuver Area. Eleven landing zones, 1 Field Artillery Direct Firing Range Position, 10 Field Artillery Indirect Firing Positions (8 co-occur with landing zones), and 6 firing points associated with the Mortar Range would be constructed throughout the northern portion of the island. Most of the landing zones and artillery firing points have either been surveyed or are located on lava. Of the 2 unsurveyed landing zones and the 2 unsurveyed firing points associated with the Mortar Range, 3 are located in steep interior areas surrounding Mount Pagan, and 1 is located in the High Hazard Impact Area on the isthmus in an area surrounded by steep topography. Both of these areas have a low potential for containing historic properties. Construction-related activities associated with the clearing and grubbing of landing zones and firing points under Pagan Alternative 1 would have a significant direct impact to six historic properties including one Pre-Contact latte site, one pre-World War II Japanese Administration site, and four World War II-era Japanese defensive sites.

A military training trail network would be constructed around the perimeter of the northern portion of Pagan to provide access to the base camp/bivouac area, Landing Zones, and the northern High Hazard Impact Area. A portion of the access road construction would involve the improvement of existing trails, while new trails would be constructed as well. A total of 39 acres (16 hectares) would be cleared and graded in the construction of these trails. Construction-related activities under Pagan Alternative 1 would have a significant direct impact to 7 historic properties including 2 Pre-Contact sites (latte sites), 2 pre-World War II Japanese Administration sites, and 3 World War II-era Japanese defensive sites. Given the steep topography of the area which restrict locations of trails (both existing and proposed), it is difficult to avoid known historic properties. Construction would also significantly impact 5 acres (2 hectares) of native forest which could contain resources of cultural importance. No other resources of cultural importance have been identified in this area.

The area adjacent to an existing airfield would contain the expeditionary base camp/bivouac area, interior roads, temporary munitions storage area, and airfield improvements. A grass airfield would be improved, and a temporary munitions storage area would be constructed. These areas would be cleared.
of vegetation. Construction-related activities such as grading, grubbing, and soil removal would have a
significant direct impact to 10 historic properties including 1 Pre-Contact site (*latte* site), 4 pre-World
War II Japanese Administration sites, and 5 World War II-era Japanese defensive sites. Resources of
cultural importance would not be impacted by construction.

Although public access would not be allowed in the construction area, the public may be allowed in
nearby areas depending upon the type of construction. An increase in noise and changes in visual setting
may occur during construction in the vicinity of historic properties, including potential traditional
cultural properties, when members of the public are present. This change in the noise and visual setting
would be intermittent and temporary and result in a less than significant impact.

**South Range Complex:** The South Range Complex would be used as a non-live-fire maneuver area.
There would be no construction-related ground clearance undertaken; therefore, there would be no
direct or indirect impacts to historic properties or resources of cultural importance from construction
activities associated with the establishment of the South Range Complex.

Although public access would not be allowed to the construction area, the public may be allowed in
nearby areas in south Pagan when construction is ongoing. An increase in noise and changes in visual
setting may occur during construction in the vicinity of historic properties, including potential traditional
cultural properties, when members of the public are present. This change in noise and visual setting
would be intermittent and temporary and result in a less than significant impact.

Pagan Alternative 1 would result in significant direct impacts to historic properties and resources of
cultural importance from construction activities. It would significantly impact up to 27 historic
properties in the range complexes and expeditionary area. Historic properties include Pre-Contact *latte*
complexes, pre-World War II Japanese Administration sites, and World War II-era Japanese defensive
sites. However, as range design is finalized, the Department of Defense will seek to further avoid or
minimize impacts on historic properties and resources of cultural importance.

Measures to mitigate significant impacts to historic properties will be identified through consultation
with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park
Service, and other interested parties representing the interests of the local government and the public.
These measures, which may include data recovery excavations, archaeological monitoring,
documentation, public education, and/or other appropriate measures, will be formalized in an
agreement document.

### 4.11.4.1.2 Operation Impacts

As described in Section 2.5, *Pagan Alternatives*, under Pagan Alternative 1, operations and maintenance
would occur within the North and South Range Complexes.

Target areas in the High Hazard Impact Areas would be used for live-fire and inert munitions training. In
general, the footprint for operations is very similar to the construction footprints and most ground
disturbance, and impacts to historic properties and resources of cultural importance would occur during
construction of the RTA. Therefore, since disturbance to historic properties has been accounted for in
most areas under construction impacts, impacts to historic properties from training operations will focus
on training maneuvers. Training maneuvers consist of vehicle and foot traffic within maneuver areas; no
digging would occur within the maneuver areas. However, potential ground disturbance to historic
Table 4.11-10 summarizes the historic properties impacted by operations for Pagan Alternative 1; impacts associated with construction are summarized in Table 4.11-9. In the High Hazard Impact Areas, five historic properties, also impacted by construction, would be significantly impacted by operations. Although not all of the northern High Hazard Impact Area has been surveyed; it is primarily covered in lava. Should sites be preserved under the lava, impacts are unlikely since the depth of the ground disturbance associated with munitions would be less than the depth of the lava. Other archaeological sites within the isthmus High Hazard Impact Area are unlikely based on the steep topography and lack of accessibility to coastal resources.

Table 4.11-10. Pagan Alternative 1 Summary of Significant Direct Impacts on Historic Properties from Operations

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Range Complex</td>
<td>North High Hazard Impact Area</td>
<td>5*</td>
</tr>
<tr>
<td></td>
<td>Landing Zones</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Field Artillery Direct and Indirect Fire Ranges/Mortar Firing Positions</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Amphibious Training Areas</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Live-Fire Maneuver Area</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Isthmus High Hazard Impact Area</td>
<td>2*</td>
</tr>
<tr>
<td></td>
<td>Military Training Trails</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Airfield/Base Camp/Bivouac Area/Munitions Storage Area</td>
<td>0</td>
</tr>
<tr>
<td>South Range Complex</td>
<td>Non-Live-Fire Maneuver Area</td>
<td>NA</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>54</td>
</tr>
</tbody>
</table>

Notes: *All of these sites are impacted by vegetation clearing in target areas, but are located outside of the area of proposed clearing. Sites solely in the construction/cleared area are not included in this total.

Legend: NA = not applicable.

Training in the northern maneuver areas includes patrolling, establishing defensive positions, and firing live-fire weapons into and/or around the High Hazard Impact Area and integrating supporting arms (including aviation, artillery, and naval gunfire assets). Where possible, mounted wheeled and tracked vehicle maneuvering would be accomplished in the northern maneuver area as well. Vehicles would move along military training trails as well as other terrain that they could safely navigate. Ground disturbance associated with wheeled and tracked vehicles off of roadways and trails would have a significant direct impact to up to 46 historic properties, including 5 Pre-Contact latte sites, 1 Pre-Contact midden site, and 40 Japanese Administration sites. Off-road vehicle use could also impact resources of cultural importance such as medicinal plants and plant gathering areas near the shoreline, but would not impact such resources located along clifflines or on steep slopes. However, training units would be required to identify engagement area locations, direction of attack, targets/threats to be engaged, and types of weapon and ammunition to be used during an engagement. Developed scenarios would be submitted to range control for approval prior to implementation. This process would allow implementation of measures to avoid and protect historic properties and resources of cultural importance.
Foot maneuvers would occur in the South Range Complex. A limited amount of survey has been conducted in the South Range Complex due to steep topography. Information from surveys conducted in the south and interviews with former residents indicate that there are probably at least eight latte villages located primarily along coastal areas. However, impacts to historic properties from foot traffic would be minimal, as it would occur primarily on designated pathways or sporadically throughout the maneuver area.

Amphibious training, consisting of swimmer and inflatable boat landings, would occur at six beaches—Red, Green, Blue, South, North, and Gold. Amphibious Assault Vehicles and Landing Craft Air Cushion vessels would be used at Red, Green, and Blue beaches. Landing Craft Air Cushion vessels would be used at Red, Green, Blue, and South beaches. Use by swimmers and inflatable boats would have a minimal impact to any historic properties, including traditional cultural properties, and resources of cultural importance. Use of Amphibious Assault Vehicles and Landing Craft Air Cushion vessels could cause ground disturbance on the beach. Landing Craft Air Cushion vessels would have a significant direct impact to one historic property, a World War II-era Japanese airfield. All beaches have been surveyed and no other resources are recorded within the vicinity of the training areas. The beach areas associated with two potential traditional cultural properties, Red Beach (Shomshon) and South Beach (Regusa), would be disturbed by amphibious landing operations. However, the beach would be restored to its original appearance by contouring and cleaning up expended materials at the end of the exercises (see Section 4.11.2, Resource Management Measures). The resulting impact to these potential traditional cultural properties would be less than significant.

Within the surface danger zones, which are safety buffers that surround target areas and live-fire maneuver areas and would contain projectiles, fragments, debris and components resulting from the firing of weapons, the potential for direct impacts from strikes from stray rounds is extremely low. The ranges would be designed to contain live-fire inside the boundaries to minimize the potential for rounds landing outside the surface danger zones. Additionally, if a stray round were to escape the ranges, the chance of it hitting a historic property is remote, given the size of the surface danger zones and dispersal of historic properties.

In general, public access would be allowed to all locations except for the High Hazard Impact Areas, which would be permanently restricted due to the presence of unexploded ordnance, when training is not occurring. It is envisioned that public access would be allowed at times when such training events are not taking place and may be available during other times depending upon the type of training taking place. This may include public access to areas of southern Pagan while training is occurring elsewhere. Therefore, intermittent and temporary loss of public access is not considered a significant indirect impact to cultural resources. Historic properties within the High Hazard Impact Area would already have been significantly impacted by construction activities and loss of access to these areas would be a less than significant impact.

Indirect impacts to historic properties and resources of cultural importance due to visual intrusions and noise-level increase from training would be less than significant. An increase in noise and changes in visual setting may occur during operations in the vicinity of historic properties, including potential traditional cultural properties, when members of the public are present. This change in noise and visual setting would be intermittent and temporary and result in a less than significant impact. Indirect impacts to resources of cultural importance such as Laguna Sanhalom due to contamination by munitions in the
northern High Hazard Impact Area would be less than significant due to the implementation of best management practices associated with a Range Training Area Management Plan (see Section 4.11.2, Resource Management Measures).

Significant direct impacts would result from Pagan Alternative 1 operational activities. Up to 54 historic properties and resources of cultural importance would be significantly impacted by off-road wheeled and tracked vehicle use in the maneuver areas, munitions training in the High Hazard Impact Areas, and amphibious training. However, as RTA design is finalized, the Department of Defense would seek to further avoid or minimize impacts to historic properties and other resources of cultural importance.

Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

4.11.4.2 Pagan Alternative 2

4.11.4.2.1 Construction Impacts

Under Pagan Alternative 2, only one, smaller northern High Hazard Impact Area would be established in North Range Complex. This would potentially impact historic properties and resources of cultural importance. Ground disturbance primarily associated with vegetation removal would total 696 acres (283 hectares), or 38 fewer acres (28 hectares) when compared to Pagan Alternative 1 (see Table 2.5-6).

Table 4.11-11 summarizes the historic properties impacted by construction-related activities for Pagan Alternative 2. Specific significant impacts to historic properties and resources of cultural importance would be the same as found under Pagan Alternative 1, with the exception that the isthmus High Hazard Impact Area would not be established. A more detailed description of potential impacts follows the table and is included in Appendix N, Cultural Resources Technical Memo.

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Range Complex</td>
<td>North High Hazard Impact Area</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Landing Zones</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Field Artillery Direct and Indirect Fire Ranges/Mortar Firing Positions</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Amphibious Training Areas</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Live-Fire Maneuver Area</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Military Training Trails</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Airfield/ Base Camp/Bivouac Area/Munitions Storage Area</td>
<td>10</td>
</tr>
<tr>
<td>South Range Complex</td>
<td>Non-Live-Fire Maneuver Area</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>25</td>
</tr>
</tbody>
</table>

Legend: NA = not applicable.
**North Range Complex:** Construction associated with the High Hazard Impact Area in the north differs from construction under Pagan Alternative 1 as there would be no High Hazard Impact Area on the isthmus. Although the size of the High Hazard Impact Area would be smaller than the northern High Hazard Impact Area under Pagan Alternative 1, the target clearance would be the same. Although most of this area has not been surveyed, in general, the area is covered by lava to depths of over 30 feet (9.1 meters) from recent volcanic eruptions. Historic properties would not be found on the surface in this area. Outside of the lava area, historic properties tend to be found nearer to the coastal areas. Most of the area of potential effects for the firebreak has been surveyed. Construction-related activities associated with the firebreak under Pagan Alternative 2 would have a significant direct impact to the same two historic properties (one Pre-Contact artifact scatter and one World War II-era Japanese defensive site) as under Pagan Alternative 1. Construction would also impact 7 acres (3 hectares) of native forest which could contain resources of cultural importance, such as medicinal plants. No other resources of cultural importance, such as cemeteries or memorials, would be directly impacted by construction in this area.

Like under Pagan Alternative 1, no construction would occur at the amphibious training beaches or within the Live-Fire Maneuver Area. Thirteen Landing Zones would be cleared, which is two more than under Pagan Alternative 1 and five firing points would be cleared for the Mortar Range. Most of the landing zones and artillery firing points have been surveyed or are located on lava. Of the four unsurveyed landing zones and the one unsurveyed firing point associated with the Mortar Range, all are located in steep interior areas surrounding Mount Pagan and have a low potential for containing historic properties. As under Pagan Alternative 1, construction-related activities associated with clearing landing zones and firing points under Pagan Alternative 2 would have a significant direct impact to six historic properties, including one Pre-Contact *latte* site, one pre-World War II Japanese Administration site, and four World War II-era Japanese defensive sites. Significant direct impacts to historic properties from construction of a military trail network would impact the same seven historic properties as under Pagan Alternative 1 (Section 4.11.4.1).

Under Pagan Alternative 2, construction-related impacts associated with the base camp/bivouac area would be the same as found under Pagan Alternative 1 and directly impact the same 10 historic properties as under Pagan Alternative 1 (Section 4.11.4.1). Like under Pagan Alternative 1, although public access would not be allowed in the construction area, the public may be allowed in nearby areas depending upon the type of construction. An increase in noise and changes in visual setting may occur during construction in the vicinity of historic properties, including potential traditional cultural properties, when members of the public are present. This change in noise and visual setting would be intermittent and temporary and result in a less than significant impact.

**South Range Complex:** Under Pagan Alternative 2, the same non-live-fire maneuver area would be established. There would be no construction-related ground clearance undertaken; therefore, there would be no direct impacts to historic properties or resources of cultural importance from construction. Although public access would not be allowed in the construction area, the public may be allowed in nearby areas in south Pagan when construction is ongoing. An increase in noise and changes in visual setting may occur during construction in the vicinity of historic properties, including potential traditional cultural properties, when members of the public are present. This change in the noise and visual setting would be intermittent and temporary and result in a less than significant impact.
Pagan Alternative 2 would result in significant direct impacts to historic properties and resources of cultural importance from construction activities. It would have a significant direct impact to 25 historic properties in the range complexes and expeditionary area. Historic properties include Pre-Contact latte complexes, pre-World War II Japanese Administration sites, and World War II-era Japanese defensive sites. However, as range design is finalized, the Department of Defense will seek to avoid historic properties and resources of cultural importance.

Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

4.11.4.2.2 Operation Impacts

As described in Section 2.5.3, Pagan Alternative 2, operations and maintenance under Pagan Alternative 2 would be similar to Pagan Alternative 1. The primary difference would be that there would only be one, smaller High Hazard Impact Area established in the North Range Complex. In addition, 13 landing zones would be maintained and used; two more than under Pagan Alternative 1. As a result of the smaller High Hazard Impact area in the north and elimination of the High Hazard Impact Area on the isthmus, four fewer historic properties would be impacted by operations. Significant direct impacts would result from Pagan Alternative 2 operational activities to 50 historic properties. Table 4.11-12 summarizes the historic properties impacted by operations for Pagan Alternative 2; impacts associated with construction are summarized in Table 4.11-11. In the High Hazard Impact Area, three historic properties, also impacted by construction, would be significantly impacted by operations. Although not all of the High Hazard Impact Area has been surveyed; it is primarily covered in lava. Should sites be preserved under the lava, impacts are unlikely since the depth of the ground disturbance associated with munitions would be less than the depth of the lava.

Table 4.11-12. Pagan Alternative 2: Summary of Significant Direct Impacts on Historic Properties from Operations

<table>
<thead>
<tr>
<th>Complex</th>
<th>Range</th>
<th>Number of Historic Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Range Complex</td>
<td>North High Hazard Impact Area</td>
<td>3*</td>
</tr>
<tr>
<td></td>
<td>Landing Zones</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Field Artillery Direct and Indirect Fire Ranges/Mortar Firing Positions</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Amphibious Training Areas</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Live-Fire Maneuver Area</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Military Training Trails</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Airfield/ Base Camp/Bivouac Area/Munitions Storage Area</td>
<td>0</td>
</tr>
<tr>
<td>South Range Complex</td>
<td>Non-Live-Fire Maneuver Area</td>
<td>NA</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

Note: *All of these sites are impacted by vegetation clearing in target areas, but are located outside of the area of proposed clearing. Sites solely in the construction/cleared area are not included in this total.

Legend: NA = not applicable.
Training in the northern maneuver area would be the same as under Pagan Alternative 1 and would directly impact the same 46 historic properties from tracked and wheeled vehicle use. Foot maneuvers would occur in the South Range Complex, but impacts to historic properties would be minimal, as it would occur primarily on designated pathways or sporadically throughout the maneuver area.

Amphibious training, consisting of swimmer and inflatable boat landings, would occur at six beaches—Red, Green, Blue, South, North, and Gold. Amphibious Assault Vehicles and Landing Craft Air Cushion vessels would be used at Red, Green, and Blue beaches. Landing Craft Air Cushion vessels would be used at Red, Green, Blue, and South beaches. Use by swimmers and inflatable boats would have a minimal impact to any historic properties, including traditional cultural properties, and resources of cultural importance. Use of Amphibious Assault Vehicles and Landing Craft Air Cushion vessels could cause ground disturbance on the beach. Landing Craft Air Cushion vessels could have a significant direct impact to one historic property, a World War II-era Japanese airfield. All beaches have been surveyed and no other resources are recorded within the vicinity of the training areas. The beach areas associated with two potential traditional cultural properties, Red Beach (Shomshon) and South Beach (Regusa), would be disturbed by amphibious landing operations. However, the beach would be restored to its original appearance by contouring and cleaning up expended materials at the end of the exercises (see Section 4.11.2, Resource Management Measures). The resulting impact to these potential traditional cultural properties would be less than significant. The potential for direct impacts to historic properties and resources of cultural importance from stray rounds in surface danger zones is considered to be extremely low.

As with Pagan Alternative 1, indirect impacts due to restrictions in public access to historic properties and resources of cultural importance is less than significant since loss of access to all areas except for the High Hazard Impact Area would be intermittent and temporary. Indirect impacts to historic properties and resources of cultural importance due to visual intrusions and noise-level increase from training would be less than significant. Public access would be allowed in certain areas while operations are ongoing depending upon the type of training. An increase in noise and changes in visual setting may occur during operations in the vicinity of historic properties, including potential traditional cultural properties, when members of the public are present. This change in noise and visual setting would be intermittent and temporary and result in a less than significant impact. Indirect impacts to resources of cultural importance such as Laguna Sanhalom due to contamination by munitions in the northern High Hazard Impact Area would be less than significant due to the implementation of best management practices associated with a Range Training Area Management Plan (see Section 4.11.2, Resource Management Measures).

Significant direct impacts would result from Pagan Alternative 2 operational activities. Up to 50 historic properties and resources of cultural importance would be significantly impacted by off-road wheeled and tracked vehicle use in the maneuver areas, munitions training in the High Hazard Impact Area, and amphibious training. However, as RTA design is finalized, the Department of Defense would seek to further avoid or minimize impacts to historic properties and other resources of cultural importance.
Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

### 4.11.4.3 Pagan No-Action Alternative

Under the Pagan no-action alternative, no military construction or live-fire military training operations associated with the proposed action would occur on Pagan. Limited activities would occur including periodic visits for eco-tourism, scientific surveys, and military training for search and rescue. These activities represent minor disruptions to existing conditions. Therefore, the no-action alternative would have less than significant impacts on cultural resources on Pagan.

### 4.11.4.4 Summary of Impacts for Pagan Alternatives

Table 4.11-13 provides a comparison of the potential impacts to cultural resources for the two Pagan alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
<td>SI mitigated to LSI</td>
</tr>
<tr>
<td>North Range Complex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Range Complex</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
</tbody>
</table>

*Legend: LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.*
### 4.11.4.5 Summary of Potential Mitigation Measures for Pagan Alternatives

Table 4.11-14 provides a summary of the potential mitigation measures for cultural resources for the two Pagan alternatives.

**Table 4.11-14. Summary of Potential Mitigation Measures for Pagan Alternatives**

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
<th>Pagan Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CULTURAL RESOURCES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Pagan alternatives would have a significant direct impact to historic properties.</td>
<td>SI mitigated to LSI</td>
<td>Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.</td>
<td>X</td>
</tr>
<tr>
<td>• Pagan Alternative 1 would have a significant direct impact to 27 historic properties and resources of cultural importance in the range complexes and expeditionary area due to vegetation clearance, as well as 54 historic properties due to operations. These historic properties include Pre-Contact latte complexes, pre-World War II Japanese Administration sites, and World War II-era Japanese defensive sites.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pagan Alternative 2 would have a significant direct impact to 25 historic properties and resources of cultural importance in the range complexes and expeditionary area due to construction, as well as 50 historic properties due to operations. These historic properties include Pre-Contact latte complexes, pre-World War II Japanese Administration sites, and World War II-era Japanese defensive sites.</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

*Legend: LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.*
4.12 **Visual Resources**

Section 4.12 analyzes the potential impact of proposed action alternatives to existing landscapes, scenic viewpoints, viewer experience, and overall viewshed value. Impacts that can affect visual resources include:

- Altering the topography and horizon line
- Removing vegetation
- Removing or altering existing buildings and infrastructure (i.e., International Broadcasting Bureau)
- Building new facilities and infrastructure

### 4.12.1 Approach to Analysis

To determine visual impacts, existing conditions are compared to anticipated conditions after implementation of the proposed action by evaluating specific factors at key observation points identified in Chapter 3.12, *Visual Resources*. Impacts from the proposed action on the viewshed from the key observation points were determined through a visual impact analysis that considers degrees of (1) visual contrast and disruption, and (2) scenic quality from three different distance zones. The value of each individual key observation point is also taken into consideration based on a combination of these parameters.

Although there are no specific regulations that direct the protection of visual resources, various land management agencies, including the Bureau of Land Management, have developed guidance on how to assess impacts to visual resources. Since the environment on Tinian and Pagan is generally open and without much urban infrastructure, the Bureau of Land Management guidance has been utilized for this impact assessment. The Bureau of Land Management guidance provides a rating system to define degrees of visual contrast. This rating system, shown in Table 4.12-1, is applied to the key observation points to determine the degree of contrast that would potentially occur from the key observation points from the introduction of the proposed facilities and activities.

<table>
<thead>
<tr>
<th>Visual Resource Contrast Defined</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>The element contrast is not visible or perceived.</td>
</tr>
<tr>
<td>Weak</td>
<td>The element contrast can be seen but does not attract attention.</td>
</tr>
<tr>
<td>Moderate</td>
<td>The element contrast begins to attract attention and begins to dominate the characteristic landscape.</td>
</tr>
<tr>
<td>Strong</td>
<td>The element contrast demands attention, will not be overlooked, and is dominant in the landscape.</td>
</tr>
</tbody>
</table>

*Source: Bureau of Land Management 1986.*
The Bureau of Land Management has also created a rating system to define degrees of impacts to scenic quality. This rating system, shown in Table 4.12-2, is also applied to the key observation points to determine the potential visual impacts from the introduction of the proposed facilities and activities.

<table>
<thead>
<tr>
<th>Degree of Visual Impact Defined</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No discernable or measureable visual contrast.</td>
</tr>
<tr>
<td>Negligible</td>
<td>Impacts that would not diminish the scenic quality of the landscape.</td>
</tr>
<tr>
<td>Minor</td>
<td>Impacts that diminish the scenic quality of the landscape to a minimal degree and are potentially noticeable when viewed from moderately sensitive viewpoints.</td>
</tr>
<tr>
<td>Moderate</td>
<td>Impacts that would diminish the scenic quality of the landscape and would easily be noticeable from sensitive viewpoints.</td>
</tr>
<tr>
<td>Major</td>
<td>Impacts resulting from construction disturbances and the long-term presence of new facilities would substantially alter the scenic value of the landscape and would dominate views from sensitive viewpoints.</td>
</tr>
</tbody>
</table>

In addition to the criteria outlined in Table 4.12-1 and Table 4.12-2, three different distance zones were considered as part of the visual impact analysis. Distance zones are defined as:

- Foreground – up to 0.25 mile (0.4 kilometer)
- Middle ground – between 0.25 mile (0.4 kilometer) and 3 miles (4.8 kilometers)
- Background – greater than 3 miles (4.8 kilometers)

With these rating categories and criteria applied to individual key observation points, a determination was made as to the level of aesthetic impact to the key observation points by a proposed action alternative. These same criteria were generally applied to scenic sites on Pagan as well, although no key observation points are identified.

For the purpose of this analysis, impact significance was determined based on a combination of the rating systems described above. Visual resource contrast and impact ratings of “none” would result in no impacts to visual resources. Contrast ratings of “weak” and/or “moderate,” combined with an impact rating of “minor” and/or “moderate” would result in less than significant impacts to visual resources. A contrast rating of “strong” combined with an impact rating of “major” would result in significant impacts to the visual resource.

### 4.12.2 Resource Management Measures

Resource management measures that are applicable to visual resources include the following best management practices:

- Clear only the areas directly associated with the proposed training facilities (disturbance contained within the smallest footprint possible)
- Use native flora to create natural-appearing “screen” around the proposed improvements at the Port of Tinian and proposed base camp

For further information on all resource management measures refer to Appendix D, Best Management Practices.
4.12.3 Tinian

4.12.3.1 Tinian Alternative 1

4.12.3.1.1 Construction Impacts

Figure 4.12-1 shows the key observation points, range complexes, and training facilities associated with Tinian Alternative 1. Construction would include base camp; munitions storage area; Tinian International Airport improvements; Port of Tinian improvements, including bulk fuel storage tank, and supply route; access road improvements, fence lines, and gates; and range and training areas.

Base camp construction activities would be visible from key observation point #10 (8th Avenue-North of the Airport) and is discussed under Section 4.12.3.1.2, Operation Impacts.

Munitions Storage Area construction would not be visible from any identified key observation point.

Tinian International Airport improvements would not be visible from any identified key observation point but would impact the views from within the Tinian International Airport and its runways by creating additional pavement and chain linked fences.

Port of Tinian improvements would not be visible from any identified key observation point. However, the proposed Port of Tinian facilities, the tracked vehicle transit lanes, and proposed supply route would be constructed within an existing open grass area with trees. Views from the public boat ramp and a few dispersed residents west of 8th Avenue would be altered to include the structures, parking areas, and lights for night operations. Minimizing the removal of the existing trees located along the northeast side of the property would decrease the impact to residents west of 8th Avenue. In addition, incorporating additional tree plantings along the perimeter of the constructed facilities would decrease the visual impact to views from the public boat ramp and surrounding area.

Access Road improvements would result in visual changes associated with the structural improvements to 8th Avenue (public use anticipated), construction of the new road to the Munitions Storage Area, unpaved roads within the Military Lease Area, and the tracked-vehicle training trail. Portions of the road improvements would be visible from identified key observation points and are discussed under Section 4.12.3.1.2, Operation Impacts.

Fence Lines and Gates would be employed for access control and security at Base Camp, Munitions Storage Area, High Hazard Impact Area(s), and training facilities, including Surface Radar sites, within the Military Lease Area.

Range Training Area (e.g., target objectives, Landing Zones, target placements, engagement areas) construction would result in varying degrees of visual disruption and visual contrast from key observation points. The construction process (e.g., vegetation clearing and grading) for the Tinian RTA is proposed to take place over a period of 8 to 10 years. Locations of active construction areas would vary throughout the construction period. Some activities (e.g., landing area for Amphibious Assault Vehicles on Unai Chulu) would be an area-focused activity and would most likely occur continually for a given amount of time. Other activities (e.g., range development) would be accomplished over a short period of time but occur sequentially over the 8 to 10 years construction period. During this same period, training would gradually increase to a final training tempo of 20 weeks per year.
Figure 4.12-1
Tinian Alternative 1
Key Observation Points

Legend

- Key Observation Point
- Surface Radar Site
- Observation Post
- Drop Zone
- Military Lease Area
- International Broadcasting Bureau
- Proposed Vegetation Clearance
  - 100% Cleared
  - 75% Cleared
  - 15% Cleared - Line of Sight

Range Complex
- A
- B
- C
- D

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

Convoy Course
- Proposed Perimeter Road/Firebreak/Buffer Area
- Proposed Access

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

North Field
Mount Lasso
Tinian International Airport

Highlands of the Central Plateau
Infantry Platoon Battle Course
Base Camp
Airfield Operations

West Tinian
Mount Dankulo
Marpo Valley

East Tinian
Unai Lam Lam
Unai Babui
Unai Chulu

Unai Chiget
Unai Masalok

Lake Hagoi

Blow Hole
Northern Battle Area Complex

Landing Zone
International Broadcasting Bureau

Philippine Sea

Pacific Ocean

4-367
Because of the overlap between the construction period and operation, permanent visual impacts from the proposed action are presented under Section 4.12.3.1.2, Operation Impacts.

### 4.12.3.1.2 Operation Impacts

Operation impacts associated with Tinian Alternative 1 would result from range complexes, training facilities, lighting, and landscape changes as visible from the key observation points. Lighting would be installed at the base camp and the Munitions Storage Area. Lighting at these locations would result in an increase in nighttime light but in areas located away from human receptors (i.e., residential areas south of the Military Lease Area and in the village of San Jose). There are no permanent lighting features proposed for the training facilities or the airport improvements; however, portable lighting would be employed at the airfield for night operations and limited portable lighting would be employed as part of night training (i.e., areas where personnel would congregate). Lighting at these locations would result in an increase in nighttime light but in areas located away from human receptors (i.e., residential areas south of the Military Lease Area and in the village of San Jose).

Figure 4.12-1 shows the key observation points, range complexes, and training facilities associated with Tinian Alternative 1. Key observation points are grouped together in the following impact discussion where they are geographically and visually related.

#### 4.12.3.1.2.1 National Historic Landmark at North Field (#1)

This complex of facilities and buildings centered on the North Field apron area is located within Range Complex D. The key observation point is looking toward the south and illustrates the general character exhibited within the National Historic Landmark. The proposed Drop Zone/Landing Zone would be visible at this key observation point since vegetation would be cleared from this area. Due to the dense vegetative cover surrounding the apron, the other training facilities (i.e., objective areas) within Range Complex D would not be visible from this key observation point.

The proposed vegetation clearing on either side of the runway would result in a change in visual cues to its character and length, and, as a result, would highlight the historic use and associated character (nature) of the visual environment of North Field. Therefore, implementation of Tinian Alternative 1 would result in beneficial direct and indirect impacts to these visual resources.

- Visual Contrast: Moderate (beneficial)
- Overall Visual Impact Rating: Negligible

#### 4.12.3.1.2.2 Unai Chulu (#2), Unai Babui (#3) and Unai Lam Lam (#4)

These three key observation points are located west and northwest of Range Complex D and have a west-northwest orientation, looking out over the ocean. These beaches would be used as tactical amphibious landing beaches. As stated in Section 4.2, Geology and Soils, beach topography would be restored using non-mechanized means such as hand-held tools after amphibious operations. Therefore, there would not be a visual impact to these beaches from amphibious operations. The amphibious landing ramp at Unai Chulu would be underwater, unable to be seen by beach visitors from the shore, and the tracked vehicle driver’s course would be located inland of ocean-facing key observation points; therefore, the view towards the ocean and the horizon would not be impacted. However, minor changes to the topography of the shoreline due to the amphibious beach landing activities may occur and could...
potentially result in minor visual impacts. No other training facilities would be visible from these key observation points. Therefore, implementation of Tinian Alternative 1 would result in less than significant direct or indirect impacts to these visual resources.

- Visual Contrast: Weak
- Overall Visual Impact Rating: Minor

4.12.3.1.2.3 Ushi “Cross” Point A and B (#5 and #6)

These key observation points are located north of Range Complex D on the northern tip of Tinian.

Ushi “Cross” Point A (#5)

Ushi “Cross” Point A (#5) has a northern orientation looking out over the ocean. There are three artillery firing points along the northeast side of the island and south-southeast of the key observation points. Additionally, there is a Surface Radar site adjacent and south of this key observation point. None of these artillery firing points or the Surface Radar site would be visible from this key observation point. Therefore, implementation of Tinian Alternative 1 would result in no direct or indirect impacts to these visual resources.

- Visual Contrast: None
- Overall Visual Impact Rating: None

Ushi “Cross” Point B (#6)

Ushi “Cross” Point B (#6) has a southern orientation looking towards North Field. The three artillery firing points would not be visible from this key observation point because of the thick vegetation adjacent to this area, their distance from the viewer, relatively flat terrain, and they are generally outside of the viewer’s vantage point. However, the Surface Radar site would be in the foreground of this key observation point and would cause a significant visual contrast and change from what is currently visible looking south from Ushi “Cross” Point. Therefore, the Surface Radar site would have a significant direct impact to this visual resource.

- Visual Contrast: Major
- Overall Visual Impact Rating: Strong

4.12.3.1.2.4 Blow Hole (#7)

This key observation point is located east of Range Complex D and has a view looking east out over the ocean. The tracked vehicle drivers course and convoy course are located west of the key observation point and would not be located within the east-facing viewshed. A Surface Radar site would be constructed over one-quarter of a mile north of the Blow Hole and would be visible in the middle ground upon approach to the Blow Hole. However, it would not be located within the immediate viewshed of this key observation point. Therefore, implementation of Tinian Alternative 1 would result in less than significant impacts to this visual resource.

- Visual Contrast: Weak
- Overall Visual Impact Rating: Minor
These key observation points are located between Range Complexes A and B. The viewshed from the Mount Lasso Lookout encompasses approximately one third of the island of Tinian, from the Pina ridge line in the south, the eastern portion of the island to Ushi “Cross” Point in the north, and beyond to the southern tip of Saipan to the horizon.

**Mount Lasso Lookout A (#8)**

Mount Lasso Lookout A (#8) has a northeast orientation looking towards Range Complex A. The existing viewshed from Mount Lasso Lookout A (#8) is primarily a view of dense vegetation.

The following facilities would be visible from Mount Lasso Lookout A (#8):

- **Range Complex A**
  - High Hazard Impact Area, which would have vegetation maintained at a height of 6 inches (15 centimeters)
  - Perimeter road/firebreak buffer
  - Convoy Course around the eastern boundary of the range complex
  - Range Control Observation Posts
  - Mortar firing points

- **Range Complex D**
  - Landing Zone
  - Northern Battle Area Complex

With approximately two-thirds of Range Complex A visible from Mount Lasso Lookout A (#8), these alterations would create significant visual contrast and change from what is currently visible from the Mount Lasso Lookout A. Four Range Control Observation Posts may be visible in the middle ground from the Mount Lasso Lookout A (#8). At 30 feet (9 meters) in height, these structures would extend above vegetation. The nearest Range Control Observation Post would be approximately 0.5 mile (0.8 kilometer) from the key observation point, and the farthest Range Control Observation Post would be approximately 2 miles (3.2 kilometers) from the key observation point, placing them in the middle ground distance zone. This would minimize the visual impact due to the relative size of the Range Control Observation Points and distance from the viewer.

Portions of Range Complex D would also be visible in the background of the viewshed from Mount Lasso Lookout A (#8), north of Range Complex A. However, the proposed cleared areas associated with Range Complex D would be visible at a much smaller scale than the viewshed described for Range Complex A. Due to the viewer’s focus from this key observation point being towards the larger proposed cleared area of Range Complex A, the cleared areas associated with Range Complex D would not likely be noticeable from this distance. Large scale vegetation clearance and maintenance of the High Hazard Impact Area in Range Complex A associated with Tinian Alternative 1 would result in significant direct and indirect impacts to this visual resource. No mitigation is proposed for this significant impact.

- Visual Contrast: (#8) Major
- Visual Impact Rating: (#8) Strong
Mount Lasso Lookout B (#9)

Mount Lasso Lookout B (#9) has a southeast orientation looking towards Range Complex B and Broadway Avenue. However, Range Complex B and Broadway Avenue, as it passes through Range Complex B, are not visible from the Mount Lasso Lookout B (#9) due to an escarpment plateau extending east from Mount Lasso. While some cleared areas on the east side of Broadway Avenue may be visible from the Mount Lasso Lookout B (#9), these areas would be both minimal and located approximately 2 miles (3.2 kilometers) from the Mount Lasso Lookout B (#9), in the middle ground distance zone, minimizing the visual impact.

One Range Control Observation Post may be visible from the Mount Lasso Lookout B (#9). At 30 feet (9 meters) in height, this structure would extend slightly above vegetation. However, this structure would be approximately 2.75 miles (3.2 to 4.4 kilometers) from the Mount Lasso Lookout B, placing it in the middle ground distance zone with dense vegetation in between, minimizing the visual impact due to its relative size and distance from the viewer. There would also be a Surface Radar site approximate 1.5 miles (2.4 kilometers) from the key observation point. As with the Range Control Observation Post, this structure would be in the middle ground distance zone with dense vegetation in between, thereby minimizing the visual impact due to its relative size and distance from the viewer. Therefore, the Range Control Observation Post and Surface Radar site for Tinian Alternative 1 would result in less than significant direct or indirect impacts to this visual resource.

- Visual Contrast: (#9) Moderate
- Visual Impact Rating: (#9) Moderate

8th Avenue-North of the Airport (#10)

The 8th Avenue-North of the Airport (#10) key observation point has a view to the north looking up 8th Avenue towards 86th Street, the base camp and Range Complex C. Although this key observation point is not associated with historic resources or a typical scenic vista, it is located within a public roadway that would serve as the primary route to the National Historic Landmark and other locations within the Military Lease Area. The base camp and proposed improvements at the northern portion of the Tinian International Airport are adjacent to, and would be visible from, 8th Avenue-North of the Airport (#10) key observation point. The proposed action would result in a change in condition to the surrounding area. The proposed development of permanent structures, including a gate, would be visible in the foreground to viewers along 8th Avenue from both the north and the south. Incorporating landscape features (trees, shrubs, berms) along the perimeter of the road and around the constructed facilities would decrease the visual impact to views from the road. The upper portion of the proposed 200-foot (61-meter) communication tower at the base camp would be visible within the middle ground. The lower portion of the tower would be blocked by vegetation and associated tower building. The base camp and airport expansion development would also be visible to air travelers at Tinian International Airport when landing and departing. While the visual contrast is strong, the value of this key observation points is limited because it does not provide a unique or particularly high quality visual experience. The view north is similar to various view corridors along Broadway Avenue and further north along 8th Avenue. Therefore, implementation of Tinian Alternative 1 would result in less than significant direct or indirect impacts to this visual resource.

- Visual Contrast: Strong
- Overall Visual Impact Rating: Moderate

4.12.3.1.2.7 Broadway North (#11)

This key observation point is located on the northern boundary of Range Complex B and has a view to the north looking into Range Complex A. The cleared areas proposed in Range Complex A would not be visible from this key observation point. However, a proposed gate across Broadway Avenue and a fence surrounding Range Complex A would be visible looking north from this key observation point. The view of these structures would result in a weak visual contrast, as the structures would not exceed the height of the existing vegetation. While the gate would cross Broadway Avenue, no highly unique visual experience exists at this location. Range Complex B facilities would not be visible from this key observation point. Therefore, implementation of Tinian Alternative 1 would result in less than significant direct or indirect impacts to this visual resource.

- Visual Contrast: Weak
- Overall Visual Impact Rating: Negligible

4.12.3.1.2.8 Broadway South A and B (#12 and #13)

These key observation points are located at the southern end of Range Complex B inside the Military Lease Area fence line.

Broadway South A (#12)

This key observation point has a view looking north into Range Complex B. The north view up Broadway Avenue, which would serve as a portion of the Convoy Course, would mirror the view of key observation point Broadway North (#11). Range Complex B would not be visible from this key observation point, except for potentially portions of the Tracked Vehicle Driver’s Course proposed west and east of Broadway. Therefore, implementation of Tinian Alternative 1 would result in less than significant direct or indirect impacts to this visual resource.

- Visual Contrast: Weak
- Overall Visual Impact Rating: Negligible

Broadway South B (#13)

Key observation point Broadway South B (#13) has a view looking south from the Military Lease Area fence line toward an expansive view of the town of San Jose and the Pina and Kastiyu ridge lines. Due to its orientation away from the Military Lease Area, this key observation point would not be impacted by Range Complex B. Therefore, implementation of Tinian Alternative 1 would result in no direct or indirect impacts to this visual resource.

- Visual Contrast: None
- Overall Visual Impact Rating: None

4.12.3.1.2.9 Unai Dankulo (#14) and Unai Masalok (#15)

These key observation points both have east-northeast views looking out over the ocean. The beaches, natural terrain, and sand dunes, as well as the access trails to the beaches, may be visually impacted by the proposed action.
**Unai Dankulo (#14)**

Unai Dankulo is not proposed for military training. The Tracked Vehicle Driver’s Course would be inland from the ocean-facing key observation points. There would be a Surface Radar site constructed adjacent and south of Unai Dankulo that would be visible from the beach, but is not within the viewshed of this key observation point, which faces toward the ocean and the horizon. The view towards the ocean and the horizon would not be impacted.

Therefore, implementation of Tinian Alternative 1 would result in less than significant direct or indirect impacts to these visual resources.

- Visual Contrast: Weak
- Overall Visual Impact Rating: Negligible

**Unai Masalok (#15)**

Unai Masalok would be used for combat swimmer training, small boat landings, and Landing Craft Air Cushion vessel landings. The Tracked Vehicle Driver’s Course would be inland from the ocean-facing key observation point. The view towards the ocean and the horizon would not be impacted. No permanent structures would be built at Unai Masalok. No training facilities would be visible from this key observation point since the view orientation is over the ocean. Therefore, implementation of Tinian Alternative 1 would result in less than significant direct or indirect impacts to these visual resources.

- Visual Contrast: Weak
- Overall Visual Impact Rating: Negligible

### 4.12.3.1.3 Summary of Impacts

Table 4.12-3 provides a summary of the visual impacts associated with Tinian Alternative 1.

**Table 4.12-3 Tinian Alternative 1 Summary of Visual Impacts**

<table>
<thead>
<tr>
<th>Key Observation Point</th>
<th>Visual Contrast Rating</th>
<th>Overall Visual Impact Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Historic Landmark at North Field (#1)</td>
<td>Moderate</td>
<td>Negligible</td>
</tr>
<tr>
<td>Unai Chulu (#2)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Unai Babui (#3)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Unai Lam Lam (#4)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Ushi “Cross” Point A (#5)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Ushi “Cross” Point B (#6)</td>
<td>Major</td>
<td>Strong</td>
</tr>
<tr>
<td>Blow Hole (#7)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Mount Lasso Lookout A (#8)</td>
<td>Major</td>
<td>Strong</td>
</tr>
<tr>
<td>Mount Lasso Lookout B (#9)</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>8th Avenue-North of the Airport (#10)</td>
<td>Strong</td>
<td>Moderate</td>
</tr>
<tr>
<td>Broadway North (#11)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
<tr>
<td>Broadway South A (#12)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
<tr>
<td>Broadway South B (#13)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Unai Dankulo (#14)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
<tr>
<td>Unai Masalok (#15)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
</tbody>
</table>
4.12.3.2 Tinian Alternative 2

4.12.3.2.1 Construction Impacts

Figure 4.12-2 shows the key observation points, range complexes, and training facilities associated with Tinian Alternative 2. Construction impacts to visual resources under Tinian Alternative 2 would be the same as those described for Tinian Alternative 1. See Section 4.12.3.1, Tinian Alternative 1, for a discussion of impacts. Because of the overlap between the construction period and operation, permanent visual impacts from the proposed action are presented under Operation Impacts.

4.12.3.2.2 Operation Impacts

The impacts to visual resources from the Tinian Alternative 2 operations would be similar to those described for Tinian Alternative 1. See Section 4.12.3.1, Tinian Alternative 1, for a discussion of impacts. Figure 4.12-2 shows the key observation points, range complexes, and training facilities associated with Tinian Alternative 2. Under Tinian Alternative 2, the International Broadcasting Bureau antenna facilities would be removed to allow for the construction of the southern Battle Area Complex. Some of the associated structures may remain for use in military operations as urban terrain assault courses. The removal of these antennae would generally result in a beneficial visual impact to view corridors on the west side of Tinian where the antennae are visible, and for air travelers landing and departing from Tinian International Airport. However, the International Broadcasting Bureau is not visible from any key observation points.

The proposed footprint of Range Complex C differs from Tinian Alternative 1 and includes objective areas on both sides of 8th Avenue. However, these objectives areas would not be visible from any identified key observation point. Therefore, implementation of Tinian Alternative 2 would result in significant direct and indirect impacts to visual resources from key observation points Ushi “Cross” Point B (#6) and Mount Lasso Lookout A (#8); less than significant direct or indirect impacts to all other visual resources from key observation points National Historic Landmark at North Field (#1), Unai Chulu (#2), Unai Babui (#3) and Unai Lam Lam (#4), Mount Lasso Lookout B (#9), 8th Avenue-North of the Airport (#10), Broadway North (#11), Broadway South A (#12), Unai Dankulo (#14), and Unai Masalok (#15); and no direct or indirect impacts from key observation points Ushi “Cross” Point A (#5), Blow Hole (#7), Broadway South B (#13).
4.12.3.2.3 Summary of Impacts

Table 4.12-4 provides a summary of the visual impacts associated with Tinian Alternative 2.

<table>
<thead>
<tr>
<th>Key Observation Point</th>
<th>Visual Contract Rating</th>
<th>Overall Visual Impact Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Historic Landmark at North Field (#1)</td>
<td>Moderate</td>
<td>Negligible</td>
</tr>
<tr>
<td>Unai Chulu (#2)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Unai Babui (#3)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Unai Lam Lam (#4)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Ushi “Cross” Point A (#5)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Ushi “Cross” Point B (#6)</td>
<td>Major</td>
<td>Strong</td>
</tr>
<tr>
<td>Blow Hole (#7)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Mount Lasso Lookout A (#8)</td>
<td>Major</td>
<td>Strong</td>
</tr>
<tr>
<td>Mount Lasso Lookout B (#9)</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>8th Avenue-North of the Airport (#10)</td>
<td>Strong</td>
<td>Moderate</td>
</tr>
<tr>
<td>Broadway North (#11)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
<tr>
<td>Broadway South A (#12)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
<tr>
<td>Broadway South B (#13)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Unai Dankulo (#14)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
<tr>
<td>Unai Masalok (#15)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

4.12.3.3 Tinian Alternative 3

4.12.3.3.1 Construction Impacts

Figure 4.12-3 shows the key observation points, range complexes, and training facilities associated with Tinian Alternative 3. Construction impacts to visual resources under Tinian Alternative 3 would be the same as those described for Tinian Alternative 1. See Section 4.12.3.1, Tinian Alternative 1, for a discussion of impacts. Because of the overlap between the construction period and operation, permanent visual impacts from the proposed action are presented under Operation Impacts.

4.12.3.3.2 Operation Impacts

The impacts to visual resources from the Tinian Alternative 3 operations would be similar to those described for Tinian Alternative 1. See Section 4.12.3.1, Tinian Alternative 1, for a discussion of impacts. Figure 4.12-3 shows the key observation points, range complexes, and training facilities associated with Tinian Alternative 3. Under Tinian Alternative 3, as in Tinian Alternative 2, the International Broadcasting Bureau antenna facilities would be removed to allow for the construction of the southern Battle Area Complex and Range Complex C would include objective areas on both sides of 8th Avenue. As in Tinian Alternative 2, these objectives areas would not be visible from any identified key observation point as in. Therefore, implementation of Tinian Alternative 3 would result in significant direct and indirect impacts to visual resources from key observation points Ushi “Cross” Point B (#6) and Mount Lasso Lookout A (#8); less than significant direct or indirect impacts to all other visual resources from key observation points National Historic Landmark at North Field (#1), Unai Chulu (#2), Unai Babui (#3) and Unai Lam Lam (#4), Mount Lasso Lookout B (#9), 8th Avenue-North of the Airport (#10), Broadway North (#11), Broadway South A (#12), Unai Dankulo (#14), and Unai Masalok (#15); and no direct or indirect impacts from key observation points Ushi “Cross” Point A (#5), Blow Hole (#7), Broadway South B (#13).
Tinian Alternative 3

Key Observation Points

Legend

- Key Observation Point
- Surface Radar Site
- Observation Post
- Drop Zone
- Military Lease Area
- International Broadcasting Bureau
- Proposed Vegetation Clearance
- Range Complex
- Tactical Amphibious Landing Beaches
- Convoy Course
- Proposed Perimeter Road/ Firebreak/Buffer Area
- Proposed Access

- 100% Cleared
- 50% Cleared
- 25% Cleared - Line of Sight
- Amphibious Assault Vehicles, Landing
- Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

Figure 4.12-3

Tinian Alternative 3
Key Observation Points

North Field Mount Lasso Tinian International Airport

Unai Babui
Unai Chulu
Landing Zone
International Broadcasting Bureau
Southern Battle Area Complex
Landing Zone
Highlands of the Central Plateau
Infantry Platoon Battle Course
Landing Zone
Munitions Storage Area

Unai Lam Lam
Unai Chiget
Unai Masalok
Unai Dankulo
Unai Babui

Pina Ridge Line
Marpo Valley
Unai Chulu

Lake Hagoi

Taga Beach
Blow Hole

Pacific Ocean
Philippine Sea

Figure 4.12-3
Tinian Alternative 3
Key Observation Points

4-377
### 4.12.3.3.3 Summary of Impacts

Table 4.12-5 provides a summary of visual impacts associated with Tinian Alternative 3.

<table>
<thead>
<tr>
<th>Key Observation Point</th>
<th>Visual Contract Rating</th>
<th>Overall Visual Impact Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Historic Landmark at North Field (#1)</td>
<td>Moderate</td>
<td>Negligible</td>
</tr>
<tr>
<td>Unai Chulu (#2)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Unai Babui (#3)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Unai Lam Lam (#4)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Ushi “Cross” Point A (#5)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Ushi “Cross” Point B (#6)</td>
<td>Major</td>
<td>Strong</td>
</tr>
<tr>
<td>Blow Hole (#7)</td>
<td>Weak</td>
<td>Minor</td>
</tr>
<tr>
<td>Mount Lasso Lookout A (#8)</td>
<td>Major</td>
<td>Strong</td>
</tr>
<tr>
<td>Mount Lasso Lookout B (#9)</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>8th Avenue-North of the Airport (#10)</td>
<td>Strong</td>
<td>Moderate</td>
</tr>
<tr>
<td>Broadway North (#11)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
<tr>
<td>Broadway South A (#12)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
<tr>
<td>Broadway South B (#13)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Unai Dankulo (#14)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
<tr>
<td>Unai Masalok (#15)</td>
<td>Weak</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

### 4.12.3.2 Tinian No-Action Alternative

The continuation of periodic military non-live-fire training in the Military Lease Area on Tinian would not be expected to produce any significant changes to the visual environment. There has been, and it would be anticipated that there would be in the future, minor, if any, vegetation clearing and the dense overgrowth would continue to dominate viewsheds on the island. As documented in the Guam and CNMI Military Relocation EIS (DoN 2010b), the planned four live-fire training ranges would be established within the Military Lease Area that would require substantial vegetation clearing and alteration of vistas from several vantage points. As documented in that EIS, the creation of the four ranges would have significant but mitigable impacts (see Table 13.2-4, Summary of Impacts; DoN 2010a) on Tinian. There would be no visual resources impacts incurred by Mariana Islands Range Complex training (DoN 2010a). Therefore, the no-action alternative would introduce significant but mitigable impacts to visual resources given the introduction of the four proposed ranges as documented in the Guam and CNMI Military Relocation EIS (DoN 2010b). The mitigation measures documented in the Guam and CNMI Military Relocation EIS (DoN 2010b) would reduce adverse vistas from Mount Lasso and Broadway Avenue through use of design guidelines to minimize land clearing and grading as well as using native flora to create a natural screening effect. With these measures, overall, the no-action alternative would have less than significant impacts on visual resources on Tinian.
### 4.12.3.3 Summary of Impacts for Tinian Alternatives

Table 4.12-6 contains a comparison of the potential impacts to visual resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Historic Landmark at North Field (#1)</td>
<td>Not applicable</td>
<td>BI/LSI</td>
<td>Not applicable</td>
<td>BI/LSI</td>
</tr>
<tr>
<td>Unai Chulu (#2), Unai Babui (#3) and Unai Lam Lam (#4)</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Ushi “Cross” Point A and B (#5 and #6)</td>
<td>Not applicable</td>
<td>NI (#5); SI (#6)</td>
<td>Not applicable</td>
<td>NI (#5); SI (#6)</td>
</tr>
<tr>
<td>Blow Hole (#7)</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Mount Lasso Lookout A and B (#8 and #9)</td>
<td>Not applicable</td>
<td>SI (#8); LSI (#9)</td>
<td>Not applicable</td>
<td>SI (#8); LSI (#9)</td>
</tr>
<tr>
<td>8th Avenue-North of the Airport (#10)</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Broadway North (#11)</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
<td>LSI</td>
</tr>
<tr>
<td>Broadway South A and B (#12 and #13)</td>
<td>Not applicable</td>
<td>LSI (#12); NI (#13)</td>
<td>Not applicable</td>
<td>LSI (#12); NI (#13)</td>
</tr>
<tr>
<td>Unai Dankulo (#14) and Unai Masalok (#15)</td>
<td>Not applicable</td>
<td>LSI (#14-15)</td>
<td>Not applicable</td>
<td>LSI (#14-15)</td>
</tr>
</tbody>
</table>

**Legend:** $BI =$ beneficial impact; $LSI =$ less than significant impact; $NI =$ no impact; $SI =$ significant impact. Shading is used to highlight the significant impacts.
4.12.4 Pagan

4.12.4.1 Pagan Alternative 1

4.12.4.1.1 Construction Impacts

Unlike Tinian, training on Pagan would be expeditionary and would include minimal construction of permanent facilities. Figure 4.12-4 shows the visual resources, range complexes, and training facilities associated with Pagan Alternative 1.

Construction would be required on the north end of the island for military training trails around the perimeter of Mount Pagan, clearance of volcanic rock covering over half of the old airstrip, and installation of concrete pads for operations (e.g., Munitions Storage Area). The Munitions Storage Area would be secured by chain-link fencing with barbed wire. Only a small portion of the High Hazard Impact Area centered on Mount Pagan would be improved (e.g., vegetation clearing) for target placement since target placement is anticipated to be within barren lava fields (i.e., lacks vegetation) to the greatest extent possible. Vegetation clearing is also anticipated within the North Range Complex to construct the landing zones and establish a firebreak around the perimeter of the High Hazard Impact Area. Limited land area would be disturbed in the High Hazard Impact Area on the isthmus to incorporate targets and to create a fire break. No construction activities would occur in south Pagan. A fence would be constructed where physically possible and signs would be posted to delineate the boundary of the High Hazard Impact Areas.

The construction of the training facilities would mostly involve cutting vegetation and filling, clearing, and grading of terrain. Because of the overlap between the construction period and operation, visual impacts are presented under Section 4.12.4.1.2, Operation Impacts.

4.12.4.1.2 Operation Impacts

4.12.4.1.2.1 North Pagan

Permanent changes to the visual environment in the northern portion of Pagan from Pagan Alternative 1 operations would include changes in the landscape within the northern High Hazard Impact Area resulting from targets, fencing, and signage and maintenance of vegetation cleared for the base camp, munitions storage area, and airfield. The existing dark barren landscape of the lava fields would remain the same; however, craters caused by military training operations (i.e., impact craters from naval gunfire, aviation, artillery, mortar ordnance) would modify the topography of the barren lava fields over time.

4.12.4.1.2.2 Central Pagan

Permanent changes to the visual environment in the central portion of Pagan from Pagan Alternative 1 operations would include changes in the landscape within the High Hazard Impact Area located on the isthmus resulting from targets, fencing, and signage and maintenance of vegetation cleared for targets and the fire break established during construction. The existing vegetated landscape would now have barren areas created by (i.e., impact craters from aviation, artillery, mortar ordnance). These areas are anticipated to lack vegetation and appear dark until the vegetation is allowed to recover.
Legend

Proposed Actions
- Field Artillery Direct Fire Range Firing Position
- Field Artillery Indirect Firing Position
- Mortar Range Firing Position
- Helicopter Landing Zone
- Hot Cargo Pad (Explosive Siting)
- Proposed Primary Munitions Supply Route
- Proposed Bivouac/Basecamp Area (42 acres)
- Munitions Storage Area Features
- High Hazard Impact Area
- Dedicated Live-Fire Maneuver Area
- Non-Live Fire Maneuver Area
- Proposed Vegetation Clearance

Proposed Airfield Elements
- Airfield Runway
- Forward Arming and Refueling Point
- Hot Cargo Pad
- Overrun
- Parking Apron
- Runway Apron
- Turnaround

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

Figure 4.12-4
Pagan Alternative 1
Visual Resources
4.12.4.2.3 South Pagan

Pagan Alternative 1 would result in minimal impacts to visual resources in the southern portion of Pagan as training operations would be limited only to foot traffic. Ground maneuvering would result in the trampling and breaking of vegetation and the creation of temporary trails and mobility corridors; however, this would only occur up to 16 weeks per year and the vegetation on Pagan is fairly robust and it is expected that vegetation would regrow rather rapidly.

Due to the lack of visual receptors as described in Section 3.12, Visual Resources, Pagan Alternative 1 would result in less than significant direct or indirect impacts to visual resources.

4.12.4.2 Pagan Alternative 2

4.12.4.2.1 Construction Impacts

Construction impacts to visual resources under Pagan Alternative 2 would be similar to those described for Pagan Alternative 1. See Section 4.12.4.1, Pagan Alternative 1, for a discussion of impacts. Figure 4.12-5 shows the visual resources, range complexes, and training facilities associated with Pagan Alternative 2. Under Pagan Alternative 2 construction would be limited to a smaller High Hazard Impact Area centered on Mount Pagan (compared to Pagan Alternative 1) as the High Hazard Impact Area on the isthmus would not be constructed. A total of five firing positions associated with the Mortar Range (one less than under Pagan Alternative 1) and thirteen Landing Zones (two more than under Pagan Alternative 1) would be constructed under Pagan Alternative 2. Because of the overlap between the construction period and operation, visual impacts for the training facilities are presented under Section 4.12.4.2.2, Operation Impacts.

4.12.4.2.2 Operation Impacts

Permanent changes to the visual environment of northern and southern Pagan during Pagan Alternative 2 operations would be the similar to those described for Pagan Alternative 1. See Section 4.12.4.1, Pagan Alternative 1, for a discussion of impacts.

Pagan Alternative 2 would result in minimal impacts to the central portion of Pagan as training operations would be limited only to foot traffic because training associated with the High Hazard Impact Area on the isthmus would not occur. The South Range Complex maneuver area would be the same as found under Pagan Alternative 1. Ground maneuvering would result in the trampling and breaking of vegetation and the creation of temporary trails and mobility corridors; however, this would only occur up to 16 weeks per year and the vegetation on Pagan is fairly robust so it is expected that vegetation would regrow rather rapidly. Due to the lack of visual receptors as described in Section 3.12, Visual Resources, Pagan Alternative 2 would result in less than significant direct or indirect impacts to visual resources.

4.12.4.3 Pagan No-Action Alternative

The no-action alternative would have minor activities associated with periodic visits to Pagan for ecotourism, scientific surveys and military training exercises related to search and rescue. Given these short term and minor activities, there would be no significant impacts to visual resources on Pagan.
### 4.12.4.4 Summary of Impacts for Pagan Alternatives

Table 4.12-7 contains a comparison of the potential impacts to visual resources for the two Pagan alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Resources</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Visual Resources</td>
<td>Not applicable</td>
<td>LSI</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

*Legend: LSI = less than significant impact; NI = no impact.*
4.13 TRANSPORTATION

Section 4.13 addresses the components of the proposed action that could affect the existing air, ground, and marine transportation resources. Potential impacts to Tinian and Pagan’s transportation network are analyzed, and include both construction and operational elements of the proposed action alternatives that could affect air, ground, and marine transportation.

4.13.1 Approach to Analysis

4.13.1.1 Air Transportation

The air transportation section evaluates the existing operational capacity of the Tinian International Airport facilities and Pagan airfield to meet the air transportation demand for the proposed action and the potential impacts of the air transportation demand on these airport facilities. Airfield demand/capacity was analyzed to determine the ability of the Tinian International Airport and Pagan airfield to accommodate forecasted operation levels with the implementation of the proposed action, and to identify additional airport facilities, if required.

Factors considered in defining airfield facility requirements include:

- Impact to the efficiency and safety of existing facilities
- Increase in level of aviation operation, which determines the requirements for runway and taxiways
- Increase in mix of aircraft projected to operate at Tinian International Airport and Pagan airfield

The impact analysis considered the following potential effects to air transportation from the proposed action:

- Increase in aviation operation demand to a level that approaches the airfield capacity resulting in operational delays, limited growth of airport operations, use of larger aircraft, and/or cancellation or consolidation of flights during peak delay periods.
- Shortfalls in the existing airport facilities, such as the pavement strength, aircraft parking apron, passenger terminal and vehicular parking facilities that would severely impede the public access to these facilities.
- Obstructions to air navigation, navigational aids, or navigational facilities which are hazardous to the usage of the airport.

Like the highway system and traffic laws, Federal Aviation Administration regulations establish how and where aircraft may fly. Collectively, the Federal Aviation Administration uses these regulations to make airport use as safe, efficient, and compatible as possible for all types of aircraft; from private propeller-driven planes to large, high-speed commercial and military aircraft. The impact analysis on air transportation resources for this EIS/OEIS is developed in consultation with the Federal Aviation Administration and assists the Federal Aviation Administration in fulfilling their requirement to complete an aeronautical study. The Federal Aviation Administration will prepare two separate aeronautical studies, one for Tinian and one for Pagan, to determine the aeronautical effects of potential obstructions to air navigation. The separate aeronautical study will review the existing airspace structure...
and use, and contain an analysis of the potential impacts of the proposed action alternatives on civil aviation. Refer to Section 4.6, Airspace for details on the impacts to airspace and air traffic.

### 4.13.1.2 Ground Transportation

The analysis for ground transportation on Tinian addresses potential impacts to traffic and circulation associated with the proposed action. The analysis uses past traffic analyses and engineering evaluations, currently available traffic data, and Highway Capacity Manual (Transportation Research Board 2000) to determine specific roadways’ projected Level of Service. For a definition of Level of Service, see Section 3.13.1, Definition.

This approach was not used for Pagan, because only all-terrain pathways currently exist and the Highway Capacity Manual methodology does not address the unique characteristics of all-terrain pathways or trail users.

As part of the 1999 amendment to the 1975 Technical Agreement, the Department of Defense transferred ownership of the roads (public rights of way) within the lease-back portion of the Military Lease Area on Tinian back to the CNMI (as described in Section 3.7, Land and Submerged Land Use), for the purposes of maintaining roads used by the civilian population and to alleviate public safety concerns for those requiring access to the Lease Back Area (Northern Mariana Islands 1975). Roads within the Exclusive Military Use Area were retained by the military with a maintenance agreement between the CNMI and the Department of Defense, to facilitate public access to the historic areas within the Military Lease Area. Development within the Military Lease Area as part of proposed action would require a review of the 1999 amendment to the 1984 Tinian lease agreement on road ownership and maintenance.

Roadways on Tinian would be designed and constructed in accordance with standards included in the Federal Highway Administration’s A Policy on Geometric Design of Highways and Streets (American Association of State Highway and Transportation Officials 2011) and criteria included in the United Facilities Code 3-250-18FA, General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas (Department of Defense 2006).

The significance of impacts were determined based on the degree of change between pre- and post-proposed action conditions. Significant impacts to ground transportation would occur if execution of the proposed action alternative would cause the following:

- Substantial increase in traffic volumes (average daily traffic) on existing roadways, such that the available capacity would be exceeded and the Level of Service would degrade to unacceptable conditions (i.e., Level of Service E or Level of Service F, as defined in Appendix O, Transportation Study)
- Significant non-compliance with jurisdictional transportation policies, plans, or mandated improvement programs

### 4.13.1.3 Marine Transportation

The analysis for marine transportation addresses the potential impacts to facility access at the Port of Tinian. The analysis assessed effects to general vessel access, loading/unloading of ships, and vessel handling requirements. This analysis was not done for Pagan alternatives, as Pagan does not currently
have an active harbor. A separate analysis addressed sea space restriction requirements for training activities around Tinian and Pagan and identified effects to marine vessel transportation.

Significance of impacts was determined qualitatively based on the degree of change between pre- and post-proposed action alternative conditions. Significant impacts to marine transportation would occur in the event that execution of the alternative caused either of the following:

- Conflict with transportation policies, plans, or programs
- Substantially affect marine transportation routes, in-harbor procedures, or infrastructure

### 4.13.2 Resource Management Measures

#### 4.13.2.1 Air Transportation

Resource management measures that are applicable to air transportation include the following:

##### 4.13.2.1.1 Avoidance and Minimization Measures

- Contractor coordination with the Commonwealth Ports Authority and the various air and sea carriers in advance for transport arrangement during peak season when the majority of construction personnel and dependents may travel at the same time (i.e. during Christmas Exodus break), to possibly spread out the departure/arrival times and to utilize different modes of transport to mitigate temporary strain on air transportation infrastructure.

- Adjustment of construction timing and phasing to accommodate the civil and commercial usage of the existing airport facilities.

##### 4.13.2.1.2 Best Management Practices and Standard Operating Procedures

- Erosion Control Plan
- Hazardous Materials Management Plan
- Hazardous Waste Management Program
- Spill Prevention, Control and Countermeasures Plans and Facility Response Plans
- Biosecurity Outreach and Education
- Traffic Management Plan and Work Zone Traffic Management
- Notice to Air Traffic – The Federal Aviation Administration will announce in the Notice to Airmen the proposed schedule for the use of the surface danger zone to inform vessel operators of periods of potential airspace use
- Range Training Area Management Plan
- Bird-Aircraft Strike Hazard Plan
- Construction Safety and Phasing Plan – Which would be approved by the Federal Aviation Administration and would require coordination with Commonwealth Ports Authority and commercial aviation operators

#### 4.13.2.2 Ground Transportation

Resource management measures that are applicable to ground transportation include the following:
4.13.2.2.1 Avoidance and Minimization Measures

- Low Impact Development

4.13.2.2 Best Management Practices and Standard Operating Procedures

- Range Training Area and Management Plan
- Traffic Management Plan and Work Zone Traffic Management
- Erosion Control Plan

4.13.2.3 Marine Transportation

Resource management measures that are applicable to marine transportation include the following:

4.13.2.3.1 Best Management Practices and Standard Operating Procedures

- Range Training Area and Management Plan
- Notice to Mariners

A complete listing of best management practices is provided in Appendix D, *Best Management Practices*.

4.13.3 Tinian

4.13.3.1 Tinian Alternative 1

4.13.3.1.1 Construction Impacts

4.13.3.1.1.1 Air Transportation

The average annual population of construction personnel, including their dependents, coming from outside of Tinian is estimated to be approximately 450 to 600 during the 8 to 10 years of the construction period of the proposed action (Appendix Q, *Socioeconomic Impact Assessment Study*) (DoN 2014a). There would be some increase in air passenger volume if they transport to and from Tinian by air, especially if the construction personnel and dependents return home at the same time (e.g. during Christmas Exodus break). It is anticipated that the construction personnel and dependents are likely to take the following transport scenarios:

- By sea
- By air to nearby airport, such as Saipan International Airport, and connect to Tinian by sea
- By air to nearby airport, such as Saipan International Airport, and connect to Tinian by air
- By chartered plane to Tinian International Airport directly (varies from approximately 3 to 6 flights for regional jets with approximately 100 to 200 seats, to approximately 20 flights by twin-engine Short 360 aircraft with 30 seats)

If Tinian International Airport is the first port of entry to the U.S. for some of the foreign construction personnel and dependents, arrangements for immigration and customs services must be made in advance with the Chief Immigration Judge Saipan, and coordination with Transportation Security Administration would be required for security screening.
The existing airfield annual service volume capacity of Tinian International Airport is approximately 164,000 operations, with hourly capacities during visual flight rules and instrument flight rules of approximately 50 and 45 operations, respectively. The existing total operations at Tinian International Airport were 49,116 in 2013, which represents approximately 30% of the annual service volume. The Federal Aviation Administration recommends a detailed planning analysis for airfield enhancements when annual operations reach 60% of the annual service volume (98,400 operations at Tinian International Airport) and implementing the enhancements when annual operations approach 80% of the annual service volume (131,200 operations at Tinian International Airport). There is approximately 50% of the airfield capacity (i.e., 82,000 annual service volume) at the existing Tinian International Airport available before any enhancements are required. Based on the above estimates, the capacity of the existing airfield facilities is sufficient to handle the increase in air travel demand during the 8 to 10 year construction period.

It is anticipated that the primary transport of construction equipment and materials to Tinian would be by sea instead of by air, in view of the delivery costs. Although some of the light construction equipment and materials may potentially be delivered by air, the increase in air cargo during the construction period would be minimal.

Construction of the proposed training facilities, such as new taxiways connecting to the north of existing Runway 08/26 and the required expeditionary (non-permanent) navigation lights are within the existing airport boundary, and would have temporary impacts to the existing airport facilities during construction, such as intermittent delays from unanticipated construction issues and time-sensitive construction operations. To the extent practical construction within runway critical areas, such as the runway safety area, would be completed during off-peak hours. Coordination with the Commonwealth Ports Authority and commercial aviation operators is required as part of the Construction Safety and Phasing Plan and would reduce these impacts and/or develop phasing strategies to remove the impacts. Development of the Construction Safety and Phasing Plan is to begin during engineering design stages of the project. Federal Aviation Administration Form 7460-1, Notice of Proposed Construction or Alteration, including the Construction Safety and Phasing Plan, has to be submitted prior to construction on the airport, and for any construction that is within an imaginary surface extending outward and upward at 100 to 1 for a horizontal distance of 20,000 feet (6,096 meters) from the nearest point of Runway 08/26.

Through the implementation of resource management measures, including contractor coordination with the Commonwealth Ports Authority and the various air and sea carriers in advance for transportation arrangements during the peak transportation seasons, and adjusting construction timing to accommodate civil and commercial usage of airport facilities, impacts to transportation facilities would be less than significant during the construction period.
4.13.3.1.1.2 Ground Transportation

Figure 4.13-1 shows the proposed ground transportation improvements and road closures. New road construction and existing roadway improvements are planned as part of the proposed action, and necessary to support tactical vehicles and military training activities on Tinian, as well as to improve access to areas within the Military Lease Area for civilians. Improvements may include, but would not be limited to, clearing, grading, resurfacing, and reinforcing/strengthening existing roads that are currently in poor condition. The following roadway improvements and new roadway construction would be considered for implementation and are detailed in Section 2.4.1.1, Construction and Improvements.

- Improve road right-of-way for utilities
- Repair existing road for public use
- Repair existing road to a public access boulevard
- Construct new paved roads
- Repair existing road for general use
- Construct new gravel roads
- Establish military training roads
- Establish perimeter patrol road

The following cargo transit and tracked vehicle transit routes would be established:

- Outside of the Military Lease Area a cargo transit route/tracked vehicle transit lane would be established
- Within the Military Lease Area a tracked vehicle training trail would be established

Construction activities associated with the proposed action are anticipated to span 8 to 10 years. On Tinian, the construction of training facilities, support facilities, and infrastructure would be limited in most cases to grading and excavation. Some localized construction of structures (e.g., port improvements, base camp, Munitions Storage Area, Observation Posts) and installation of automation equipment within the Military Lease Area would take place (Section 2.4.1.1, Construction and Improvements).

Depending on how rapidly construction is completed, the average number of construction workers, including their dependents, would range from approximately 450 to 600 on Tinian for each year of the 8- to 10 year construction period, and most off-island construction workers would be expected to live in workforce housing that is currently located behind the Tinian Dynasty Hotel and Casino (Appendix Q, Socioeconomic Impact Assessment Study (DoN 2014a).

Throughout the 8- to 10-year construction period of Tinian Alternative 1, intermittent impacts to traffic circulation may result from the movement of trucks containing construction and debris removal materials, as well as from construction workers commuting. It is assumed that construction workers residing in workforce housing would be bused to the construction site in 40-passenger buses (between 12 and 15 bus trips per work day). This increase in traffic volumes on Tinian roadways would not significantly adversely affect traffic circulation or roadway Level of Service.
Figure 4.13-1
Ground Transportation Improvements

Legend

Roadway Improvement Segments
- Repair Existing Road for Public Use
- Repair Existing Road for Public Use - Boulevard
- Construct New Paved Road
- Construct New Gravel Road
- Establish Military Training Road
- Repair Existing Road for General Use
- Improve Road Right of Way for Utilities
- Perimeter Patrol Road
- Road Closure
- Existing Road - No Action

Sources: DoN 2010, DoN 2013

* This gate serves as the primary MLA access point for civilians

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

NORTH

4-391
Construction truck movements may result in generally isolated impacts that could include, but would not be limited to, congestion, slower speeds in construction zones, temporary roadway closures, and short detours that may be caused by equipment movement, delivery of construction materials, removal of construction debris, and construction of roadway improvements.

Most of the construction activities would occur on military property, and as such, very limited transportation and circulation impacts from construction are anticipated. Projects at the port or road and utility improvements from the port to the base camp would impact the community. The traffic management plan and work zone traffic management would minimize construction impacts on vehicular travel and bicycle and pedestrian circulation, and access to destinations near the construction area.

With implementation of best management practices (Appendix D), which would include a comprehensive Traffic Management Plan, work zone traffic management strategies, and appropriate roadway and public right-of-way maintenance, construction under Tinian Alternative 1 would not significantly increase the potential for impacts to traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles, increase the rate of traffic related accidents, or reduce transportation safety. Therefore, construction activities associated with Tinian Alternative 1 would result in less than significant direct and indirect impacts to ground transportation resources.

4.13.3.1.3 Marine Transportation

Construction of proposed training ranges and support facilities would increase use of Tinian’s port facilities. Several vessel visits would be required to transport the initial equipment, materials, and personnel (temporary and permanent) associated with construction of the training and supporting facilities. Use of the port would be increased over the entire 8 to 10 year course of the construction period.

All vessels associated with the construction would dock at Tinian’s commercial harbor. Tinian Alternative 1 does not include improvements to the harbor. However, port improvements (on land) would include enhancements to the existing old public boat ramp to accommodate use by Amphibious Assault Vehicles, new military-only bulk fuel storage tanks, a new military-only biosecurity facility, and a military-only vehicle washdown facility. The improvements are described in Chapter 2, Proposed Action and Alternatives, Sections 2.4.1.2.4 and 2.4.1.2.5, and shown on Figure 2.4-5. These improvements would not affect the port’s current ability to process vessels transporting personnel and cargo. Therefore, construction activities associated with Tinian Alternative 1 would result in less than significant impacts to marine transportation resources.

4.13.3.1.2 Operation Impacts

4.13.3.1.2.1 Air Transportation

The existing capacity of Tinian International Airport facilities and the air transportation demand for the proposed action have been analyzed. Based on the airfield demand/capacity analysis, the airport would not experience airfield-capacity constraints with the additional air transportation demand under the proposed action. Details of the analysis are given in Appendix O, Transportation Study (DoN 2014b).
No runway pavement additions, or strengthening of existing runway pavement, are anticipated. The existing runway length would be sufficient to accommodate the fleet mix with reduced maximum takeoff weights (i.e., limited allowable gross weights) for 747-400, C-17, and C-130.

A new aircraft parking apron and associated taxiway for the U.S. military would be provided to the north of Runway 08/26, and would be separated from the existing civilian apron and taxiways. It is anticipated that usage of the existing civilian apron and taxiways for the proposed action would be limited once the military apron and taxiways are in operation. Runway 08/26 would be the only major shared-use airport facility.

The personnel associated with the proposed action, including all support personnel, would enplane and deplane separate from civilian passengers and would then be bused to the base camp in designated vehicles, or walk to the base camp through a proposed gate in the joint airport/base camp security fence. It is anticipated that personnel would not be processed in the existing passenger terminal. No additional requirement for passenger processing in the existing passenger terminal is anticipated. If Tinian International Airport is the first port of entry to the U.S. for foreign allies or participants from overseas military facilities, clearance for immigration, customs, and quarantine control would be carried out at designated staging areas separate from the existing airport terminal facilities. Therefore, no additional requirement for customs, immigration, or quarantine facilities would be needed at the existing passenger terminal.

A communication tower is proposed at the base camp. Under the CFR Title 14 Part 77, Subpart B, Federal Aviation Administration Form 7460-1, Notice of Proposed Construction or Alteration, must be filed before construction. The Federal Aviation Administration would complete an obstruction evaluation/airport airspace analysis to determine whether the effects of the proposed tower would constitute a hazard to air navigation. An application for a license from the Federal Communications Commission must also be filed, if applicable.

Periodic impacts to the existing airfield facilities (mainly Runway 08/26) would be expected due to the implementation of Tinian Alternative 1. Intermittent delays could occur periodically when military training occupies the runway or during other activities (such as arming/dearming aircraft). However, potential delays would be sporadic and typically on the order of 5 minutes or less. In addition, coordination with the Commonwealth Ports Authority and commercial aviation would minimize these impacts. The training event timing could be coordinated with the civil and commercial usage of the existing airport facilities. Increase in maintenance requirements for Runway 08/26 are anticipated as a result of the increase in usage for the military training exercises.

In summary, implementation of Tinian Alternative 1 would result in less than significant direct or indirect impacts to air transportation resources.

4.13.3.1.2.2 Ground Transportation

In general, roadways would be maintained to ensure their serviceability, and would be designed in accordance with the American Association of State Highway and Transportation Officials’ *A Policy on the Geometric Design of Highways and Streets, 6th Edition* (American Association of State Highway and Transportation Officials 2011) and United Facilities Criteria 3-250-18FA, *General Provisions and Geometric Design For Roads, Streets, Walks, and Open Storage Areas* (Department of Defense 2006). Exceptions to design standards (e.g., lane width, shoulder width, vertical alignment, stopping sight
distance, clear recovery zones) may be requested in some cases, with sufficient justification and documentation of reasons for the request. Examples of reasons for which exceptions have been granted include reducing or avoiding significant right-of-way, and environmental and/or socioeconomic impacts. Existing roads around the North Field Runway (e.g., 123rd Street, Ushi Point Road, and Lennox Avenue) would be maintained by the U.S. military to allow tour bus access.

Roadway alignments were evaluated for both feasibility and constructability. Permanent erosion control and bank stabilization measures are recommended for implementation on segments with steep grades and/or side slopes. Detailed information, including illustrations of the proposed roadway network, typical cross-sections, and elevation profiles are included in Appendix O, Transportation Study. Planned roadway improvements are preliminary and are subject to change pending ongoing engineering and feasibility studies.

**Vehicles**

Each unit would bring the type and amount of vehicles and equipment required for its own training. The type and amount of vehicles and equipment required would vary depending on the training activities being conducted. Examples of the type of vehicles and equipment that would be used on Tinian are shown and described in Table 2.2-2, Representative Weaponry and Equipment. Vehicles would include, but not limited to, the following:

- High Mobility Multi-purpose Wheeled Vehicle (Humvee)
- Light Armored Vehicle (e.g., C2 variant of LAV-25)
- Amphibious Assault Vehicle (e.g., AAV-7A1)
- Medium Tactical Vehicle Replacement 7-ton Truck

In addition, various types of military and commercial vehicles are planned for personnel movement and permanent support of administrative and range maintenance functions. These are listed in Section 2.4, Ground Transportation.

To minimize the need for shipping equipment to Tinian, parking for permanently staged vehicles would be provided within the Military Lease Area.

**Pre-Training Preparation**

Pre-training preparation would include an advance team performing administrative functions within the Tinian RTA. Pre-training preparation activities consist of a check-out of base camp facilities, clearing the Military Lease Area of non-participating personnel, establishing check points/road blocks, and conducting communications checks. Vehicles involved in pre-training preparation would travel minimally on roadways outside the Military Lease Area and would involve vehicles to be supplied from the base camp motor pool. The minimal, infrequent, and temporary increase in traffic volumes associated with pre-training preparation would result in no impacts to traffic circulation or roadway Level of Service. Pre-training preparation activities, (i.e., establishing check points/road blocks and clearing the Military Lease Area of non-participating personnel) would reduce the risk of safety hazards, accidents, and collisions.
Arrival/Departure

The periods of peak demand on roadways outside the Military Lease Area would be expected to occur immediately following the arrival, and preceding the departure, of personnel and equipment. The Port of Tinian and Tinian International Airport would serve as the primary embarkation and disembarkation points for transportation of personnel and equipment by sea and air, respectively. Personnel arriving at Tinian would disembark and proceed to base camp by vehicle, bus, or on foot.

The expected primary route for personnel traveling between The Port of Tinian and the base camp is approximately 3.44 miles (5.54 kilometers) in length and includes the following roadways outside of the Military Lease Area: new parallel roadway south of West Street, new parallel roadway west of 6th Avenue and Tinian Power Plant, and 8th Avenue. The expected primary route for personnel traveling between Tinian International Airport and base camp is less than 0.5 mile (0.8 kilometer) in length and does not require travel on roadways outside the Military Lease Area.

For purposes of impact analysis a scenario with the maximum potential for adverse effects was used; assuming a training population of 3,000 (the maximum number of personnel the base camp could accommodate) arrive on the same day, disembark from the Port of Tinian, and are transported to base camp by bus, 150 round-trips (450 passenger vehicle equivalents) would be required. Daily traffic volumes on 8th Avenue, outside the Military Lease Area, would increase from 115 to 565 vehicles (measured in passenger car equivalents). Although substantial, this estimated increase in traffic volumes (average daily traffic) would not exceed available capacity and this roadway would continue to operate at the acceptable Level of Service A with free-flowing traffic and little or no delay to motorists.

During the arrival and departure periods, brief traffic delays and increased traffic congestion would likely occur due to transport of personnel and equipment. Increases in traffic volumes associated with the arrival of military personnel would be temporary and all Tinian roadways would continue to operate at the acceptable Level of Service A. Traffic levels on the majority of roadways within the village of San Jose would not be affected, and traffic volumes on military transit corridors outside the Military Lease Area would return to baseline conditions following arrival. Ground transportation conditions during departure would be similar to arrival. The temporary increase in vehicular traffic volumes during the arrival and departure periods would result in no impacts to traffic circulation or roadway Level of Service.

Training

Ingress to and egress from the four range complexes would not result in a direct increase in traffic on roadways outside the Military Lease Area. Personnel departing base camp destined for any of the range complexes would follow the most direct route available, as described in Appendix O, Transportation Study.

In addition to the training facilities associated with the four range complexes, several training facilities would be distributed throughout the Military Lease Area, including a Convoy Course, Tracked Vehicle Driver’s Course, and maneuver areas (for both light and amphibious forces). Vehicle maneuvering would only occur on developed roads and trails within the Military Lease Area, or within designated range areas. Tracked vehicles would travel only along designated tracked vehicle trails or within designated range areas (i.e., the Tracked Vehicle Driver’s Course). Tactical vehicles involved in exercises at Military
Lease Area-wide training facilities would not result in an increase in the amount of traffic on roadways outside the Military Lease Area.

Supporting activities, such as transportation of munitions and hazardous waste, would require use of roadways outside the Military Lease Area.

The primary proposed supply route, which would be used for transport of munitions, as well as other supplies, is illustrated in Chapter 2, Proposed Action and Alternatives, Figure 2.4-3 and runs from the Port of Tinian to the Munitions Storage Area. Transportation of munitions would result in a minor increase in the amount of vehicular traffic on roadways outside of the Military Lease Area. All roadways that comprise the proposed supply route currently operate under capacity at the acceptable Level of Service A and are able to accommodate the marginal increase in vehicular traffic. Therefore, the increase in vehicular traffic along the proposed supply route would not adversely affect roadway Level of Service.

Transportation of Hazardous Materials

Vehicles transporting hazardous materials (including munitions) will travel from the Port of Tinian to the proposed Munitions Storage Area, base camp, and/or the northern part of Tinian International Airport via the primary proposed supply route (see Chapter 2, Proposed Action and Alternatives; Figure 2.4-3), which utilizes roads outside of the Military Lease Area and away from populated neighborhoods. A secondary proposed supply route would connect the Munitions Storage Area to munitions holding pads at the northern part of Tinian International Airport. The secondary proposed supply route would utilize roads within the Military Lease Area, including 8th Avenue, 86th Street, and Broadway Avenue. This secondary route bypasses roads which run through the Tinian International Airport and would help to prevent potential conflicts with airfield operation, which could result from temporary road closures for transport of munitions. During training activities, all roads within the Military Lease Area may be used for the transport of munitions as necessary to live-fire training facilities.

Transportation of hazardous materials would result in a minor increase in the amount of vehicular traffic on roadways outside of the Military Lease Area. All roadways that comprise the proposed supply route currently operate under capacity at the acceptable Level of Service A and are able to accommodate the marginal increase in vehicular traffic. U.S. Department of Transportation regulations establish the requirements for transporting hazardous substances. Transportation of all materials would be conducted in compliance with the U.S. Department of Transportation regulations and CFR Title 49.

Transportation of hazardous materials under Tinian Alternative 1, and the minimal incremental increase in traffic associated with the transportation of hazardous materials, would not significantly increase the potential for impacts to traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles, increase the rate of traffic related accidents, or reduce transportation safety. Therefore, transportation of hazardous materials under Tinian Alternative 1 would result in less than significant direct and indirect impacts to ground transportation resources.

Liberty

Military personnel training on Tinian are expected to have 1 day of liberty per training cycle. While off-duty, military personnel would have liberty to go into town. Military personnel would not have access to
privately owned vehicles and would be bused to town and/or other destinations on Tinian. The number of bus trips required to transport off-duty personnel would vary depending on the training cycle.

The minimal incremental increase in traffic associated with transportation of military personnel to and from town, or other destinations on Tinian, under Tinian Alternative 1 would not be expected to significantly increase the potential for impacts to traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles, increase the rate of traffic related accidents, or reduce transportation safety. Therefore, liberty under Tinian Alternative 1 would result in less than significant direct and indirect impacts to ground transportation resources.

**Operations and Management**

Base camp and training operations would require some permanent employment. In total, about 95 full-time positions would be needed to maintain a functional operation. This increase in population would result in an insubstantial increase in traffic volumes on Tinian roadways.

The minimal incremental increase in traffic associated with operations-related employment under Tinian Alternative 1 would not significantly increase the potential for impacts to traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles, increase the rate of traffic related accidents, or reduce transportation safety. Therefore, operations and management under Tinian Alternative 1 would result in less than significant direct and indirect impacts to ground transportation resources.

**Access**

Mandatory vehicle access control to military installations is a Department of Defense requirement (Department of Defense Directives 5200.08-R and 5200.08 [2009, 2014]). Gates at 8th Avenue and Broadway Avenue would be manned to allow Military Lease Area access to authorized personnel (including International Broadcasting Bureau employees). Common to all alternatives would be the prohibition of public access at any time to the High Hazard Impact Area, Munitions Storage Area, base camp, all fenced and gated training facilities, and the range Observation Posts.

During the training period, varying degrees of public access may be afforded, and would depend on the areas being used for training. It is estimated that civilian use and access would be affected up to 20 weeks per year.

The proposed action would result in the following permanent and temporary road and/or intersection closures:

- **Permanent road closure** – Existing roads within the High Hazard Impact Area, including portions of Broadway Avenue and 116th Street, would be closed under all alternatives.
- **Temporary road closure** –
  - Outside the Military Lease Area: transportation of munitions would result in the temporary closure of intersections along the proposed supply route (see Chapter 2, *Proposed Action and Alternatives*, Figure 2.4-3).
  - Within the Military Lease Area: Only certain portions would be open during the training period. As training cycles are better defined, an access plan would be developed and published for public information.
Permanent closure of existing roads within the High Hazard Impact Area (including portions Broadway Avenue and 116th Street) would limit route choice and restrict vehicular access to areas of northern Tinian. A new perimeter road would be constructed around the High Hazard Impact Area. However, given the projected high utilization and frequency of live-fire training activities along Broadway Avenue (i.e., at Range Complex A and Range Complex B), motorists would be diverted to alternate routes (i.e., 8th Avenue) to access areas within the Military Lease Area. Motorists who currently travel on Broadway Avenue (280 daily vehicle trips) would be diverted to 8th Avenue during periods when access to areas within the Military Lease Area is allowed. The estimated peak hour vehicle demand at the proposed 8th Avenue gate would be fewer than 50 vehicles. This estimated peak hour demand would not exceed the gate capacity of 300 vehicles per hour. Adequate vehicle storage would be provided and queues would not be expected to spillback onto adjacent roadways. Therefore, the proposed gate at 8th Avenue would provide the security level required with little or no disruption to the ingress and egress of the installation.

Additionally, planned roadway improvements along 8th Avenue (e.g., resurfacing, realignment, and vegetation clearance) would ensure adequate capacity to accommodate the projected traffic volumes (approximately 345 daily vehicles). The altered circulation patterns resulting from the permanent closure of existing roads within the High Hazard Impact Area under Tinian Alternative 1 would not significantly increase the potential for impacts to traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles; or increase the rate of traffic related accidents; or reduce transportation safety.

Temporary closure of roads and intersections along the proposed supply route would occur during transportation of munitions. To minimize the potential negative adverse effect of roadway closures and resulting altered circulation patterns, the U.S. military would coordinate with the village of San Jose, Commonwealth Department of Public Works, and other local authorities to provide as much advance notice as possible of the date and times public access would be both restricted and afforded to areas within the Military Lease Area. With implementation of resource management measures which would include a Range Training Area Management Plan, access controls and the permanent and temporary closure of roads under Tinian Alternative 1 would not significantly increase the potential for impacts to traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles; increase the rate of traffic related accidents; or reduce transportation safety. Therefore, access controls and the permanent and temporary closure of roads from implementation of Tinian Alternative 1 would result in less than significant direct and indirect impact to ground transportation resources.

Planned roadway improvements would support access to base camp and training support facilities and would result in beneficial impacts to traffic circulation for vehicles, pedestrians, and bicycles, and would decrease accident rates and increase overall transportation safety on Tinian.

4.13.3.1.2.3 Marine Transportation

Increases in marine vessel traffic and harbor use during Tinian Alternative 1 operations would be limited to vessel trips required for transport of personnel, equipment, and materials at the beginning and end of each training cycle. Personnel would arrive and depart to and from Tinian via a mix of air and sea transportation. For the marine transportation analysis, it is assumed that all personnel would arrive and
depart via sea transportation, and that a surge-level of personnel would be both embarking and disembarking at once.

At the Port of Tinian, Amphibious Assault Vehicles and Rubber Raiding Craft used during training activities would use an improved public boat ramp, shown in Chapter 2, Proposed Action and Alternatives, Figure 2.4-5. Other existing port facilities could be used during training operations. None of the proposed improvements to existing port facilities is expected to impact harbor capacity.

Proposed danger zones are shown in Chapter 2, Proposed Action and Alternatives, Figures 2.4-17 and 2.4-20. As stated in 33 CFR Part 334, Navigable Waters (surface danger zone and Restricted Area Regulations); operation of the Tinian RTA would exclude traffic from these areas of sea space on a full-time or intermittent basis, depending on the requirements of training. Consistent with military safety requirements, danger zones would be open to the public only when hazards are minimized to assure safety of the non-participating public. In addition to the danger zones, adjacent restricted areas may be required to accommodate warning areas that separate military operations from non-participating marine vessels.

Cargo vessels traveling from Saipan would be impacted by the danger zones, as these vessels typically traverse in shallow waters off the western shore (100 feet to 1 mile [30 meters to 2 kilometers] offshore) from the northern tip of Tinian to the Port of Tinian, which would be encumbered by the danger zones. Cargo vessels will either have to schedule travel through danger zones during times when the range is not in use, or detour around the danger zones. These impacts would be intermittent.

Range control would be conducted to maximize safety for both the public and military units. Training schedules would be published through Notice to Mariners. The range control facility would remotely survey the range and danger zones via Surface Radar, and visual inspection cameras and/or thermal imaging, and communicate with personnel involved in training to identify conflict prior to, and during use. Procedures would be implemented for the immediate cessation of training if a vessel entered a restricted area. Active training is proposed for 20 weeks per year.

Therefore, Tinian Alternative 1 operations would result in less than significant direct or indirect impacts to marine transportation resources.

4.13.3.2 Tinian Alternative 2

4.13.3.2.1 Construction Impacts

4.13.3.2.1.1 Air Transportation

The impacts to air transportation resources resulting from Tinian Alternative 2 construction activities would be the same as those identified for Tinian Alternative 1, discussed in Section 4.13.3.1. Through the implementation of resource management measures, including contractor coordination with the Commonwealth Ports Authority and the various air and sea carriers in advance for transportation arrangements during the peak transportation seasons, and adjusting construction timing to accommodate civil and commercial usage of airport facilities, Tinian Alternative 2 construction activities would result in less than significant direct and indirect impacts to air transportation resources.
4.13.3.2.1.2 Ground Transportation

Impacts to ground transportation resources during Tinian Alternative 2 construction activities would be the same as those identified for Tinian Alternative 1, discussed in Section 4.13.3.1.

With implementation of best management practices (Appendix D), which would include a comprehensive Traffic Management Plan and appropriate work zone traffic management strategies, Tinian Alternative 2 construction activities would not significantly increase the potential for impacts traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles, increase the rate of traffic related accidents, or reduce transportation safety. Therefore, construction activities associated with Tinian Alternative 2 would result in less than significant direct and indirect impacts to ground transportation resources. In addition, planned roadway improvements would result in an overall beneficial impacts to traffic circulation for vehicles, pedestrians, and bicycles, and would decrease accident rates and increase overall transportation safety on Tinian.

4.13.3.2.1.3 Marine Transportation

Impacts to marine transportation resources during Tinian Alternative 2 construction activities would be the same as those identified for Tinian Alternative 1, discussed in Section 4.13.3.1.

Construction activities associated with Tinian Alternative 2 would not affect the port’s ability to process vessels transporting personnel and cargo. Therefore, Tinian Alternative 2 construction activities would result in less than significant direct and indirect impacts to marine transportation resources.

4.13.3.2.2 Operation Impacts

4.13.3.2.2.1 Air Transportation

Impacts to air transportation resources during Tinian Alternative 2 operations would be the same as those identified for Tinian Alternative 1, discussed in Section 4.13.3.1. Tinian Alternative 2 operations would result in less than significant direct and indirect significant impacts to air transportation resources.

4.13.3.2.2.2 Ground Transportation

Impacts to ground transportation resources during Tinian Alternative 2 operations would be similar to those identified for Tinian Alternative 1, discussed in Section 4.13.3.1.

The planned roadway network and projected roadway use levels within the Military Lease Area under Tinian Alternative 2 would differ from Tinian Alternative 1 as follows:

- **Range Complex C.** The southern Battle Area Complex would exist. Therefore, vehicle travel on roadways between base camp and Range Complex C would increase slightly compared to Tinian Alternative 1. The slight increase in vehicle travel would not adversely affect traffic circulation or roadway Level of Service.
- **Military Lease Area-wide Training Facilities.** The Convoy Course would run along a different alignment that would extend into the International Broadcasting Bureau Area. There would be more engagement areas along the route (11 versus 6) compared to Tinian Alternative 1. The reconfiguration of the Convoy Course would not change projected roadway use levels compared to Tinian Alternative 1.
• **Access.** The International Broadcasting Bureau would not be in operation. Therefore, vehicle travel on roadways between the proposed 8th Avenue gate and the International Broadcasting Bureau would be expected to decrease slightly compared to Tinian Alternative 1.

The minimal incremental increase in traffic associated with transportation of military personnel, the altered circulation patterns resulting from the permanent closure of existing roads within the High Hazard Impact Area, the transportation of hazardous materials, and the temporary road closures and detours under Tinian Alternative 2 would not significantly increase the potential for impacts to traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles, increase the rate of traffic related accidents, or reduce transportation safety.

Therefore, Tinian Alternative 2 operations would result in less than significant direct and indirect impacts to ground transportation resources. In addition, planned roadway improvements would result in beneficial impacts to traffic circulation for vehicles, pedestrians, and bicycles, and would decrease accident rates and increase overall transportation safety on Tinian.

### 4.13.3.2.2.3 Marine Transportation

Impacts to marine transportation resources during Tinian Alternative 2 operations would be similar to those identified for Alternative 1, discussed in [Section 4.13.3.1](#). The Tinian Alternative 2 danger zones are expanded versus those of Alternative 1, as shown in Chapter 2, *Proposed Action and Alternatives*, Figure 2.4-17. The closure of the larger area as compared to Tinian Alternative 1 would have no additional impact to marine transportation, as vessels would already be re-routed due to the closure.

Therefore, Tinian Alternative 2 operations would result in less than significant direct and indirect impacts to marine transportation resources.

### 4.13.3.3 Tinian Alternative 3

#### 4.13.3.3.1 Construction Impacts

##### 4.13.3.3.1.1 Air Transportation

The impacts to air transportation resources during Tinian Alternative 3 construction activities would be the same as those identified for Tinian Alternative 1, discussed in [Section 4.13.3.1](#). Through the implementation of resource management measures, including contractor coordination with the Commonwealth Ports Authority and the various air and sea carriers in advance for transportation arrangements during the peak transportation seasons, and adjusting construction timing to accommodate civil and commercial usage of airport facilities, construction activities associated with Tinian Alternative 3 would result in less than significant direct and indirect impacts to air transportation resources.

##### 4.13.3.3.1.2 Ground Transportation

Impacts to ground transportation resources during Tinian Alternative 3 construction activities would be the same as those identified for Tinian Alternative 1, discussed in [Section 4.13.3.1](#).

With implementation of resource management measures which would include a comprehensive Traffic Management Plan and appropriate work zone traffic management strategies, construction associated with Tinian Alternative 3 would not significantly increase the potential for impacts traffic circulation or
roadway Level of Service for vehicles, public transit, pedestrians, or bicycles, increase the rate of traffic related accidents, or reduce transportation safety. Therefore, construction activities associated with Tinian Alternative 3 would result in less than significant direct and indirect impacts to ground transportation resources.

4.13.3.3.1.3 Marine Transportation

Impacts to marine transportation resources from Tinian Alternative 3 construction activities would be the same as those identified for Tinian Alternative 1, discussed in Section 4.13.3.1.

Construction activities associated with Tinian Alternative 3 would not affect the port’s ability to process vessels transporting personnel and cargo. Therefore, Tinian Alternative 3 construction activities would result in less than significant direct and indirect impacts to marine transportation resources.

4.13.3.3.2 Operation Impacts

4.13.3.3.2.1 Air Transportation

The impacts to air transportation resources resulting from Tinian Alternative 3 operations would be the same as those identified for Tinian Alternative 1, discussed in Section 4.13.3.1. Operation of Tinian Alternative 3 would result in less than significant direct and indirect impacts to air transportation resources.

4.13.3.3.2.2 Ground Transportation

Impacts to ground transportation resources resulting from Tinian Alternative 3 operations would be similar to those identified for Tinian Alternative 1, discussed in Section 4.13.3.1.

The planned roadway network and projected use levels within the Military Lease Area under Tinian Alternative 3 would differ from Tinian Alternative 1 as follows:

- **Range Complex C.** The southern Battle Area Complex would exist. Therefore, vehicle travel on roadways between base camp and Range Complex C would increase slightly compared to Tinian Alternative 1. The slight increase in vehicle travel would not adversely affect roadway Level of Service.

- **Range Complex D.** The northern Battle Area Complex would not exist. Therefore, vehicle travel on roadways between base camp and Range Complex D would be expected to decrease slightly compared to Tinian Alternative 1.

- **Military Lease Area-wide Training Assets.** The Convoy Course would run along a different alignment that would extend into the International Broadcasting Bureau area. There would be more engagement areas along the route (11 versus 6) compared to Tinian Alternative 1. The reconfiguration of the Convoy Course would not change projected roadway use levels compared to Tinian Alternative 1.

- **Access.** The International Broadcasting Bureau would not be in operation. Therefore, vehicle travel on roadways between the proposed 8th Avenue gate and the International Broadcasting Bureau would be expected to decrease slightly compared to Tinian Alternative 1.

The minimal incremental increase in traffic associated with transportation of military personnel, the altered circulation patterns resulting from the permanent closure of existing roads within the High
Hazard Impact Area, the transportation of hazardous materials, and the temporary road closures and detours under Tinian Alternative 3 would not significantly increase the potential for impacts to traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles, increase the rate of traffic related accidents, or reduce transportation safety.

Therefore, Tinian Alternative 3 operations would result in less than significant direct and indirect impacts to ground transportation resources. In addition, planned roadway improvements would result in beneficial impacts to traffic circulation for vehicles, pedestrians, and bicycles, and would decrease accident rates and increase overall transportation safety on Tinian.

### 4.13.3.2.3 Marine Transportation

Impacts to marine transportation resources during Tinian Alternative 3 operations would be the same as those identified for Tinian Alternative 1, discussed in Section 4.13.3.1. The Tinian Alternative 3 danger zones are expanded as compared to those of Tinian Alternative 1, as shown in Chapter 2, *Proposed Action and Alternatives*, Figure 2.4-17. The closure of the larger area as compared to Tinian Alternative 1 would have no additional impact to marine transportation, as vessels would already be re-routed due to the closure.

Therefore, Tinian Alternative 3 operations would result in less than significant direct and indirect impacts to marine transportation resources.

### 4.13.3.4 Tinian No-Action Alternative

The periodic non-live-fire training that the military has undertaken in the Military Lease Area of Tinian would be expected to continue under the no-action alternative. Constructing and operating the four training ranges on Tinian analyzed in the Guam and CNMI Military Relocation EIS (DoN 2010a) would have less than significant impacts to ground transportation and no impacts to air or sea port transportation (see Table 14.2-4; DoN 2010a). On Tinian, Mariana Islands Range Complex training would not affect transportation resources (DoN 2010b). The no-action alternative, therefore, would have less than significant impacts to transportation resources.
4.13.3.5 Summary of Impacts for Tinian Alternatives

Table 4.13-1 contains a comparison of the potential impacts to transportation resources for the three Tinian alternatives and the no-action alternative.

Table 4.13-1. Summary of Impacts for Tinian Alternatives

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
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<tr>
<td>Air Transportation</td>
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<td>LSI</td>
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<tr>
<td>Marine Transportation</td>
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<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
</tbody>
</table>

Legend: BI = beneficial impact; LSI = less than significant impact; NI = no impact.
4.13.4 Pagan

4.13.4.1 Pagan Alternative 1

4.13.4.1.1 Construction Impacts

4.13.4.1.1.1 Air Transportation

Pagan Alternative 1 is designed to use Pagan’s terrain features to support the combined level training for the proposed action. The proposed facilities would support an expeditionary base camp. Air transportation during the construction period would be very limited and constrained by the existing Runway 11/29 measuring 1,500 feet (457 meters) long and with a load-bearing capacity of only 4,000 pounds (1,814 kilograms). Some of the construction work would be carried out by the military as part of the training exercises. The primary mode of transportation for construction equipment, materials, and personnel would be by sea. The increase in the number of flights to Pagan during construction would be minimal.

The lava flow from the 1981 volcano eruption covered nearly half of Runway 11/29 on the existing Pagan airfield. The lava flow would be removed under the proposed action and Runway 11/19 would be extended, re-graded, and strengthened. New aircraft parking apron would be provided. There would be temporary closure of the Pagan airfield during the removal of the lava flow and for the improvements on and adjacent to the runway. Upon completion of proposed improvements the airfield would reopen. In view of the very low usage of the existing Pagan airfield, the construction would be carried out with minimal interruption of operations and as part of military training. The impacts to the existing facility during construction would be limited and included in the operation phase impacts. Federal Aviation Administration Form 7460-1, Notice of Proposed Construction or Alternation, would be submitted prior to construction on the Pagan airfield.

Therefore, direct and indirect impacts to air transportation resources from construction activities associated with implementation of Pagan Alternative 1 would be less than significant.

4.13.4.1.1.2 Ground Transportation

Currently there are no roads, transit networks, pedestrian, or bicycle facilities, and no significant vehicular traffic patterns occur on Pagan. Only all-terrain vehicle pathways exist on Pagan and their use is limited. Construction of the expeditionary base camp, supporting facilities, and military training trails on Pagan would require heavy equipment, including, but not limited to: road graders, vibratory compactors, dump trucks, and backhoes.

Construction activities associated implementation of Pagan Alternative 1 would not increase the potential for impacts to traffic circulation or Level of Service for vehicles, public transit, pedestrians, bicycles; increase the rate of traffic related accidents, or reduce transportation safety. Therefore, Pagan Alternative 1 construction activities would result in no direct or indirect impacts to ground transportation resources.

4.13.4.1.1.3 Marine Transportation

There is currently no functional dock or appreciable marine vessel traffic to Pagan. Therefore, Pagan Alternative 1 construction activities would have no impact to marine transportation.
4.13.4.1.2 Operation Impacts

4.13.4.1.2.1 Air Transportation

Based on the airfield demand/capacity analysis, the Pagan airfield would not experience airfield-capacity constraint with the additional air transportation demand under the proposed action. Details of the analysis are given in Appendix O, Transportation Study (DoN 2014b). Although the airfield has sufficient capacity for the increased operations, the existing physical constraints at Runway 11/29, such as the lava flow from the 1981 volcano eruption, would limit its usage for the proposed action and improvements would be implemented. During the operation phase of the Pagan alternatives, the lava flow would be removed and Runway 11/29 would be extended, re-graded and strengthened, and a new aircraft parking apron would be provided adjacent to the runway to support the training activities. It is anticipated that the Pagan airfield would be restricted for the exclusive military use during the training period (around 16 weeks per year). Taking into consideration the existing low usage of the Pagan airfield for general aviation only, the direct and indirect impacts to the civilian usage of the Pagan airfield are considered less than significant.

Transportation of personnel and equipment to Pagan by air is only the secondary mode of transportation. Marine transportation is considered the primary mode. If the Pagan airfield would be the first port of entry to the U.S. for any foreign allies or participants from overseas military facilities, coordination among the Department of Defense, Department of Homeland Security, and the CNMI Customs Services would be accomplished. No permanent facility for passenger boarding or processing on the Pagan airfield is anticipated.

The proposed action also includes improvements at the Pagan airfield that would have positive effects to air transportation resources. These improvements include:

- Removal of the lava flow and increase in the capability of the runway in terms of runway length and strength
- Runway turnaround aprons
- Aircraft parking aprons
- Removal of existing obstructions within the runway object free area and trimming trees outside to meet the transition slope and obstacle clearance surfaces

These improvements would enhance the existing facilities at the Pagan airfield.

Therefore, Pagan Alternative 1 operations would have beneficial direct and indirect impacts on air transportation resources.

4.13.4.1.2.2 Ground Transportation

All units would be expected to arrive and depart with their own vehicles and equipment. Similar to Tinian, personnel would arrive and depart via sea transport (e.g., Amphibious Assault Vehicle) and aircraft (CH-53, MV-22, and C-130).

Training activities under Pagan Alternative 1 would require the use of the planned military training trails (see Chapter 2, Proposed Action and Alternatives, Figure 2.5-3). About 6 miles (10 kilometers) of the planned 22-mile (35-kilometer) trail system would be on existing all-terrain vehicle pathways or trails and the other 16 miles (25 kilometers) would be over terrain where no pathways or trails currently exist.
Access to all-terrain vehicle pathways or trails and areas within the High Hazard Impact Area would be restricted.

No specific construction activities would occur to support maneuvering operations. Personnel would move along the landscape and train in a manner similar to combat conditions. Vehicles would move along the established military training trails as well as other terrain that they could safely navigate (excluding no maneuver areas).

Pagan Alternative 1 would not increase the potential for impacts to traffic circulation or Level of Service for vehicles, public transit, pedestrians, bicycles; or increase the rate of traffic related accidents; or reduce transportation safety. Therefore, Pagan Alternative 1 operations would result in no direct or indirect impacts to ground transportation resources.

4.13.4.1.2.3 Marine Transportation

During operations, personnel would arrive and depart via air or marine transport at the beginning and end of each training period. The primary mode of marine transportation would be amphibious shipping to beaches of both personnel and equipment, as no docking facilities are proposed at Pagan under any Alternative. All training equipment would arrive with the personnel. There is no current functional dock on Pagan or appreciable vessel traffic in adjacent waters.

The Proposed danger zones associated with Pagan Alternative 1 are described in Chapter 2, Proposed Action and Alternatives, Section 2.5, and Figures 2.5-4 and 2.5-6. As stated in 33 CFR Part 334, Navigable Waters (danger zone and restricted area regulations), operation of the Pagan RTA would exclude traffic from these areas of sea space on a full-time or intermittent basis, depending on the requirements of training. Consistent with military safety requirements, danger zones would be open to the public only when hazards are minimized to assure safety of the non-participating public. In addition to the danger zones, adjacent restricted areas may be required to accommodate warning areas that separate military operations from non-participating vessels.

Range control would be conducted to maximize safety for the public and military units. Training schedules would be published through a Notice to Airmen. The range control facility would remotely survey the range and communicate with personnel involved in training to identify conflict prior to and during use. Procedures would be implemented for the immediate cessation of training if a vessel entered the restricted areas.

Therefore, Pagan Alternative 1 operations would have no impact to marine transportation resources.

4.13.4.2 Pagan Alternative 2

4.13.4.2.1 Construction Impacts

4.13.4.2.1.1 Air Transportation

Impacts to air transportation resources during Pagan Alternative 2 construction activities would be the same as those identified for Pagan Alternative 1, discussed in Section 4.13.4.1.
4.13.4.2.1.2 Ground Transportation

Impacts to ground transportation resources during Pagan Alternative 2 construction activities would be the same as those identified for Pagan Alternative 1, discussed in Section 4.13.4.1.

Construction activities associated with Pagan Alternative 2 would not increase the potential for impacts to traffic circulation or Level of Service for vehicles, public transit, pedestrians, bicycles; increase the rate of traffic related accidents; or reduce transportation safety. Therefore, Pagan Alternative 2 construction activities would result in no direct or indirect impacts to ground transportation resources.

4.13.4.2.1.3 Marine Transportation

Impacts to marine transportation resources during Pagan Alternative 2 construction activities would be the same as those identified for Pagan Alternative 1, discussed in Section 4.13.4.1.

Pagan Alternative 2 construction activities would have no impact to marine transportation.

4.13.4.2 Operation Impacts

4.13.4.2.1 Air Transportation

Impacts to air transportation resources during Pagan Alternative 2 operations would be the same as those identified for Pagan Alternative 1, discussed in Section 4.13.4.1.

4.13.4.2.2 Ground Transportation

Impacts to ground transportation resources during Pagan Alternative 2 operations would similar to those identified for Pagan Alternative 1, discussed in Section 4.13.4.1.

Under Pagan Alternative 2, vehicular access to areas of northern Pagan would be slightly less restricted due to the smaller northern High Hazard Impact Area compared to Pagan Alternative 1.

Pagan Alternative 2 would not increase the potential for impacts to traffic circulation or Level of Service for vehicles, public transit, pedestrians, bicycles, increase the rate of traffic related accidents, or reduce transportation safety. Therefore, Pagan Alternative 2 operations would result in no direct or indirect impacts to ground transportation resources.

4.13.4.2.3 Marine Transportation

The proposed danger zones associated with Pagan Alternative 2 are described in Chapter 2, Proposed Action and Alternatives, Section 2.5, and Figures 2.5-4 and 2.5-6. Impacts to marine transportation resources during Pagan Alternative 2 operations would be the same as those identified for Pagan Alternative 1, discussed in Section 4.13.4.1. Pagan Alternative 2 operations would have no impact to marine transportation resources.

4.13.4.3 Pagan No-Action Alternative

The no-action alternative would include short term and periodic visits to Pagan for eco-tourism, scientific surveys and military training for search and rescue type exercises and would be expected to continue. These temporary activities would have no impacts on transportation resources. Therefore, the no-action alternative would have no impacts ground transportation resources.
4.13.4.4 Summary of Impacts for Pagan Alternatives

Table 4.13-2 contains a comparison of the potential impacts to transportation resources for the two Pagan alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Air Transportation</td>
<td>LSI</td>
<td>BI</td>
<td>LSI</td>
</tr>
<tr>
<td>Ground Transportation</td>
<td>NI</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td>Marine Transportation</td>
<td>NI</td>
<td>NI</td>
<td>NI</td>
</tr>
</tbody>
</table>

Legend: BI = beneficial impact; LSI = less than significant impact; NI = no impact.
4.14 UTILITIES

Section 4.14 describes the potential utility impacts of the proposed action requirements on the existing utility infrastructure on Tinian and Pagan. Impacts such as installation of proposed utilities and construction of facilities that could affect other resources are covered in their respective sections, including: Sections 4.3, Water Resources; 4.4, Air Quality; 4.5, Noise; 4.9, Terrestrial Biology; and 4.10, Marine Biology. Changes to land uses are presented in Section 4.7, Land and Submerged Land Use, and potential soil contamination issues are addressed in Section 4.16, Hazardous Materials and Waste.

4.14.1 Approach to Analysis

The impact analysis addresses potential effects to the capacity and/or distribution of the following utilities systems: electrical, potable water, wastewater, stormwater, solid waste, and information technology/communications. The analysis estimates increased requirements due to proposed facilities, infrastructure, personnel, and forecast natural civilian population growth independent of the proposed action. These analyses cover both construction and operation of the proposed action. The Utilities Study (Appendix P) used an approximate current population for Tinian of 3,500 including an allowance for tourists (DoN 2014a). The Socioeconomic Impacts Assessment Study (Appendix Q) estimated the impact of the proposed action to Tinian’s population (not including training units) presented below in Table 4.14-1 (DoN 2014b). Tinian’s utility requirements are assessed based on these forecast changes to the island population plus requirements to support the training units.

<table>
<thead>
<tr>
<th>Category</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Baseline Population</td>
<td>2,890</td>
<td>3,211</td>
<td>3,532</td>
</tr>
<tr>
<td>Population Change – Construction(^1)</td>
<td>477</td>
<td>537</td>
<td>596</td>
</tr>
<tr>
<td>Population Change – Military Operations(^2)</td>
<td>143</td>
<td>192</td>
<td>242</td>
</tr>
<tr>
<td>Population with the Proposed Action</td>
<td>3,510</td>
<td>3,940</td>
<td>4,370</td>
</tr>
<tr>
<td>Total Population Change</td>
<td>620</td>
<td>729</td>
<td>838</td>
</tr>
<tr>
<td>Population Change – Percentage</td>
<td>21.4%</td>
<td>22.7%</td>
<td>23.7%</td>
</tr>
</tbody>
</table>

Notes:  
\(^1\) Annual average during the 8 to 10 years of construction.  
\(^2\) Includes dependents.

Source: Socioeconomic Impacts Assessment Study, Table 5.1-3 (DoN 2014b).

The analysis also compares projections of future utility requirements to the capacity of the utilities. Existing utility requirements attributed to the current Tinian population are considered baseline conditions and are discussed in Section 3.14, Utilities.

For the purposes of this analysis, a conservative assumption was made that most of the construction workers would come from off-island locations (i.e., presently not resident on Tinian or Pagan). In addition, for the purposes of this analysis, off-island construction workforce dependents are considered under direct impacts. Therefore, there would be no indirect impacts of the proposed action as it relates to the utility resource.
The projections of future utility requirements account for the following impacts:

- Off-island (i.e., presently not resident on Tinian or Pagan) construction workforce and their dependents
- All proposed U.S. military active duty personnel
- On-base civilian workforce
- Industrial requirements from proposed facilities

The impact analysis considered the capacity of the various utilities and the ability of the utility to properly handle and provide required services to both the military and civilian customers. The analysis also assesses whether the utility is currently operating within design capacity and regulatory requirements, and whether the utility would continue to operate within design capacity and regulatory requirements under the conditions of the proposed action.

As discussed in Chapter 3, data was available for October 2011 through August 2014 pertaining to potable water production and use (Commonwealth Utilities Corporation 2014). Pump rates from Marpi Well #2 are available through 2014. The potable water database supplied by Commonwealth Utilities Corporation, consisting of potable water production rates and metered supply from October 2011 through August 2014, was used to evaluate available potable water to meet the project demands.

The significance of utility-related impacts was determined qualitatively. A significant impact would occur if:

- The projected increase in demand for a utility would exceed the available or proposed planned capacity of that utility, resulting in substandard service to existing or expected future customers of that utility.
- The estimated demands of the proposed action would cause the utility to operate in violation of regulatory requirements.

If a utility obtains (or is expected to obtain) an agreement with regulatory agencies to either exempt certain requirements or extend the due date for regulatory compliance, then that utility would be deemed to be operating within regulatory requirements. This situation would be categorized as a less than significant impact.

**4.14.2 Resource Management Measures**

- Resource management measures, including best management practices and standard operating procedures, applicable to utilities are provided below and described in Appendix D, *Best Management Practices*. Leadership in Energy and Environmental Design (construction and operations)
- Stormwater Management Plan and Stormwater Pollution Prevention Plan (construction)
- Coordination with the utility providers on planned outages and service disruptions (construction)
- Inventory of spare parts, maintenance equipment, and tools (operation)
Potable Water

- Disposal of hydrotesting and cleaning and flushing water in accordance with the CNMI Bureau of Environmental and Coastal Quality regulations
- Operation, inspection, and maintenance of potable water storage tanks, water production wells, pumps and treatment equipment in accordance with a regularly updated and approved Operations and Maintenance manual to ensure proper function
- Periodic inspection of water transmission, distribution and service lines and repair of any damaged lines to ensure adequate operation and identification of any damage or leaks within the system

Wastewater

- Operation and maintenance of wastewater facilities in accordance with a regularly updated and approved Operations and Maintenance manual
- Inspection of septic tank systems no less than every 3 years and periodic cleaning in accordance with the CNMI regulations
- Prevent trees or shrubs from growing over any septic tank and leaching field components
- Sewer lines and pump station(s) would be inspected and maintained to minimize the risk of sanitary sewer overflows

Stormwater Management

- Compliance with Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects
- Well Head Protection Zones (construction and operations)
- Low Impact Development (construction and operations)

Solid Waste

- Recycling of municipal solid waste, such as glass, paper, and metals
- Reuse of all green waste and 60% of construction and demolition debris, based upon Department of Defense Strategic Sustainability Performance Plan, fiscal year 2012 (dated September 20, 2012)

4.14.3 Tinian

4.14.3.1 Tinian Alternative 1

4.14.3.1.1 Construction Impacts

As described in Section 2.4.1.2.7, Utility Improvements, new construction and improvements to the existing utilities infrastructure would occur to provide electrical power, potable water, wastewater management, stormwater management, solid waste, and communications to the base camp, Munitions Storage Area, Port of Tinian support facilities, and the Tinian RTA. There are no permanent electrical power utility, potable water utility, wastewater infrastructure, or information technology/communications infrastructure associated with the Tinian International Airport Improvements.
Construction of the Tinian RTA would be accomplished over an 8 to 10 year period. During that time, training events could also occur, so there could be an overlap of construction and operation activities. Routinely, construction work would temporarily be impacted during live-fire training events, construction workers would remain on island, and construction would resume after training events have ended. Because construction activities would be impacted during live-fire training events, this overlap would not result in additive impacts to utilities resources. Regardless of when these activities would occur, all construction-related impacts, including impacts associated with workers residing at worker housing, have been assessed within the construction impacts, while all operation-related impacts have been assessed within operation impacts.

During an overlap of construction and operation, not all of the facilities would be completed and in operation. As an example, there would be a reduction in electrical power demand from operation that would compensate for having some construction electrical power demand during that time. The existing power generating capacity has excess capacity to provide for any potential increased electrical power demand during overlap between construction and operation that might occur. Short-term power outages could occur at some of the operational facilities for construction hook ups, which would need to be coordinated between construction and operation. Stormwater management features would be built in phases with the training facilities and be functional during any training exercises occurring during construction.

4.14.3.1.1.1 Electrical Power

As discussed in Section 3.14.4.1, Electrical Power, the existing Tinian power plant has an installed generating capacity rated at 17.0 megawatts. One 4.5 megawatt generation unit is kept in reserve for maintenance purposes; therefore, the utility maintains 12.5 megawatts of capacity available to meet expected loads. With an average daily load of 4.5 megawatts, 8 megawatts of reserve power remains available. The power demand required during construction would mainly be met with portable generators in the field, and connections to the existing electrical system would be limited. As a result, the 8 megawatt reserve far exceeds any contemplated demand, and is within the current capability of the existing power plant. Therefore, there would be no impacts to services associated with capacity.

As discussed in the Utilities subsection of Section 2.4.1, Elements Common to All Action Alternatives, new electrical lines and improvements to existing power distribution lines would be constructed. Impacts to the provision of electrical power during construction of the proposed facilities may include temporary power outages to facilitate hooking up new and rerouted power lines. These would be of short duration, scheduled to allow for advance notification to users, and timed to be least disruptive (e.g., late in the evening), thereby minimizing the effect of any potential outages. Therefore, Tinian Alternative 1 construction activities would result in less than significant impacts to the existing electrical utility.

4.14.3.1.1.2 Potable Water

Construction water use would include dust suppression, concrete mixing, rinsing new water pipes, hydrotesting new water storage tanks, and other typical construction requirements. As discussed in the potable water portion of Section 2.4.1, Elements Common to All Action Alternatives, the projected water supply requirements for the proposed action would be mostly met by a new water system and supply wells in the Military Lease Area for military use. The new water system would be completely
independent of the existing Commonwealth Utilities Corporation system. The proposed water system would be constructed early in the site development process. The existing Commonwealth Utilities Corporation water system will be able to meet increased demand as a result of construction activities in the early phases of construction due to the limited need for road watering, cement requirements, and other construction water uses. After the proposed military potable water system is installed, construction activities within the Military Lease Area would use minimal water from the existing Commonwealth Utilities Corporation water system. This use would be limited to water use by facilities outside of the Military Lease Area, such as the existing concrete batch plant, if utilized by the construction contractor.

Use of the existing Commonwealth Utilities Corporation potable water system would occur for supplying the proposed military facilities at the Port of Tinian. Thus, construction impacts to the existing Commonwealth Utilities Corporation potable water system would be limited to tie-ins at the Port of Tinian, which could cause short duration local water service outages. The impacts of these outages would be coordinated with the Commonwealth Utilities Commission operators to be during the least disruptive times, and are anticipated to be of short duration.

The majority of the construction workers would reside in a work camp outside the Military Lease Area provided by the construction contractor. With proper negotiation, the existing worker facilities associated with the Tinian Dynasty Hotel and Casino could potentially be utilized as the work camp. Construction managers and their dependents are expected to find housing in existing properties outside of the Military Lease Area on Tinian. The additional work force would increase the demand on the existing Commonwealth Utilities Corporation potable water system by approximately 33,525 gallons (126,906 liters) per day. To evaluate the capacity and ability of the existing Tinian potable water system to meet project needs, production and use data from October 2011 through August 2014 was utilized. The average daily production over this time period was 1,056,553 gallons (3,999,488 liters) per day; average use was 320,384 gallons (1,212,785 liters) per day. The potential water production from Maui Well #2 has been estimated as at least 1 million gallons per day (3.8 million liters) of potable water in the dry season and 1.5 million gallons (5.7 million liters) per day in the wet season (Army Corps of Engineers 2003). Based upon this production range, the maximum production in 2013 of 1,260,000 gallons (4,769,619 liters) per day was selected to represent a new average production rate that could be sustainably pumped. Utilizing this new average pump rate, an additional 203,477 gallons (770,131 liters) per day would be available for the potable water system. After applying the unaccounted for water factor of 75%, 50,862 gallons (192,534 liters) per day (after losses in the distribution system) would be available to the Tinian population.

The existing potable water system would be expected to meet increased water needs during construction. Therefore, construction under Tinian Alternative 1 would result in less than significant impacts to the existing potable water utility.

4.14.3.1.1.3 Wastewater

The existing U.S. military septic tank and leaching field system on Tinian is not currently being used due to poor condition of the leaching field. Currently, Joint Region Marianas has plans to rehabilitate this system in order to support current military training exercises not associated with the proposed action on Tinian. Use of this existing system during construction for the proposed action may require the
rehabilitation of the septic tank or leaching field depending on its condition at the time of the construction. The use of the existing system for the proposed action would also require inspection and permit compliance verification prior to use. Wastewater generated around construction sites by construction workers and managers would be collected at temporary toilet facilities that would be emptied periodically using a vacuum truck, and then transported to the existing U.S. military septic tank and leaching field system for treatment and disposal. The estimated average daily wastewater flow rate is 1,370 gallons (5,190 liters). The existing system is permitted for an average daily flow of 6,640 gallons (25,000 liters), thus there is a 5,270 gallons (19,950 liters) per day excess capacity. The estimated wastewater flow generated during construction is anticipated to be within the excess capacity of the U.S. military septic tank and leaching field system. Should this existing U.S. military septic tank and leaching field system become unavailable, a potential alternate approach may be to pursue the existing wastewater system at the Tinian Dynasty Hotel and Casino to treat and dispose of wastewater. This option would require proper negotiation with the Tinian Dynasty Hotel and Casino and regulatory approval.

It is anticipated that construction managers and their dependents would reside in existing housing outside the Military Lease Area. The individual septic tank and leaching field systems associated with these housing units are typically sized for small families. Consequently, there should be no additional capacity required. A majority of the construction workforce will reside in a work camp located outside the Military Lease Area provided by the construction contractor. With proper negotiation and rehabilitation, existing worker facilities associated with the Tinian Dynasty Hotel and Casino could potentially be utilized as the work camp. According to recent discharge monitoring reports in 2014, the Dynasty Hotel and Casino’s wastewater treatment plant has an average daily flow up to 150,000 gallons (568,000 liters). The permitted discharge limit of the plant is a monthly average flow of 240,000 gallons (908,000 liters), thus there is 90,000 gallons (341,000 liters) per day of excess capacity. The estimated increase in wastewater flow generated by the construction workforce is an average daily flow of 27,400 gallons (104,000 liters) and is well within the 90,000 gallons (341,000 liters) per day of excess capacity at the plant. As such, the existing plant is anticipated to have adequate capacity to treat and dispose of the additional wastewater flow generated by the construction workforce. It is not anticipated that upgrades to the wastewater treatment plant would be required if the work camp is utilized.

Because the existing wastewater infrastructure could handle the projected wastewater increase associated with the construction and construction worker housing, it is not anticipated that the wastewater generated during construction would cause existing wastewater systems to operate in violation of their regulatory requirements. Therefore, Tinian Alternative 1 construction activities would result in less than significant impacts to the existing wastewater infrastructure.

4.14.3.1.4 Stormwater Management

Drainage and Low Impact Development is described in Section 4.3, Water Resources. Stormwater management infrastructure would be constructed in accordance with local and federal regulations and guiding documents that take into account both quantity and quality. During construction stormwater management facilities would be strategically placed throughout the base camp, the Port of Tinian improvement area, the Tinian International Airport, along road improvements, and within the Tinian RTA. These improvements would be located adjacent to and downstream of the proposed site improvements, to capture, detain, and treat any increases in stormwater runoff volume, rate, and
pollutants, as applicable. Temporary stormwater control facilities would be, where possible, located in areas that will ultimately be developed such that surface disturbances would be minimized. In locations where the temporary facilities would not have additional construction on the disturbed area, the site would be re-graded, seeded and mulched to minimize stormwater erosion impacts.

Proposed stormwater retention ponds and other infiltration devices would be located outside of existing water wellhead protection zones, in accordance with the CNMI Well Drilling and Well Operations Regulations. Other environmental and operational constraints, such as Federal Aviation Administration mitigation areas for ecological/species protection, would also be applied when siting proposed stormwater management improvements to prevent and/or minimize the potential for any adverse impacts.

The primary stormwater improvements would consist of temporary surface conveyance and control via vegetated swales, pipe culverts, and retention ponds. The majority of roadways would be rural road sections (no curb and gutter) and thus stormwater would be controlled using roadside swales. Urban road sections with curb, gutter, and drainage inlets would only be used when necessary and in limited quantity, as applicable, for water quality treatment, and improve conveyance of large volumes of stormwater, and to minimize associated construction, operation, and maintenance costs.

Construction of permanent stormwater management facilities would occur at the base camp, training areas, Munitions Storage Area, the Port of Tinian, the Tinian International Airport, and at other areas with proposed site improvements. An effort would be made during construction to reduce areas disturbed to only those areas required to construct each facility or improvement. The stormwater management facilities would be modified, as needed, to accommodate construction phasing.

Based on the stormwater management treatment systems described above and the implementation of best management practices in Appendix D, *Best Management Practices*, Tinian Alternative 1 would result in less than significant impacts to stormwater management.

### 4.14.3.1.1.5 Solid Waste

Solid waste generated during the construction phase would primarily consist of green waste resulting from the clearing and grubbing of the base camp, Munitions Storage Area, roadways, and training facility footprints. The solid waste streams anticipated to be generated during the construction phase are summarized in Table 4.14-2.

Construction and demolition waste would be sampled if reviews of existing reports indicate that lead-based paint or asbestos could be present. If required, waste would be treated and disposed of appropriately (see Section 4.16, *Hazardous Materials and Waste*). Green waste can be beneficially reused as compost, cover material, animal food, and other alternative uses. To the extent possible, beneficial reuse and recycling of construction and demolition waste would occur. Other construction and demolition waste would be transported off-island for recycling at facilities with capacity to receive the material and proper permitting, in accordance with construction and demolition waste disposal regulations.
Table 4.14-2. Tinian Alternative 1 Projected Construction Waste

<table>
<thead>
<tr>
<th>Waste Description</th>
<th>Waste in Tons (metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Waste</strong></td>
<td></td>
</tr>
<tr>
<td>Tinian Base Camp</td>
<td>Vegetation Clearance 60,984 tons (55,324 metric tons)</td>
</tr>
<tr>
<td>Training Range Alternative 1</td>
<td>Range Clearance 378,824 tons (343,667 metric tons)</td>
</tr>
<tr>
<td><strong>Construction and Demolition Waste</strong></td>
<td></td>
</tr>
<tr>
<td>Base Camp</td>
<td>Construction and demolition waste from construction of base camp facilities (3.89 pounds per square foot of facility space) 766 tons (695 metric tons)</td>
</tr>
<tr>
<td>Base Camp Road Demolition</td>
<td>Asphalt waste from planned demolition of 8,563 feet of existing roads located within the base camp 6,668 tons (6,049 metric tons)</td>
</tr>
<tr>
<td>Munitions Storage Area</td>
<td>Construction and demolition waste from planned construction of Munitions Storage Area facilities (3.89 pounds per square foot of facility space) 168.2 tons (152.6 metric tons)</td>
</tr>
<tr>
<td>Tinian International Airport Improvements</td>
<td>Construction and demolition waste from planned construction of Tinian Airport Improvements (3.89 pounds per square foot of facility space) 468.4 tons (425.8 metric tons)</td>
</tr>
<tr>
<td>Port of Tinian</td>
<td>Construction and demolition waste from planned construction of Port of Tinian facilities (3.89 pounds per square foot of facility space) 29.7 tons (26.9 metric tons)</td>
</tr>
</tbody>
</table>


Other municipal solid waste generated by the construction contractors would be disposed of at a regulatory compliant facility. The existing solid waste facilities on Tinian are not in compliance with regulatory requirements, and therefore solid waste generated would have to be transferred off-island to a compliant landfill.

Based on the previous analysis, Tinian Alternative 1 construction activities would result in less than significant impacts to the solid waste management.

4.14.3.1.1.6 Information Technology/Communications

The proposed telecommunications system would consist of a combination of overhead pole-mounted cabling and underground conduits, manholes/handholes, and pull-boxes that would provide the site infrastructure to support government communications systems (e.g., government telephone, government data, security, and closed circuit television), as well as commercial utility services, including commercial telephone, internet, and cable television. New distribution infrastructure originating at the base camp area distribution node would distribute telecommunications services to end-user buildings and facilities in the base camp, ranges, and other facilities. Proposed core information technology/communications cable connections would connect the area distribution node to end user buildings and facilities at the base camp through overhead pole-supported cabling. Proposed core
information technology/communications cable connections would connect the area distribution node in the base camp to range entrances through overhead pole supported cabling and underground concrete encased duct banks and cabling.

Commercial telephone, internet, and cable television services would be provided to the base camp through infrastructure provided by the commercial utility providers. The cables are anticipated to be installed mostly overhead except for routing that crosses the runway clear zone, which would be installed underground. Inside the base camp, the cables for commercial telephone, internet, and cable television service would be distributed around the base camp through overhead pole-supported cabling.

Commercial telephone, internet, and cable television services would be provided to the construction work camp through infrastructure provided by the commercial utility providers. Inside the work camp, the cables for commercial telephone, internet, and cable television service is anticipated to be distributed through overhead pole-supported cabling. Commercial telephone, internet, and cable television services to the work camp would be minimal and have limited impact to the existing commercial provider infrastructure. Impact to existing commercial telephone, television, and internet services during construction would be limited to potential short outages that would be necessary to facilitate new connections to the existing systems. As with other utilities, such outages would be of short duration and would be scheduled to cause the least disruption. Therefore, Tinian Alternative 1 construction activities would result in less than significant impacts to the existing information technology/communications utilities.

### 4.14.3.1.2 Operation Impacts

#### 4.14.3.1.2.1 Electrical Power

The electrical load increase due to the population change for operation workers and training personnel is included in the facility demand calculations, which is calculated on a watts per square foot basis and included in the total maximum demand shown in Table 4.14-3. The electrical load increase could be less than the calculated load due to implementation of Leadership in Energy and Environmental Design Certification and the Energy Policy Act of 2005, and best management practices listed in Appendix D, Best Management Practices. However, even without such savings, the total power demand for the Tinian Alternative 1 shown in Table 4.14-3 is 6.03 megawatts, which is less than the current excess capacity of the existing power plant. The existing island-wide power generation facility is capable of meeting the increased power demand during operation.

A study of the existing electrical utility infrastructure was performed and documents that both Tinian’s generating system and distribution system are reliable and in good condition. Details of this study are provided in Volume II of Appendix P, Utilities Study. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to the existing electric utility generation capability and electrical distribution system.
Table 4.14-3. Tinian Future Proposed Plan Electrical Power Demand Forecast

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Megawatts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Existing Peak Demand (see note below)</td>
<td>4.5</td>
</tr>
<tr>
<td>2</td>
<td>Base Camp</td>
<td>1.17</td>
</tr>
<tr>
<td>3</td>
<td>Training Facilities</td>
<td>0.21</td>
</tr>
<tr>
<td>4</td>
<td>Munition Storage Area</td>
<td>0.12</td>
</tr>
<tr>
<td>5</td>
<td>Biosecurity facility and Port of Tinian Bulk Fuel Storage Tanks</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>Total Increase</td>
<td>1.53</td>
</tr>
<tr>
<td></td>
<td>Percent Increase from Existing Peak Demand</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td>Total Tinian Demand</td>
<td>6.03</td>
</tr>
<tr>
<td></td>
<td>Tinian Power Plant Capacity</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>Available Remaining Power Capacity</td>
<td>6.47</td>
</tr>
</tbody>
</table>

Note: The existing peak demand includes the future anticipated load for the existing International Broadcasting Bureau facility. The International Broadcasting Bureau facility would remain on Tinian in Tinian Alternative 1. The International Broadcasting Bureau load is included for all three proposed alternatives, because it would continue to operate for a period of time before it is relocated.

Source: DoN 2014a.

4.14.3.1.2.2 Potable Water

There is currently no existing potable water system to, or within, the Military Lease Area. Under Tinian Alternative 1, the base camp, Munitions Storage Area, and proposed facility improvements at the Port of Tinian would require potable water and fire protection systems. The estimated average and maximum demands for the proposed facilities are provided in Table 4.14-4.

Table 4.14-4. Estimated Potable Water Demand for Proposed Tinian Range Training Area System

<table>
<thead>
<tr>
<th>Description</th>
<th>Average Demand</th>
<th>Maximum Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Camp (Including Munitions Storage Area)</td>
<td>240,013 gallons per day (908,548 liters per day)</td>
<td>459,758 gallons per day (1,740,374 liters per day)</td>
</tr>
<tr>
<td>Port facilities (Military Biosecurity &amp; Vehicle Wash Down Facilities)</td>
<td>22,181 gallons per day (83,965 liters per day)</td>
<td>22,581 gallons per day (85,479 liters per day)</td>
</tr>
<tr>
<td>Total Tinian Demand for Proposed Action</td>
<td>262,194 gallons per day (992,513 liters per day)</td>
<td>482,339 gallons per day (1,825,853 liters per day)</td>
</tr>
</tbody>
</table>

Source: DoN 2014a.

Under Tinian Alternative 1, operation of the potable water system serving the proposed military facilities, except the proposed Port of Tinian facilities, would be independent of the Commonwealth Utilities Corporation’s water system. Approximately three to six new supply wells, plus one backup, located to the north and east of the Tinian International Airport within the Military Lease Area would be installed to support the proposed action. The operation and maintenance of this new system, including supply, transmission, and distribution, would be independent of the Commonwealth’s Utilities Corporation’s water system. Fire suppression services for the expeditionary airport facilities would be provided by standard expeditionary procedures such as using stand-by fire water trucks as no permanent utility infrastructure will be installed.

Due to the distance between the proposed facilities at the Port of Tinian (in the village of San Jose) and the proposed military potable water system (in the Military Lease Area), the Commonwealth Utilities Corporation’s potable water system would need to be used to supply water to the proposed facilities at the Port of Tinian. The proposed facilities at the Port of Tinian would require an average demand of 12,675 gallons (47,980 liters) per day.
The potable water demand from operation personnel and their dependents would average 30,250 gallons (114,509 liters) per day. The operation personnel and their dependents would reside in the public areas and increase the demand on the Commonwealth Utilities Corporations’ potable water system. The total average demand of 12,675 gallons (47,980 liters) per day for personnel and industrial use at the proposed facilities at the Port of Tinian and operation personnel and their dependents living outside the Military Lease Area result in a total demand of 42,925 gallons (162,489 liters) per day. As described in the Construction section, the Tinian potable water system has a potential to produce and deliver an additional 50,862 gallons (192,534 liters) per day. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to the Tinian potable water system.

### 4.14.3.1.2.3 Wastewater

The areas requiring wastewater infrastructure on Tinian under the proposed action include the base camp, Munitions Storage Area, and proposed facilities at the Port of Tinian. The largest wastewater needs for the proposed action come from the base camp. The estimated wastewater flows for the proposed base camp are shown in Table 4.14-5, and include domestic and industrial wastewater sources. Due to the magnitude of the estimated flows associated with the proposed action, the existing U.S. military septic tank and leaching field system would not have adequate capacity. A new wastewater collection and treatment system is required to support the proposed action and would be located at the base camp. Due to the transient nature of the population, the wastewater system would need to be able to handle a wide range of flow conditions.

**Table 4.14-5. Estimated Wastewater Flows generated by Military Personnel**

<table>
<thead>
<tr>
<th>Wastewater Flow</th>
<th>Flow Conditions</th>
<th>No Training</th>
<th>For Basic Max Training Population</th>
<th>For Surge Training Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Day</td>
<td></td>
<td>47,052 gallons per day (178,111 liters per day)</td>
<td>122,052 gallons per day (462,016 liters per day)</td>
<td>197,052 gallons per day (745,922 liters per day)</td>
</tr>
<tr>
<td>Peak Day</td>
<td></td>
<td>51,327 gallons per day (194,293 liters per day)</td>
<td>238,827 gallons per day (904,058 liters per day)</td>
<td>426,327 gallons per day (1,613,823 liters per day)</td>
</tr>
<tr>
<td>Peak Hour*</td>
<td></td>
<td>58,452 gallons per day (221,264 liters per day)</td>
<td>402,312 gallons per day (1,522,916 liters per day)</td>
<td>655,602 gallons per day (2,481,723 liters per day)</td>
</tr>
</tbody>
</table>

*Peak Hour is the peak hour flow rate given as a daily rate.

Source: DoN 2014a. *Peak Hour is the peak hour flow rate given as a daily rate.

Note: The “no training” scenario accounts for the operation and maintenance of the base camp by the operations personnel when no training military personnel are present. The “training population” scenario would include wastewater generated by up to 1,500 military training personnel. The “surge training population” scenario addresses the potential for up to 3,000 military training personnel for several weeks, several times per year inclusive within the proposed action for 20 weeks per year of training.

Per discussions with the CNMI Bureau of Environmental and Coastal Quality, Tinian is a Class I Aquifer Recharge Area, which, by the CNMI regulations, requires that projects with an average daily flow greater than 5,000 gallons (18,927 liters) per day utilize technology other than a septic tank and leaching field system. The CNMI regulations would also require that the system be capable of producing secondary treated effluent. As shown in Table 4.14-5, the average daily flow could vary from 47,052 gallons (178,111 liters) per day to 197,052 gallons (745,922 liters) per day. Therefore, the wastewater treatment system would require a minimum of secondary level of treatment, as defined by CNMI regulations. The CNMI secondary treated effluent regulatory requirements are summarized in Table 4.14-6.
Table 4.14-6. CNMI Secondary Treated Effluent Requirements (Base Camp)

<table>
<thead>
<tr>
<th>Effluent Characteristic</th>
<th>Maximum Discharge Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Monthly</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand, 5-day</td>
<td>20 mg/L</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>20 mg/L</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>1.0 mg/L</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>23 cfu/100 mL</td>
</tr>
<tr>
<td>pH</td>
<td>Between 6.5 and 8.6</td>
</tr>
</tbody>
</table>

Legend: cfu = colony forming unit; mg/L = milligram per liter; mL = milliliter.


A critical issue with the regulatory effluent limits is the total nitrogen parameter. The limits for secondary treated effluents include a total nitrogen concentration of 1.0 milligram per liter. This regulatory limit is lower than what is attainable using currently best available control technology for total nitrogen, wherein total nitrogen is the sum of the organic nitrogen, ammonia, nitrite, and nitrate concentrations. The CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality is aware of this issue and evaluates this requirement on a case-by-case basis. According to the CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality, other systems required to meet this nitrogen limit measure nitrate as nitrogen.

The estimated wastewater characteristics for the base camp are summarized in Table 4.14-7, see Volume IV of Appendix P, Utilities Study.

Table 4.14-7. Estimated Influent Loading (Base Camp)

<table>
<thead>
<tr>
<th>Training Scenario</th>
<th>Biological Oxygen Demand (5-day)</th>
<th>Total Suspended Solids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(pounds/day)</td>
<td>(milligrams/liter)</td>
</tr>
<tr>
<td></td>
<td>(pounds/day)</td>
<td>(milligrams/liter)</td>
</tr>
<tr>
<td>No Training</td>
<td>16</td>
<td>679</td>
</tr>
<tr>
<td>Typical Training</td>
<td>271</td>
<td>418</td>
</tr>
<tr>
<td>Training Surge</td>
<td>526</td>
<td>413</td>
</tr>
</tbody>
</table>

Note: * Higher concentration is due to a lower flow rate with fewer personnel; more personnel result in additional flows

Source: DoN 2014a.

As discussed in the Utilities subsection of Section 2.4.1, Elements Common to All Alternatives, a new wastewater collection, treatment, and disposal system would be provided at the base camp. This system would include sewage receiving and solids management. The wastewater treatment system at the base camp would be designed, permitted, constructed, certified for use, operated, and maintained in accordance with the CNMI regulations and be capable of meeting the CNMI’s secondary treated effluent requirements. Industrial wastewater sources at the base camp such as the dining facility, fuel loading, vehicle wash platforms, vehicle grease racks, and vehicle maintenance shops would have their wastewater flow directed through grease traps or oil/water separators prior to flowing downstream to the wastewater treatment system. Secondary treated effluent would be disposed of through a subsurface disposal area consisting of sub-leaching fields.

The Munitions Storage Area would be located outside of the base camp area and would have lower wastewater needs that would be served by individual sewage disposal systems, including a septic tank and leach field. The estimated average daily wastewater flow for the Munitions Storage Area is 3,880 gallons (14,687 liters) per day. The individual wastewater disposal systems for the Munitions Storage Area would be designed, permitted, constructed, certified for use, operated, and maintained in accordance with the CNMI regulations. Where site limitations of area and/or soil type are such that methods of individual wastewater disposal system cannot be utilized, wastewater would be stored in
water-tight holding tanks and periodically pumped by a licensed contractor and taken to the base camp wastewater treatment plant for treatment and disposal.

The proposed facilities at the Port of Tinian would require treatment of industrial wastewater generated from the wash-down of vehicles, which is estimated to be up to 12,000 gallons (45,000 liters) per day when the facility is in use. This wastewater from the vehicle wash-down area would be treated by a sedimentation basin followed by an intermittent sand filtration system prior to discharge to an adjacent stormwater retention pond. The proposed biosecurity facility at the Port of Tinian is estimated to generate an average daily wastewater flow of 576 gallons (2,180 liters) per day. Due to the biosecurity facility’s proximity to the coastline, it is anticipated that the domestic wastewater would be stored in a holding tank that would be periodically emptied and contents transferred to the base camp wastewater treatment plant for treatment and disposal.

Wastewater generated on the ranges would be collected in portable toilets and emptied at the base camp wastewater treatment and disposal system periodically by a licensed contractor. The proposed independent military wastewater infrastructure would be designed and constructed to handle the projected increase in wastewater generated during operation. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to the existing wastewater infrastructure.

4.14.3.1.2.4 Stormwater Management

Tinian Alternative 1 would result in newly created impervious surfaces including roads, airport improvements, base camp facilities, port improvements, and minor structures associated with training facilities, as described in Section 2.4.1.1, Construction and Improvements. In accordance with local and federal guidance on water quality, a Low Impact Development approach to stormwater management would be utilized to maintain existing hydrology conditions to the maximum extent technically feasible. The Low Impact Development strategies include detailed modeling and design alternative analyses to both maximize infiltration of treated stormwater for groundwater recharge and prevent the transportation of pollutants resulting from proposed facilities or operations. Low Impact Development devices and other structural and non-structural best management practices would be selected and sited based on specific land use activities, anticipated pollutant characteristics, and pollutant treatment capabilities.

Stormwater management systems require regular maintenance to ensure the systems operate as designed and continue to provide adequate storage capacity, conveyance, and treatment. The use of a Low Impact Development approach requires additional maintenance specific to water quality and the operation of the Low Impact Development devices. A Stormwater Management Plan would be developed taking into consideration the climate, site conditions, operations, pollutant generation, and specific Low Impact Development devices such as vegetated swales and bioretention and nonstructural best management practices such as range clearance procedures. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to stormwater management. Drainage and Low Impact Development is described in Section 4.3, Water Resources.
### 4.14.3.1.2.5 Solid Waste

There are currently no permanently established U.S. military solid waste facilities on Tinian. The existing solid waste facility on Tinian consists of a non-compliant open disposal site that is operated under a the CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality Administrative Order dictating specific operation and maintenance measures. The estimated total solid waste demand for operation of the proposed action is shown below in Table 4.14-8.

<table>
<thead>
<tr>
<th>Waste Stream</th>
<th>Estimated Percent</th>
<th>Projected Waste Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and Cardboard</td>
<td>28.5%</td>
<td>6,185 pounds per day</td>
</tr>
<tr>
<td>Glass</td>
<td>4%</td>
<td>868 pounds per day</td>
</tr>
<tr>
<td>Plastics and Polystyrene</td>
<td>19.5%</td>
<td>4,232 pounds per day</td>
</tr>
<tr>
<td>Metal (including aluminum and expended brass cartridges estimated at 300 pounds per day)</td>
<td>6%</td>
<td>1,302 pounds per day</td>
</tr>
<tr>
<td>Organics</td>
<td>34.5%</td>
<td>7,487 pounds per day</td>
</tr>
<tr>
<td>Construction and Demolition from operations and maintenance</td>
<td>5%</td>
<td>1,085 pounds per day</td>
</tr>
<tr>
<td>Electronics</td>
<td>1%</td>
<td>217 pounds per day</td>
</tr>
<tr>
<td>Remaining/Composite MSW</td>
<td>1.3%</td>
<td>282 pounds per day</td>
</tr>
<tr>
<td>Household Hazardous Waste</td>
<td>0.2%</td>
<td>43 pounds per day</td>
</tr>
<tr>
<td><strong>Total Solid Waste Generation</strong></td>
<td></td>
<td>21,700 pounds per day</td>
</tr>
<tr>
<td><strong>40% Recycle Rate</strong></td>
<td></td>
<td>8,680 pounds per day</td>
</tr>
<tr>
<td><strong>Remaining Solid Waste Disposal</strong></td>
<td></td>
<td>13,020 pounds per day</td>
</tr>
</tbody>
</table>

*Note: Based on 7.0 pounds per person per day generation rate and 40% of the generated waste would be recycled (7.0 pounds per day X 3,100 X 0.60 = 13,020 pounds per day disposal requirement). The requirement is based on the peak number of personnel supported during the CJMT training cycle.*

The disposal requirements for the projected solid waste generated as a result of the proposed action would initially be met by establishment of a solid waste transfer station, recycling center, and associated open storage areas within the base camp area. The municipal solid waste would be collected in dumpsters and recycling containers located throughout the base camp and training areas. Solid waste container trucks would transport the waste containers to the transfer station and recycling center at the base camp, where the municipal solid waste would be separated, shredded, compacted, baled, and stored in holding areas. The processed waste would then be shipped to a facility in compliance with U.S. Environmental Protection Agency/Resource Conservation and Recovery Act requirements. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to solid waste management.
4.14.3.1.2.6 Information Technology/Communications

The current commercial information technology/communications facilities have adequate capacity to serve the proposed new facilities. The island’s telephone and internet provider, IT&E, and the island’s television provider, Docomo Pacific, have stated that there are sufficient capacities to provide commercial telephone and internet to the new planned facilities. New service lines to the new facilities would be routed via a combination of aerial cables and underground cables in concrete encased duct banks.

Military use of the existing information technology infrastructure would be limited to a leased line (for security) or Satellite connection to Guam. Since the high security connections to the fiber optics system would be a line lease, capacity of the existing civilian portion of that cable is not expected to be significantly impacted. The Tinian information technology infrastructure in the Military Lease Area would not be connected to the commercial services. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to the current information technology/communications utilities.

4.14.3.2 Tinian Alternative 2

4.14.3.2.1 Construction Impacts

The impacts to the electrical power, potable water, wastewater, and information technology/communications utilities and stormwater management resulting from Tinian Alternative 2 construction activities are nearly the same as those described for Tinian Alternative 1. See Section 4.14.3.1, Tinian Alternative 1, for a discussion of impacts.

The overall impacts to solid waste management during construction of Tinian Alternative 2 would be similar to those described in Section 4.14.3.1, Tinian Alternative 1, with the difference being the quantity of green waste produced (an additional 32,382 tons [29,377 metric tons]), which is a result of differences between the footprint of the training facilities under Tinian Alternative 2 as compared to Tinian Alternative 1, and the future relocation of the International Broadcasting Bureau facilities, which would generate increased construction and demolition waste. Construction and demolition waste would be generated during the construction phase in the quantities summarized in Table 4.14-9.

The differences in the quantity of green waste (439,808 tons [398,991 metric tons] versus 472,190 tons [428,368 metric tons]) and construction and demolition waste (8,100 tons [7,349 metric tons] versus 8,649 tons [7,847 metric tons]) would not have a notable effect on the impact to the solid waste management. For the reasons discussed above, Tinian Alternative 2 construction activities would result in less than significant impacts to the existing electrical, potable water, wastewater, and information technology/communications utility and less than significant impacts to stormwater management and solid waste management.
Table 4.14-9. Tinian Alternative 2 Projected Construction Waste

<table>
<thead>
<tr>
<th>Waste Description</th>
<th>Waste in Tons (metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Waste</strong></td>
<td></td>
</tr>
<tr>
<td>Tinian Base Camp</td>
<td></td>
</tr>
<tr>
<td>Vegetation Clearance</td>
<td>60,984 tons (55,324 metric tons)</td>
</tr>
<tr>
<td>Training Range Alternative 2</td>
<td></td>
</tr>
<tr>
<td>Range Clearance</td>
<td>411,206 tons (373,044 metric tons)</td>
</tr>
<tr>
<td><strong>Construction and Demolition Waste</strong></td>
<td></td>
</tr>
<tr>
<td>Base Camp</td>
<td>Construction and demolition waste from construction of base camp facilities (3.89 pounds per square foot of facility space) 766 tons (695 metric tons)</td>
</tr>
<tr>
<td>Base Camp Road Demolition</td>
<td>Asphalt waste from planned demolition of 8,563 feet of existing roads located within the base camp 6,668 tons (6,049 metric tons)</td>
</tr>
<tr>
<td>Munitions Storage Area</td>
<td>Construction and demolition waste from planned construction of MSA facilities (3.89 pounds per square foot of facility space) 168.2 tons (152.6 metric tons)</td>
</tr>
<tr>
<td>Tinian International Airport Improvements</td>
<td>Construction and demolition waste from planned construction of Tinian Airport Improvements (3.89 pounds per square foot of facility space) 468.4 tons (425.8 metric tons)</td>
</tr>
<tr>
<td>Port of Tinian</td>
<td>Construction and demolition waste from planned construction of Port of Tinian facilities (3.89 pounds per square foot of facility space) 29.7 tons (26.9 metric tons)</td>
</tr>
<tr>
<td><strong>International Broadcasting Bureau Fuel Tank Demolition</strong></td>
<td></td>
</tr>
<tr>
<td>Steel Debris</td>
<td>Scrap metal debris generated by the planned demolition of the two existing above ground storage tanks in the International Broadcasting Bureau compound 92.7 tons (84.1 metric tons)</td>
</tr>
<tr>
<td>Concrete Debris</td>
<td>Concrete debris generated by the planned demolition of the above storage tank foundations in the International Broadcasting Bureau 455.6 tons (413.3 metric tons)</td>
</tr>
</tbody>
</table>


4.14.3.2.2 Operation Impacts

The total power demand for the Tinian Alternative 2 associated with the base camp, Munitions Storage Area, and proposed facilities at the Port of Tinian, along with the projected potable water demand, proposed water distribution system, projected wastewater flows, proposed wastewater collection and treatment system, and the information technology/communications infrastructure would be almost identical to that described in Section 4.14.3.1, Tinian Alternative 1.

Tinian Alternative 2 would result in impervious surfaces including roads, airport improvements, base camp facilities, port improvements, and minor structures associated with training facilities, as described in Section 2.4.1.2, Construction and Improvements. The stormwater management system for Tinian Alternative 2 would utilize the same approach as described in Section 4.14.3.1, Tinian Alternative 1.
Specific drainage elements including Low Impact Development device selection and best management practice sizing and locations would be modified to accommodate the proposed site improvements within Tinian Alternative 2. As with Tinian Alternative 1, Tinian Alternative 2 would follow strict operation and maintenance protocols to ensure the stormwater management system functions as designed and that the system does not create any adverse effects to downstream or off-site facilities.

The planned solid waste transfer station, recycling center, off-island shipment, and open storage areas planned in Tinian Alternative 1 would also be planned in Tinian Alternative 2. Therefore, the impacts during Tinian Alternative 2 operations would be nearly the same as presented in Section 4.14.3.1, Tinian Alternative 1.

As such, operation of Tinian Alternative 2 would result in less than significant impacts to the existing electrical power, potable water, wastewater, and information technology/communications utilities and less than significant impacts to stormwater management and solid waste management.

4.14.3.3 Tinian Alternative 3

4.14.3.3.1 Construction Impacts

The impacts to the electrical power, potable water, wastewater, and information technology/communications utilities and stormwater management resulting from Tinian Alternative 3 construction activities are nearly the same as those described for Tinian Alternative 1. See Section 4.14.3.1, Tinian Alternative 1, for a discussion of impacts.

The overall impacts to the solid waste management during Tinian Alternative 3 construction activities would be similar to those described in Section 4.14.3.1, Tinian Alternative 1, with the difference being the quantity of green waste produced (an additional 24,789 tons [22,481 metric tons]), which is a result of differences between the footprint of the base camp area and the training facilities, and the future relocation of the International Broadcasting Bureau facilities, which would generate increased construction and demolition waste. Construction and demolition waste would be generated during the construction phase in the quantities summarized in Table 4.14-10.

The differences in the quantity of green waste (439,800 tons [398,991 metric tons] versus 464,589 tons [421,472 metric tons]) and construction and demolition waste (8,100 tons [7,349 metric tons] versus 8,649 tons [7,847 metric tons]) would not have a notable effect on the impact to the solid waste management. Therefore, Tinian Alternative 3 construction activities would result in less than significant impacts to the existing electrical, potable water, wastewater, and information technology/communications utility and less than significant impacts to stormwater management solid waste management.
Table 4.14-10. Tinian Alternative 3 Projected Construction Waste

<table>
<thead>
<tr>
<th>Waste Description</th>
<th>Waste in Tons (metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Waste</strong></td>
<td></td>
</tr>
<tr>
<td>Tinian Base Camp</td>
<td>Vegetation Clearance 60,984 tons (55,324 metric tons)</td>
</tr>
<tr>
<td>Training Range Alternative 3</td>
<td>Range Clearance 403,605 tons (366,148 metric tons)</td>
</tr>
<tr>
<td><strong>Construction and Demolition Waste</strong></td>
<td></td>
</tr>
<tr>
<td>Base Camp</td>
<td>Construction and demolition waste from construction of base camp facilities (3.89 pounds per square foot of facility space) 766 tons (695 metric tons)</td>
</tr>
<tr>
<td>Base Camp Road Demolition</td>
<td>Asphalt waste from planned demolition of 8,563 feet of existing roads located within the base camp 6,668 tons (6,049 metric tons)</td>
</tr>
<tr>
<td>Munitions Storage Area</td>
<td>Construction and demolition waste from planned construction of Munitions Storage Area facilities (3.89 pounds per square foot of facility space) 168.2 tons (152.6 metric tons)</td>
</tr>
<tr>
<td>Tinian International Airport Improvements</td>
<td>Construction and demolition waste from planned construction of Tinian Airport Improvements (3.89 pounds per square foot of facility space) 468.4 tons (425.8 metric tons)</td>
</tr>
<tr>
<td>Port of Tinian</td>
<td>Construction and demolition waste from planned construction of Port of Tinian facilities (3.89 pounds per square foot of facility space) 29.7 tons (26.9 metric tons)</td>
</tr>
<tr>
<td><strong>International Broadcasting Bureau Fuel Tank Demolition</strong></td>
<td></td>
</tr>
<tr>
<td>Steel Debris</td>
<td>Scrap metal debris generated by the planned demolition of the two existing above ground storage tanks in the International Broadcasting Bureau compound 92.7 tons (84.1 metric tons)</td>
</tr>
<tr>
<td>Concrete Debris</td>
<td>Concrete debris generated by the planned demolition of the AST foundations in the International Broadcasting Bureau 455.6 tons (413.3 metric tons)</td>
</tr>
</tbody>
</table>


4.14.3.3.2 **Operation Impacts**

The total power demand for the Tinian Alternative 3 associated with the base camp, Munitions Storage Area, and proposed facilities at the Port of Tinian, along with the projected potable water demand, proposed water distribution system, projected wastewater flows, proposed wastewater collection and treatment system, and the information technology/communications infrastructure would be almost identical to that described in Section 4.14.3.1, Tinian Alternative 1.
Tinian Alternative 3 would result in newly created impervious surfaces including roads, airport improvements, base camp facilities, port improvements, and minor structures associated with training facilities, as described in Section 2.4.1.2, Construction and Improvements. The stormwater management system for Tinian Alternative 3 would utilize the same approach as described above in Tinian Alternative 1. Specific drainage elements including Low Impact Development device selection and best management practice sizing and location would be modified to accommodate the proposed site improvements within Tinian Alternative 3. As with Tinian Alternative 1, Tinian Alternative 3 would follow strict operation and maintenance protocols to ensure the stormwater management system functions as designed and that the system does not create any adverse effects to downstream or off-site facilities.

The planned solid waste transfer station, recycling center, open storage areas, and off-island shipment and disposal in Tinian Alternative 1 would also be planned for Tinian Alternative 3. Therefore, the impacts during Tinian Alternative 3 operations would be the same as presented in Section 4.14.3.1, Tinian Alternative 1. Tinian Alternative 3 operations would result in less than significant impacts to the existing electrical power, potable water, wastewater, and information technology/communications utilities and less than significant impacts to stormwater management and solid waste management.

### 4.14.3.4 Tinian No-Action Alternative

The periodic non-live-fire military training exercises that occur in the Military Lease Area on Tinian consist of troop maneuvering, ground vehicle movements, and helicopter and fixed-wing aircraft operations. The training exercises that have occurred in the Military Lease Area on Tinian during the 2012 to 2014 timeframe were of short duration and had minimal needs for utility support. In addition, there would be less than significant impacts to wastewater and potable water and no impacts to power and solid waste when establishing and using the four live-fire training ranges on Tinian (see Table 15.2-4, DoN 2014b). No impacts to utilities would be anticipated due to the Mariana Islands Range Complex training. Therefore, the no-action alternative would have less than significant impacts on utilities.
4.14.3.5 Summary of Impacts for Tinian Alternatives

Table 4.14-11 provides a comparison of the potential impacts to utilities for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>Utilities</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Electrical Power</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Potable Water</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Wastewater</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Stormwater Management</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Solid Waste</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Information Technology/Communications</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact.
4.14.4 Pagan

4.14.4.1 Pagan Alternative 1

4.14.4.1.1 Construction Impacts

There is no current electrical power utility, potable water utility, wastewater infrastructure, or information technology/communications infrastructure on Pagan. All requirements for these utilities during construction would be provided by temporary camp style systems (generators, alternative energy devices, etc.). Since there are currently no utilities on Pagan, there would be no impact to existing utilities.

No permanent wastewater infrastructure exists or is being proposed for Pagan. It is anticipated that wastewater generated on Pagan would be managed with field sanitation devices and expeditionary procedures would be followed. Field sanitation devices would include toilets with collection bags or burn-out latrines and field urinals. It is anticipated that the ash produced by the burn-out latrines would be collected in containers and shipped to an approved disposal facility.

The stormwater management system for Pagan would be consistent with the level of site improvements. The majority of stormwater system improvements would consist of vegetated swales for conveyance and control of stormwater, gravel low water crossings along dirt trails, and detention ponds where increased imperviousness occurs, such as at the airfield. The proposed airfield improvements on Pagan would impact infiltration rate due to the compaction associated with the proposed training activity and may contribute to increased stormwater flows. Phasing of these stormwater improvements would follow the phasing of site improvements to ensure continued control of stormwater and would mimic pre-development hydrology to the maximum extent technically feasible. Construction activities would require a Stormwater Pollution Prevention Plan and appropriate use of erosion control procedures to protect downstream water resources.

The primary solid waste impact would consist of green waste generated during the clearing and grubbing phase. Green waste would be managed on site through size reduction and through the use of chipping. Any waste generated during construction that cannot be processed and reused on Pagan would be shipped to an acceptable off-island location for proper handling and disposal or reuse. Therefore, construction of Pagan Alternative 1 would result in no impacts to the electrical power utility, potable water utility, wastewater infrastructure, or information technology/communications infrastructure and less than significant impacts to stormwater management and solid waste management.

4.14.4.1.2 Operation Impacts

Requirements for electrical power during operation would be provided by temporary camp style systems (generators, alternative energy devices, etc.). No permanent potable water infrastructure is being proposed for Pagan. It is anticipated that potable water would be provided by the use of portable de-salinization units, water totes brought to Pagan, or other portable devices. No information technology/communications utility is being proposed besides portable devices that do not require infrastructure.
It is anticipated that wastewater generated on Pagan would be managed with field sanitation devices and expeditionary procedures would be followed. Field sanitation devices would include toilets with collection bags or burn-out latrines and field urinals. It is anticipated the ash produced by the burn-out latrines would be collected in containers and shipped to an approved facility.

The stormwater management system for Pagan would be consistent with the level of site improvements. The majority of stormwater system improvements would consist of vegetated swales for conveyance and control of stormwater, gravel low water crossings along dirt trails, and detention ponds where increased imperviousness occurs, such as at the airfield.

The solid waste generated during training operations on Pagan would be minimal. The waste would be collected in containers and shipped to an approved facility. Therefore, Pagan Alternative 1 operations would result in no impacts to the electrical power, potable water, wastewater, or information technology/communications utilities and less than significant impacts to stormwater management and solid waste management.

4.14.4.2 Pagan Alternative 2

4.14.4.2.1 Construction Impacts

The potential construction impacts to all utilities for Pagan Alternative 2 would be nearly the same as for those discussed in Section 4.14.4.1, Pagan Alternative 1. Therefore, Pagan Alternative 2 construction activities would result in no impacts to the electrical power, potable water, wastewater, and information technology/communications utilities and less than significant impacts to stormwater management and solid waste management.

4.14.4.2.2 Operation Impacts

The potential impacts to all utilities resulting from Pagan Alternative 2 operations would be the same as for those discussed in Section 4.14.4.1, Pagan Alternative 1. Therefore, Pagan Alternative 2 operations would result in no impacts to electrical power, potable water, wastewater, and information technology/communications utilities and less than significant impacts to stormwater management and solid waste management.

4.14.4.3 Pagan No-Action Alternative

Only periodic low impact visits for eco-tourism, scientific surveys, and military training for search and rescue are anticipated to occur on Pagan. There are currently no existing utilities on Pagan, and no impacts to wastewater, potable water, power, stormwater and solid waste would occur under the no-action alternative. Therefore, the no-action alternative would have no impacts on utilities.
### 4.14.4.4 Summary of Impacts for Pagan Alternatives

Table 4.14-12 provides a comparison of the potential impacts to utilities for the two Pagan alternatives and the no-action alternative.

#### Table 4.14-12. Summary of Impacts for Pagan Alternatives

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Utilities</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Electrical Power</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potable Water</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Wastewater</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Stormwater Management</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Solid Waste</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Information Technology/ Communications</td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

*Legend: LSI = less than significant impact.*
4.15 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Section 4.15 evaluates the effects of the proposed action on the general socioeconomic conditions in the CNMI, with concentration on socioeconomic impacts to Tinian and Pagan. Appendix Q, *Socioeconomic Impact Assessment Study*, provides detailed analysis conducted in determining the socioeconomic impacts described in this section.

In compliance with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations and Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, this section also identifies and evaluates impacts that could disproportionately and adversely affect minority and low-income populations and have the potential to expose children to adverse health and/or safety risks.

### 4.15.1 Approach to Analysis

Methodologies for focused topics are identified and described below; see Appendix Q, *Socioeconomic Impact Assessment Study* (specifically Chapter 2 and Appendix A of the study), for more detailed information on approach to analysis, methodologies and intermediate calculations made for quantified estimates.

Impacts are quantified and compared to estimates of expected future baseline conditions, and presented as percentage changes compared to the expected future baseline conditions (e.g., employment if the proposed action were implemented versus baseline employment, and the percent difference between the two is identified as the impact). The expected future baseline represents projected socioeconomic conditions from 2016, when the Record of Decision would be signed, to 2025, when construction related to the proposed action would be complete. While the expected future baseline is not the no-action alternative for the proposed action, it does not take potential effects from the proposed action into consideration. The expected future baseline was established because establishing a baseline that accounted for no change in economic activity over time would likely lead to incorrect results (U.S. Environmental Protection Agency 2010).

Impacts that are quantified were calculated as direct impacts; some potential indirect impacts would also be anticipated to occur due to multiplier effects associated with financial activity and, as such, would primarily be associated with economic impacts. Public service and sociocultural impacts are presented qualitatively, though some quantitative data are used to provide a basis for conclusions.

Data for environmental justice and protection of children analyses were gathered from the U.S. Census Bureau and the U.S. military. Additionally, in February 2014, a series of project specific interviews were conducted to obtain more detailed information about the socioeconomic conditions on Tinian and community sentiment about Pagan (see Appendix Q, *Socioeconomic Impact Assessment Study, Appendix B, January-February 2014 Site Visit Meeting Records*).

There is military-specific legislation (Public Law 110-17, 10 U.S. Code 2391: *Military Base Reuse Studies and Community Planning Assistance*) and implementing Department of Defense Directives (3030.01 and 5410.12) that address the issue of what is a significant impact to communities due to changes in military programs.
The price of pozzolan in 2012 was lower than the cost would be to ship pozzolan to market (U.S. Geological Survey 2013, Saipan Shipping Company 2014). This indicates that, while a permit to mine pozzolan was provided by the CNMI Department of Public Lands to a private mining company, a pozzolan mine on Pagan may not be economically feasible and pozzolan mining activities are not expected to take place (see Appendix Q, Socioeconomic Impact Assessment Study, Section 4.2.10 for more information). Therefore, impacts to pozzolan mining are not analyzed.

Impacts are analyzed separately for the construction and operations phases of the proposed action. For additional information on methods of analysis, see Chapter 2 and Appendix A of Appendix Q, Socioeconomic Impact Assessment Study.

### 4.15.1.1 Population

Population change was determined based on changes in the number of people who would be on Tinian as a result of the proposed action. Sources of additional population that would be related to the proposed action include construction workers, operations personnel, and training personnel, along with dependents of construction workers and operations personnel. Estimates of the change in population were divided by the estimated baseline population to determine the percentage change in population relative to baseline levels. See Sections 1.1.1 and 1.2.1 of Appendix A of the Socioeconomic Impact Assessment Study for additional details on these estimates.

Construction of training ranges and support facilities on Tinian would occur for 8 to 10 years. It is anticipated that the construction workforce would be rotational, i.e., the same construction workers would not be on Tinian the entire 8 to 10 year period. While Tinian residents would be eligible to work on project-related construction, Tinian has a very small construction workforce, so the vast majority of construction workers were anticipated to come from off-Tinian and temporarily add to the population. While it is possible that some portion of the construction workforce could be from other the CNMI islands, and travel to Tinian for work on a daily basis, for purposes of analysis, in order to assess maximum potential impacts, all workers from off-island are assumed to reside on Tinian and add to the existing population. Additional assumptions used in the process of estimating population change led to an assessment of maximum potential impacts. For instance, construction phase population was estimated using data on construction cost to construction worker ratios that were based on numerous smaller CNMI construction projects that would not achieve the same efficiencies of scale and utilization of equipment over manpower that would likely be realized with this proposed construction effort.

Department of Defense-specific legislation (Public Law 110-17 10 U.S. Code 2391: Military base reuse studies and community planning assistance) and Directives (Department of Defense 3030.01 and 5410.12) address the issue of what is a significant impact on communities due to changes in population related to Department of Defense programs, such as a base realignment or expansion. Collectively, these documents establish “thresholds” that allow the Department of Defense’s Office of Economic Adjustment to provide communities with technical and financial assistance for organizing and planning for Department of Defense program impacts. To qualify for financial assistance, the magnitude of Department of Defense personnel increases must meet the following statutory thresholds:

- More than 2,000 direct military, civilian, and contractor personnel (i.e., net addition); or
• More military, civilian, and contractor personnel than 10% of persons employed in the counties or independent municipalities within 15 miles (24 kilometers) of the installation, whichever is less.

Additionally, the Office of Economic Adjustment must make a finding that the affected community would experience a “direct and significantly adverse consequence” based on the Department of Defense impacts in light of community-specific needs and resources (Office of Economic Adjustment, Department of Defense n.d.).

Impacts related to population change on Pagan are not assessed because there is no existing permanent population or socioeconomic infrastructure, although visitors do travel to the island.

A change in population is not considered an impact itself. However, population change has the potential to drive positive or negative impacts to other socioeconomic factors discussed in the following subsections.

4.15.1.2 Economic Conditions

Economic conditions that are assessed include tourism, gross domestic product, employment and income, government revenues, housing, agriculture, fishing and aquaculture, airports and sea ports, and power utility rates.

Increases in quantifiable impacts related to jobs and dollars – the usual measures of economic prosperity – were considered “beneficial” impacts. Impacts that were either qualitative or where precise numbers could not be estimated, were given significance ratings on a judgment basis, considering the overall information available from surveys or interviews conducted for this EIS/OEIS (see Appendix Q, Socioeconomic Impact Assessment Study, Appendix B, January-February 2014 Site Visit Meeting Records).

4.15.1.2.1 Tourism

Estimates of potential changes in the number of visitors to Tinian and the CNMI, which may result from the proposed action, were developed in Appendix Q, Socioeconomic Impact Assessment Study. These estimates were compared to baseline estimates of visitors in order to establish the percentage change in number of visitors to the CNMI that would result from the proposed action. See Sections 1.1.2.1 and 1.2.2.1 of Appendix A of the Socioeconomic Impact Assessment Study (Appendix Q), for additional details on these estimates.

Potential changes in number of visitors resulting from the proposed action were estimated for the following scenarios: (1) impacts could occur by altering commercial and civil aircraft flight paths and increasing the distance flown and associated fuel costs resulting in a potential rise in ticket prices, which could lead to reduced demand for visits to Tinian; and (2) access restrictions to tourist sites in the Military Lease Area potentially resulting in a decrease in tourism visitors.

4.15.1.2.2 Gross Domestic Product

Estimates of changes to gross domestic product that would result from the proposed action were developed in Appendix Q, Socioeconomic Impact Assessment Study. These estimates were compared to baseline estimates of gross domestic product in order to establish the percentage change in the CNMI
gross domestic product that would result from the proposed action. See Sections 1.1.2.2 and 1.2.2.2 of Appendix A of the Socioeconomic Impact Assessment Study (Appendix Q) for details on these estimates.

Contributions to gross domestic product were estimated in association with potential changes in tourism visitor expenditures, construction expenditures, operations employment, and spending by military personnel while on Tinian. Each contribution was determined separately and then summed to calculate the total change to gross domestic product.

4.15.1.2.3 Employment and Income

Estimates of changes to employment and income that would result from the proposed action were developed in Appendix Q, Socioeconomic Impact Assessment Study. These estimates were compared to baseline estimates of employment and income in order to establish the percentage change in Tinian employment and income that would result from the proposed action. Total employment and income associated with the proposed action were estimated based on planned construction spending and estimates of operations employment. See Sections 1.1.2.3 and 1.2.2.3 of Appendix A of the Socioeconomic Impact Assessment Study for information on these estimates.

4.15.1.2.4 Government Revenues

Estimates of changes to government revenues that would result from the proposed action were developed in Appendix Q, Socioeconomic Impact Assessment Study. These estimates were compared to baseline estimates of government revenues in order to establish the percentage change in the CNMI government revenues that would result from the proposed action. Changes in government revenues were estimated based on estimated changes in gross domestic product associated with the proposed action using the historical relationship between gross domestic product and government revenues of 20% (i.e., government revenues have historically equaled 20% of gross domestic product). See Sections 1.1.2.4 and 1.2.2.4 of Appendix A of the Socioeconomic Impact Assessment Study for information on these estimates. Qualitative assessments related to payments for use of the CNMI land were also made, under the assumption that these payments would be positive and contribute to the CNMI government revenues.

4.15.1.2.5 Housing

Estimates of changes to housing demand on Tinian that would result from the proposed action were developed in Appendix Q, Socioeconomic Impact Assessment Study. These estimates were compared to broad estimates of baseline housing supply on Tinian in order to determine whether demand could be met by supply. Based on the existing supply of potential construction workforce housing located behind the Tinian Dynasty, construction contractor-provided housing was assumed to accommodate the vast majority of construction workers (all non-managers). See Section 1.2.2.5 of Appendix A of the Socioeconomic Impact Assessment Study for information on approach to housing analysis.

4.15.1.2.6 Agriculture

Impacts to agriculture were assessed in terms of potential reductions of land available for grazing in the Military Lease Area. The amount of land currently used for cattle grazing was considered as was a range of estimates of grazing area required per head of cattle in the Tinian herd (of various potential sizes) that were developed in Appendix Q, Socioeconomic Impact Assessment Study. Estimates were compared
to the land that would potentially be available for grazing with the proposed action, in order to
determine whether there would be adequate space for the herd. See Sections 1.1.2.5 and 1.2.2.6 of
Appendix A of the Socioeconomic Impact Assessment Study for information on these estimates.

Additional discussion regarding growing agricultural products for subsistence purposes is provided with
respect to community and social topics in Section 4.15.1.4.

4.15.1.2.7 Fishing and Aquaculture

Marine areas that would potentially have access restricted as a result of the proposed action were
reviewed in comparison with areas that are used for commercial fishing to determine whether areas
that are important to commercial fishing would be affected by the proposed action. Similarly, potential
affects that the proposed action may have on open-ocean aquaculture were reviewed in terms of
whether open-ocean aquaculture and the proposed action would be compatible given potential access
restrictions. See Sections 1.1.2.6 and 1.2.2.7 of Appendix A of the Socioeconomic Impact Assessment
Study for information on the approach to analysis for fishing and aquaculture.

4.15.1.2.8 Airport and Sea Ports

Estimates of changes to sea port freight that would result from the proposed action were developed in
Appendix Q, Socioeconomic Impact Assessment Study. These estimates were compared to baseline
estimates in order to establish the percentage change that would result from the proposed action.
Potential changes in the level of airport freight were addressed qualitatively. See Sections 1.1.2.7 and
1.2.2.8 of Appendix A of the Socioeconomic Impact Assessment Study for information on the approach
to analysis for airports and sea ports.

4.15.1.2.9 Power Utility Rates

The potential for changes to utility rates was based on whether the proposed action would lead to a
change in demand for power and thus result in a change in costs to residents of Tinian. The general
framework of analysis considered that a reduction in overall power demand on Tinian would lead to the
same cost of power generation being shared by fewer customers, and thus lead to higher per-customer
power utility rates (and vice versa). Additional information on this topic is provided in Appendix Q, the
Socioeconomic Impact Assessment Study.

4.15.1.3 Public Services

Impacts to public services (i.e., education, emergency services, and health) were assessed primarily in
relation to changes in population. Increases in population tend to drive up the demand for public
services as well as the level of services required to be provided by public service agencies. Additional
demands, generated by additional population, were evaluated and compared to the ability of existing
facilities and services to meet these demands. Impacts to public services were considered significant if
they would lead to a condition where demand on public services would exceed existing capacity of
Tinian public services agencies to provide services. Additional information on this topic is provided in
Appendix Q, the Socioeconomic Impact Assessment Study and detail on estimates is provided in Sections
1.1.3 and 1.2.4 of Appendix A of the study.
4.15.1.4 Community and Social Topics

Community and social topics were identified, discussed, and summarized in the context of both community character and community cohesion. Community character is the distinctive identity of a particular place that results from the interaction of many factors—built form, landscape, history, people, and their activities (American Planning Association 2011). Community character impacts occur when ties with particular places are degraded or eliminated. Community cohesion is the social ties and community commitments that bind people together or a community with strong relationships between people from diverse backgrounds. A deterioration of community cohesion occurs when there are increased divisions between social groups in a community (Holdsworth 2009). Additional information on this topic is provided in Appendix Q, the Socioeconomic Impact Assessment Study and detail is provided in Sections 1.1.4 and 1.2.5 of Appendix A of the study.

4.15.1.5 Environmental Justice and Protection of Children

The Council on Environmental Quality suggests several principles in its Environmental Justice Guidance Under the National Environmental Policy Act (1997), to guide agencies in identifying environmental justice issues. These guidelines and the following steps were used to assess potential environmental justice impacts. First, minority and/or low-income populations affected by the proposed action within the region of influence were identified. Second, if these population groups were present, they were specifically identified as to where they were located. Third, it was determined whether these populations were exposed to health or environmental impacts caused by the proposed action. If so, then these impacts were evaluated to determine whether the effects were disproportionately high and adverse to human health or to the natural and physical environment of low-income and/or minority populations. The guidance further states that, “when determining whether environmental effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable:

(a) Whether there is or will be an impact on the natural or physical environment that significantly (as employed by NEPA) and adversely affects a minority population, low-income, or Indian tribe;

(b) Whether environmental effects are significant (as employed by NEPA) and are or may be having an adverse impact on minority populations, low-income population, or Indian tribe that appreciably exceeds or is likely to appreciably exceed those on general population or other appropriate comparison group; and

(c) Whether the environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.”

Health and safety impacts to children were identified by consulting U.S. Environmental Protection Agency’s memorandum Addressing Children’s Health through Reviews Conducted Pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act (U.S. Environmental Protection Agency 2012). The memorandum suggests that proposed activities that impact air quality, water quality, floodplains, noise, and traffic and/or produce hazardous/poisonous materials, introduce toxic chemicals, or use radiation have the potential to adversely affect the health and safety of children. Therefore, the analysis herein considered where children live, go to school, and play to determine whether children
would be affected by proposed RTA construction and operational activities. Analysis then identified if any adverse health or safety risks for children would be introduced.

If disproportionately high and adverse impacts to low-income and/or minority populations were identified, then they would be considered significant; however, analysis of proportionality (the possibility that impacts would have greater effects on certain locations than other locations) did not apply because the only locations that could be affected by the proposed action are in the CNMI. If children were exposed to adverse health and safety risks, then impacts would be considered significant.

### 4.15.2 Resource Management Measures

There are no resource management measures that were specifically developed for socioeconomics. In many cases; however, there are incidental environmental, socioeconomic, and cultural benefits resulting from standard operating procedures and best management practices. As detailed in Appendix D, *Best Management Practices*, the following resource management measures are standard operating procedures and best management practices that have incidental benefits relating to socioeconomics:

- Dust Control Measures
- Water Quality Monitoring
- Design individual projects using Leadership in Energy and Environmental Design Certification standards
- Design projects with Water Conservation measures
- Spill Prevention, Control and Countermeasures Plans and Facility Response Plans
- Biosecurity Outreach and Education
- Implement Traffic Management Plan and Work Zone Traffic Management
- Noise Abatement
- Notice to Mariners
- Notice to Air Traffic
- Utility Services
- Cultural Resources
- Range Environmental Vulnerability Assessments

### 4.15.3 Tinian

Please refer to Appendix Q, *Socioeconomic Impact Assessment Study, Chapter 5, Impacts of the Proposed Action*, for supporting documentation of the socioeconomic impact conclusions. Assessments of potential environmental justice impacts and potential impacts to children’s health and safety follow the socioeconomic analysis.

#### 4.15.3.1 Tinian Alternative 1

#### 4.15.3.1.1 Construction Impacts

#### 4.15.3.1.1.1 Population

The construction phase of the proposed action, for Tinian Alternative 1, would be anticipated to increase Tinian’s population by between 477 and 596 (including between 456 and 571 construction
workers and between 21 and 26 construction worker dependents), on average, each year for an 8 to 10 year period. Tinian’s baseline population over the time period was estimated to be between 2,890 and 3,532. Given projected baseline population and projected population increase, the population increase would be between 14% and 21%.

Since the population increase is estimated to be greater than 10%, in order for the CNMI to qualify for financial assistance to help manage this growth, the Office of Economic Adjustment must make a finding that Tinian would experience a “direct and significantly adverse consequence” based on the Department of Defense impacts in light of community-specific needs and resources (Office of Economic Adjustment, Department of Defense n.d.). As noted above in Section 4.15.1.1, a change in population is not considered an impact itself. However, population change has the potential to drive positive or negative impacts to other socioeconomic factors discussed in the following subsections.

### 4.15.3.1.2 Economic Conditions

#### Tourism

The number of tourism visitors to some tourism areas on Tinian may decline modestly relative to baseline conditions during the construction period due to temporary access restrictions (see Appendix Q, Socioeconomic Impact Assessment Study, Section 5.2.1). Because the impact of the construction phase would be small relative to the overall number of visitors, Tinian Alternative 1 construction activities to tourism is considered less than significant.

#### Gross Domestic Product

Construction activities associated with Tinian Alternative 1 are anticipated to lead to increases in the CNMI gross domestic product. Increases to the gross domestic product would be an estimated $29 to $36 million, annually, over the 8 to 10 year construction period (see Appendix Q, Socioeconomic Impact Assessment Study, Section 5.2.2). This represents an annual increase of between 2.7% and 4.1% over baseline levels, which were estimated to be between $878 million and $1.09 billion. Because gross domestic product would increase, Tinian Alternative 1 construction activities would result in beneficial impacts.

#### Employment and Income

Construction activities associated with Tinian Alternative 1 would result in employment increases of between 456 and 571 annual construction jobs on Tinian during the construction period; this would represent between a 19% and 30% increase in employment over baseline levels (see Appendix Q, Socioeconomic Impact Assessment Study, Section 5.2.3), which were estimated to be between 1,899 and 2,378 jobs. Income related to the additional jobs is estimated to be between $5.9 and $7.4 million annually (between 13% and 21% above baseline levels, which were estimated to be between $35.8 million and $44.6 million). Since employment and income would increase, Tinian Alternative 1 construction activities would result in beneficial economic impacts.

#### Government Revenues

The CNMI government revenues under Tinian Alternative 1 would increase by between $6.5 million and $7.9 million, annually, over the course of the 8 to 10 year construction period (see Appendix Q, Socioeconomic Impact Assessment Study, Section 5.2.4). About 90% of this (between $5.9 million and
$7.1 million) would be associated with construction activities (e.g., taxes on income and businesses, fees). Estimated baseline CNMI government revenues were estimated to be between $176 million and $219 million, indicating that the annual increase in government revenues associated with construction would be between 3% and 4% above estimated baseline levels. Since government revenues would increase, Tinian Alternative 1 construction activities would result in beneficial impacts to the CNMI government revenues.

**Housing**

There are existing underutilized dwelling units including those associated with and adjacent to the Dynasty Hotel. It is understood that the dwelling units associated with the Dynasty could be available to construction workers and could house in excess of 1,500 people, many more than would potentially be needed for the high-end estimate of 571 construction workers. Given this apparent availability of existing workforce housing, it is likely that construction contractors would make this housing available for their employees and that no new workforce housing would need to be constructed to implement the proposed action.

For construction managers, who are not anticipated to reside in workforce housing, between 18 and 23 housing units would be needed in the Tinian community (see Appendix Q, *Socioeconomic Impact Assessment Study*, Section 5.2.5). As of the 2010 Census, there were 101 housing units for rent and additional housing is currently being built. Thus demand for housing related to construction, under Tinian Alternative 1, would not exceed the number of units available during construction. There may be some potentially beneficial impacts related to growth in the housing/rental markets. Overall, Tinian Alternative 1 construction activities would result in less than significant impacts on housing.

**Agriculture**

Commercial agriculture, which only occurs outside of Military Lease Area boundaries, would not be affected by Tinian Alternative 1 construction activities.

As of 2014, the Lease Back Area (i.e., southern portion of the Military Lease Area) supported approximately 2,375 acres (961 hectares) of agricultural grazing permits. An estimated approximation of 1,010 acres (409 hectares) of that was being used for cattle grazing. Under Tinian Alternative 1, land within the Lease Back Area, which has been used for cattle grazing, would be removed from cattle grazing use. However, the DoN has identified and proposed a total of 2,554 acres (1,034 hectares) of land for cattle grazing areas throughout the Military Lease Area. Of this total 1,010 acres (409 hectares) would be unencumbered by surface danger zones and 1,544 acres (625 hectares) would be encumbered. The unencumbered portion is approximately the same amount of land that is currently used for cattle grazing and the approximate amount of land needed for the current herd under the ideal herd size to utilized acreage ratio (see Appendix Q, *Socioeconomic Impact Assessment Study*, Sections 4.2.6 and 5.2.6). The proposed action would require that some cattle be relocated; however, since the amount of land currently used for cattle grazing would be made available for cattle grazing under Tinian Alternative 1, impacts to cattle grazing are considered less than significant.

**Commercial Fishing and Aquaculture**

There would be limited access restrictions to nearshore waters at Unai Chulu due to construction of an amphibious landing. Access to commercial fishing or potential open-ocean aquaculture activities would
not be affected. Therefore, there would be no impacts related to Tinian Alternative 1 construction activities.

**Airports and Sea Ports**

At Tinian International Airport, there is the potential for increased revenue from freight deliveries during construction. For inbound sea port freight, measured in revenue tons, short-term increases of between 8% and 12% are anticipated during the construction period under Tinian Alternative 1 (as annual revenue tons would increase by between 50,573 and 61,076 above estimated baseline levels which were estimated to be between 516,443 and 642,966 revenue tons) (see Appendix Q, *Socioeconomic Impact Assessment Study, Section 5.2.8*). Since capacity would not be exceeded and revenues would increase, Tinian Alternative 1 construction activities would result in increased revenues to the Commonwealth Ports Authority and beneficial economic impacts.

Additionally, infrastructure improvements, including additional lighting, would be made to the Tinian seaport that would benefit the public.

**Power Utility Rates**

Construction activities under Alternative 1 would not displace any utility users. And there would be no reduction in demand for electricity consumption on Tinian. Therefore, Tinian Alternative 1 construction activities would result in no impact to Tinian resident utility rates.

**4.15.3.1.1.3 Public Services**

**Education**

An increase in the number of students of between 29 and 59 is anticipated during Tinian Alternative 1 construction and operations activities (see Appendix Q, *Socioeconomic Impact Assessment Study, Section 5.3.1*), with between 8 and 10 students per year associated with construction related population. The addition of between 8 and 10 students per year would be between a 1.5% and 2.3% increase above baseline levels, which were estimated to be between 451 and 551 students. The total number of students associated with the proposed construction (between 459 and 561) would be fewer than recent (2007-2008 school year) enrollment of 615 students. Since enrollment would not exceed recent levels, it is not anticipated that the construction phase would lead to capacity issues at Tinian schools. Because issues of excess capacity are not anticipated, impacts are considered less than significant.

**Emergency Services**

Under Tinian Alternative 1, emergency services agencies (police and fire departments) would have a short-term added burden due to increased construction-related population. Existing staffing to service population ratios greatly exceed U.S. averages (see Appendix Q, *Socioeconomic Impact Assessment Study, Section 3.4.2.2*). With the projected population increase associated with proposed construction, it is estimated that staffing to service population ratios would continue to exceed U.S. averages. Since Tinian agencies would continue to exceed U.S. averages for level of service, it is anticipated that emergency services agencies would have sufficient capacity to meet the anticipated increased demands without exceeding capacity. Since capacity would not be exceeded, Tinian Alternative 1 construction activities would result in less than significant impacts to Tinian’s emergency services agencies.
Public Health

Off-island construction workers associated with the proposed action would increase the service population of the Tinian Health Center; however, construction worker population would not exceed the past population during the late 1990s, when the Tinian Dynasty was under construction, when an estimated 1,800 non-resident construction workers were on Tinian (DoN 2010a).

No existing deficits were noted by Tinian Health Center officials, and given recent facility upgrades (DoN 2014), the additional service population would not be anticipated to necessitate the construction of a new facility or initiate demand for additional services that are not currently provided on Tinian (major health issue would continue to be serviced off-island). Since construction contractors would cover construction worker healthcare expenses, such as by providing health insurance and covering workers compensation expenses, Tinian Health Center revenues would be anticipated to increase in conjunction with the level of services provided, allowing for the hiring of staff or purchasing of equipment and supplies needed to meet additional demands. Because it is not anticipated that an additional medical facility would be required as a result of the proposed action and because providing services in relation to additional demands would be funded by patient fees, Tinian Alternative 1 construction activities would result in less than significant direct impacts to Tinian’s public health.

4.15.3.1.1.4 Community and Social Topics

More detailed information on Community and Social Topics can be found in Appendix Q, Socioeconomic Impact Assessment Study, Sections 3.5, 4.4, and 5.4.

Community character on Tinian may change due to factors associated with construction activities related to the proposed action. Access restrictions in areas where construction would take place (see Section 2.4.1.2.6, Fence Lines and Gates) could shift the relationship between some community members and certain areas/landscapes of the island by reducing opportunities for using the land for subsistence, income earning, practicing traditional skills, or any other place-based relationship. However, since construction activities would restrict access to only discreet portions of the island, there would be considerable alternative areas and locations available that would provide opportunities for using the land, and effects on place-based relationships for the vast majority of the population would likely not occur.

Community cohesion on Tinian may also change due to construction activities associated with the proposed action. Community or social cohesion measures the levels of “relationship between individuals, groups and organizations within a community” (Holdsworth 2009), a concept that is closely tied with the Chamorro concept of “inafa’maolek” (a core Chamorro value that refers to the “interdependence within the kinship group,” literally translated as “making it good for each other” or “getting along”). The potential decreases in opportunities to access resources in areas where construction would take place could reduce opportunities for some to provide “chenchule” (gifting or donation, which preserves and strengthens networks), thus disrupting his/her ability to maintain and strengthen the social cohesion within their network. In addition, a potential decrease in the opportunity to practice cultural activities such as fishing, hunting, and gathering among the community on Tinian could lessen the opportunities that the community could engage in activities together and build and maintain social cohesion. However, because construction activities would restrict access to only discreet portions of the island, there would be considerable alternative areas and locations available that would
provide opportunities for using the land, and effects on personal relationships driven by changes in opportunities to access resources, for the vast majority of the population, would likely not occur.

Finally, a lack of community cohesion occurs when there are “divisions between groups, individuals and systems” (Stone and Hughes 2002); such divisions could be possible if the current Tinian population were to come into conflict with the incoming construction worker population. The introduction of some construction workers from outside of the CNMI would increase the number of people present in the community that have no social ties to the community or commitments that bind them to the community. However, foreign workers regularly operate on Tinian and in the past have not been prone to conflict.

Because only discreet portions of the island would be affected, and because major community conflict with construction workers is not anticipated, the potential changes to community character and cohesion caused by Tinian Alternative 1 construction activities would result in less than significant impacts to the overall community. However, these changes may significantly impact the perceptions that some Tinian residents have of the place they live.

4.15.3.1.5 Environmental Justice and Protection of Children

Data from the 2010 Census indicate that 98.2% of Tinian’s population was comprised of minorities (see Table 3.15-8) and 44.6% of the population was low income (see Table 3.15-9) (U.S. Census Bureau 2010). On Tinian, these populations predominantly reside in San Jose and Marpo Heights (see Figures 3.15-6 and 3.15-7). Children age 18 and younger comprise to approximately 30% of the total population of Tinian (see Table 3.15-10); attend the Tinian elementary school, junior/senior high school, or the Head Start program in San Jose; and reside in San Jose and Marpo Heights areas (see Figure 3.15-7).

The resources that could impact environmental justice populations disproportionately would be air quality, noise, public health and safety, and hazardous materials and waste. Air pollutant emissions would not degrade the regional air quality, noise during construction would not extend outside Military Lease Area boundaries, the public would be prohibited from entering construction zones to protect their health and safety, and any hazardous materials used or waste generated would be stored and disposed of according to federal and CNMI regulations. Therefore, Tinian Alternative 1 construction activities would have no significant impacts that would be considered adverse or disproportionate to the health and safety of environmental justice populations.

4.15.3.1.2 Operation Impacts

4.15.3.1.2.1 Population

The number of military personnel training is variable and fluctuates annually across 20 non-consecutive weeks of live-fire training. During weeks when there would be live-fire training, there may be as few as 30 and as many as 3,000 personnel (assumes a maximum of 2,200 training personnel and the potential for overlap of pre- or post-training parties) in the Military Lease Area. On average, over the course of a year, 771 training personnel would be on Tinian.

Additional population to Tinian, consisting of base operation and support employees and their dependents, is estimated to be between 143 and 242 (see Appendix Q, Socioeconomic Impact Assessment Study, Section 5.1.1). Estimated baseline Tinian population ranges from 2,890 to 3,532
indicating that non-military operations-related population increase would be between 4% and 8.4% over baseline levels.

Since the population increase would be variable in size and, in part transient in duration, in order for the CNMI to qualify for financial assistance to help manage this growth, the Office of Economic Adjustment must make a finding that Tinian would experience a “direct and significantly adverse consequence” based on the Department of Defense impacts in light of community-specific needs and resources (Office of Economic Adjustment, Department of Defense n.d.). A change in population is not considered an impact itself. However, population change has the potential to drive positive or negative impacts to other socioeconomic factors discussed in the following subsections.

### 4.15.3.1.2.2 Economic Conditions

#### Tourism

Tinian Alternative 1 operational activities may result in a decline in tourism relative to estimated baseline levels. Flights to and from Saipan and Tinian may need to be diverted from overflying the Military Lease Area during training, which would potentially result in increased ticket costs (by an estimated 0.26% while training would be occurring) and a decrease in overall demand for travel to Tinian (by and estimated 0.12% to 0.15%). This effect would lead to an estimated decline in visitors of 68 and 123 (-0.08% and -0.22%) annually, compared to baseline levels (see Appendix Q, *Socioeconomic Impact Assessment Study*, Section 5.2.1).

In addition, access to certain natural/historic attractions in the Military Lease Area would be reduced during training, potentially leading to decreases in projected growth in visitor numbers. This reduction in visitors is estimated to be between 578 and 788 annually, representing between a 0.7% and 1.38% reduction from estimated baseline levels (see Appendix Q, *Socioeconomic Impact Assessment Study*, Section 5.2.1).

In total, it is estimated that Tinian Alternative 1 operations would reduce tourism visitors to Tinian by between 647 and 912 annually, from baseline levels which were estimated to be between 57,046 and 82,565 annually, constituting a decline of between 0.8% and 1.6%.

Despite the small reduction potentially associated with the proposed action, it is estimated that, while the proposed action would be occurring, there would be more visitors to Tinian than there are currently, due to market expansion in China and Korea (see Appendix Q, *Socioeconomic Impact Assessment Study*, Section 1.1.2.1 of Appendix A). Because the impact of the proposed action is expected to be small in percentage terms, and because it is expected that the Tinian tourism market will grow from current levels (indicating that the proposed action would not hinder overall growth in the industry), impacts to tourism are considered less than significant.

#### Gross Domestic Product

The CNMI gross domestic product would see an estimated net increase of between $3.7 million and $4.2 million per year considering the following operations-related factors: combined income earned by RTA employees (estimated to be $3.4 million per year), the spending of training personnel at Tinian business establishments (estimated to be $2 million per year), and the estimated decrease in visitor expenditures (between -$1.2 million and -$1.7 million) due to decreased visitor numbers. The increase of between $3.7 and $4.2 million per year would represent an increase of between 0.3% and 0.5% compared to
baseline levels which were estimated to be between $878 and $1,093 million (see Appendix Q, *Socioeconomic Impact Assessment Study*, Section 5.2.2).

Additional growth in gross domestic product would result from operational expenditures, which would include payments to the Commonwealth Utilities Corporation for utilities service, the purchase of fuel from local distributors, and other purchases. The increase in gross domestic product brought about by Tinian Alternative 1 operations is considered a beneficial impact.

**Employment and Income**

It is estimated that the employment increase associated with Tinian Alternative 1 operations would be 95 full-time positions, an increase of between 4% and 5% compared to baseline employment levels, which were estimated to range from 1,899 to 2,378 jobs. Combined, these positions would earn approximately $2.2 million annually, between a 4.9% to 6.1% increase in income relative to baseline levels, which were estimated to be between $35.8 and $46.7 million. Additional employment and income would be generated at businesses that provide goods and services to RTA employees and visiting trainees. Increases in employment and income as a result of Tinian Alternative 1 operations would result in beneficial impacts (see Appendix Q, *Socioeconomic Impact Assessment Study*, Section 5.2.3).

**Government Revenues**

The CNMI government revenues under Tinian Alternative 1 would increase by between $650,000 and $790,000, annually, in association with RTA operations. These increases would be from revenues related to income and business taxes associated with employment. Estimated baseline CNMI government revenues are between $176 million and $219 million indicating that the increase in government revenues associated with RTA operations would be between 0.3% and 0.4% over baseline levels (see Appendix Q, *Socioeconomic Impact Assessment Study*, Section 5.2.1).

In addition to those estimated revenues, payments associated with any additional acquisition of land on Tinian, taxes associated with local operations expenditures, and other payments and fees (such as port charges) would contribute to increases in government revenues. The increase in government revenues associated with Tinian Alternative 1 operations would result in beneficial impacts.

**Housing**

Between 57 and 87 housing units would be required for operations-related residents of Tinian (see Appendix Q, *Socioeconomic Impact Assessment Study*, Section 5.2.5). As of the 2010 Census, there were 101 housing units for rent and additional housing is currently being built. Additional demand for housing under Tinian Alternative 1 likely would not exceed the number of units available.

For the 8 to 10 year period when construction and operations overlap, the required 57 to 87 operations-related units and 18 to 23 construction-related units would, combined, generate a requirement for between 75 and 110 units. The high end of the range (110 units) would exceed the number of existing available rental units, which as of the 2010 Census was 101.

While demand generated by the proposed action may exceed existing supply, other factors would likely relieve potential conditions of excess demand. As noted in Section 3.15, additional housing units are being developed, as homestead property; while these units would not be available to incoming
populations, the occupants of these units would conceivably exit the housing units that they currently occupy, which would increase the number of rental units available for incoming population. It is also possible that some construction managers may share housing units amongst themselves, which would lead to a reduction in the number of estimated units demanded. Furthermore, additional demand for housing may lead to private sector housing development, with the additional housing supply considered a beneficial economic outcome. Overall, impacts of the proposed action on Tinian housing are considered less than significant.

**Agriculture**

Commercial agriculture, which only occurs outside of Military Lease Area boundaries, would not be affected by Tinian Alternative 1 operations.

As of 2014, the Lease Back Area (i.e., southern portion of the Military Lease Area) supported approximately 2,375 acres (961 hectares) of agricultural grazing permits. An estimated approximation of 1,010 acres (409 hectares) of that was being used for cattle grazing. Under Tinian Alternative 1, land within the Lease Back Area, which has been used for cattle grazing, would be removed from cattle grazing use. However, the DoN has identified and proposed a total of 2,554 acres (1,034 hectares) of land for cattle grazing areas throughout the Military Lease Area. Of this total 1,010 acres (409 hectares) would be unencumbered by surface danger zones and 1,544 acres (625 hectares) would be encumbered. The unencumbered portion is approximately the same amount of land that is currently used for cattle grazing and the approximate amount of land needed for the current herd under the ideal herd size to utilized acreage ratio (see Appendix Q, *Socioeconomic Impact Assessment Study*, Sections 4.2.6 and 5.2.6). The proposed action would require that some cattle be relocated; however, since the amount of land currently used for cattle grazing would be made available for cattle grazing under Tinian Alternative 1, impacts to cattle grazing are considered less than significant.

**Commercial Fishing and Aquaculture**

Tinian does not have a commercial fishing fleet so there would be no impacts from that perspective. However, the waters on the west side of the Military Lease Area are prime locations for net casting from boats, which is a method applied in commercial fishing, so commercial fishers from Saipan may be affected. Once the RTA is operational, access to adjacent waters, during some of the 20 weeks of training, would be restricted, including access to some areas used for net-cast fishing. Since these restrictions would not be permanent and other areas would be available for net-cast fishing during times when access is temporarily restricted, impacts to on-shore or open-ocean fishing activities from Tinian Alternative 1 operations would be less than significant.

There are no current open-ocean aquaculture operations in Tinian waters. Because there is a large amount of open-ocean area around Tinian that would not be affected by the proposed action, it is anticipated that any potential future open-ocean aquaculture operation would be compatible with the proposed action, and no impacts would be anticipated.

**Airports and Sea Ports**

Once the RTA is operational, airport and sea port freight would increase negligibly leading to small increases in port fees. There would also be airport and sea port infrastructure improvements and road
upgrades that would benefit the public. Increased freight activity, port fees, and infrastructure improvements would result in beneficial impacts on the Tinian airport and sea port.

**Power Utility Rates**

Under Tinian Alternative 1, the International Broadcasting Bureau would remain in place. Power utility rates could potentially decrease for Tinian residents because of increased demand for power from the RTA and associated reduced cost per unit of electricity sold by the Commonwealth Utilities Corporation. Potentially reduced electricity rates under Tinian Alternative 1 would have beneficial impacts to Tinian ratepayers.

### 4.15.3.1.2.3 Public Services

**Education**

An increase in the number of students of between 29 and 59 is anticipated during Tinian Alternative 1 construction and operation activities. After construction is complete, considering only operations related increases, the increase in number of students would be between about 21 and 48 (see Appendix Q, *Socioeconomic Impact Assessment Study*, Section 5.3.1), and increase over baseline enrollment levels of between 3.8% and 10.7%.

Considering both construction and operations, given an estimated baseline number of students ranging from 451 to 551, the high estimate for total number of students with the proposed action (609) is lower than the number of students that attended Tinian schools during the 2007 to 2008 school year (615 students). Since even the highest estimates of student population with the proposed action would be less than levels seen in the recent past, it is not likely that the proposed action would lead to Tinian schools exceeding existing capacity. Since it is not likely that capacity would be exceeded, impacts are considered less than significant.

**Emergency Services**

During Tinian Alternative 1 operations, military police would accompany the military units when training personnel are in town. A fire-response facility would be added to respond to emergencies within the Military Lease Area, as well as assist the community when needed. Therefore, Tinian Alternative 1 operations would result in beneficial impacts to emergency services.

**Public Health**

The military units undertaking training come with their own medical and first aid capabilities and the addition of personnel could be accommodated by the existing health agencies on Tinian. Therefore Tinian Alternative 1 operations would result in less than significant impacts to Tinian’s public health services.

### 4.15.3.1.2.4 Community and Social Topics

More detailed information on Community and Social Topics can be found in Appendix Q, *Socioeconomic Impact Assessment Study*, Sections 3.5, 4.4, and 5.4.

Decreased opportunities to access fresh locally grown and gathered food, decreased income for those that participate in subsistence and commercial gathering activity, decreased access to recreational and
cultural activity areas, and potential conflict with incoming populations can all impact community character and cohesion.

Community character on Tinian may change due restricted access to certain areas that are used for agriculture, hunting, fishing, and gathering (see Section 2.4.1.4.1 for information on access restrictions). The potential decrease in access to these food sources and the associated subsistence, recreational, and cultural activities could change the nature of everyday activities for the population on Tinian. This could accelerate the trend of the Tinian community moving away from these activities to a more modern community with different cultural practices and reduced practice of traditional skills. In addition, the access restrictions themselves, by restricting access to areas that have been known to be accessible, could shift the perception of the relationship between the community and the place they live.

Community cohesion on Tinian may also change due to the proposed action. Community or social cohesion measures the levels of “relationship between individuals, groups and organizations within a community” (Holdsworth 2009), a concept that is closely tied with the Chamorro concept of “inafa’maolek”. The potential decreases in opportunities for access to resources in the Military Lease Area could reduce a person’s ability to provide “chenchule,” thus disrupting his/her ability to maintain and strengthen the social cohesion within their network. In addition, a potential decrease in the practice of cultural activity among the Chamorro community on Tinian could lessen the opportunities that the community could engage in activity together and build and maintain social cohesion. Finally, a lack of community cohesion occurs when there are “divisions between groups, individuals and systems” (Stone and Hughes 2002); such divisions could be possible if the current Tinian population were to come into conflict with incoming populations. The introduction of military training personnel would increase the number of people present in the community that have no social ties to the community or commitments that bind them to the community. However, military personnel tend to be respected by the local population on Tinian and there is not a history of conflict.

The potential changes to community character and cohesion that could occur from Tinian Alternative 1 operations would result in less than significant impacts to the overall community. However, these changes may significantly impact the perceptions that some Tinian residents have of the place they live.

4.15.3.1.2.5 Environmental Justice and Protection of Children

Environmental Justice

Under Tinian Alternative 1, there would be no geological or soil impacts (see Section 4.2.3.1) that would affect environmental justice populations. Impacts to water (see Section 4.3.3.1) from munitions expenditure and constituents would introduce less than significant impacts, and air quality (see Section 4.4.3.1) would not be adversely affected as a consequence of RTA operations. Therefore, no disproportionately high and adverse human health effects from geology and soils, water, and air quality to low-income and minority populations would occur.

Noise levels from small caliber munitions expenditures would also not generally extend beyond the Military Lease Area boundaries. However, as depicted in Section 4.5, Noise, Table 4.5-13, estimated day-night average ambient noise levels from aircraft operations would increase four-fold (20 decibels) throughout much of Tinian. This large rate of increase reflects both the level of anticipated aircraft operations involved in the proposed action and the relative quiet existing conditions of Tinian. During
these airspace training operations, noise generated by aircraft overflights would expose 10 homes in Marpo Valley, east of Marpo Heights, to noise levels over 65 A-weighted day-night average sound levels and therefore, would be considered incompatible with residential land use. It is estimated that about 40 people (slightly more than 1% of Tinian’s population) live in the 10 houses that would be exposed to these noise levels from aircraft operations. Impacts to the 10 residences would occur as often as 15% of the time during operations, or about 3 weeks per year. This incompatibility would be considered significant to the residents of 10 houses, but since the affected individuals account for approximately 1% of Tinian’s total population, the affect would be less than significant. The impact would not be considered disproportional as all of Tinian is considered a minority and low-income area.

Peak noise levels would be significant during training with large caliber weapons and artillery blasts. As noted in Section 4.5, Noise, 80 people on Tinian and over 1,000 people on Saipan would be exposed to Peak noise levels of 115 decibels during certain training events under unfavorable weather conditions (wind directions and cloud cover). This Peak noise level of 115 decibels compares with hearing a siren of an emergency vehicle (Noise Help 2014) or proximate to other common noise events like fireworks or being near a rock band playing music. There are approximately 13,596 large caliber expenditures from 155 millimeters high explosive weapons per year under the proposed action that would produce the Peak noise levels of 115 decibels (see Chapter 2, Table 2.4-5). Best management practices addressed in Section 4.5, Noise, and Appendix D, would limit nighttime training with large caliber weapons. In addition, these peak noise levels would only be experienced during unfavorable weather conditions. Unfavorable weather conditions occur when the wind blows in the opposite direction of normal trade winds. It was estimated that this condition would occur a maximum of 10-15% of the total training time. Therefore, there is the potential on Saipan to hear Peak noise of 115 decibels from certain large caliber weapon training about 2,040 times (15% of 13,596) during the times while weather conditions were unfavorable. The residents of Tinian and Saipan that would be the receptors of these periodic Peak noise levels live in a minority and low-income area. However, the impact would not be considered disproportional as all of the CNMI is considered a minority and low-income area.

There would be impacts to land use (see Section 4.7.3.1), recreation (see Section 4.8.3.1), and visual resources (see Section 4.12.3.1) from the operations of proposed Tinian Alternative 1. Residents of Tinian, most of who are minority and low-income populations, would be affected by access restrictions to the Military Lease Area during active training events. However, access would still be granted during the 32 weeks when there would be no training and intermittently during the 20 weeks when training would occur. Effects from access restrictions would be shared equally throughout the island and would not be considered disproportionately high and adverse to minority and low-income populations.

Economic impacts would tend to be beneficial and public service agencies would have sufficient capacity to meet the needs of the proposed action leading to no adverse impacts on the health or environment of populations. A potentially significant impact on community character and community cohesion was identified but this would affect all residents similarly and so would not be a disproportionate impact.

There would be no significant impacts that would be adverse or disproportionate to affect environmental justice populations resulting from Tinian Alternative 1 operations.
Protection of Children

Noise exposure at schools on both Tinian and Saipan was evaluated (see Section 4.5.2.1). The modeling results illustrated that on average, noise generated by aircraft would not exceed levels considered detrimental to human hearing, either for adults or children in these school areas. However, to the northeast of Marpo Heights, 10 homes in which children may live would be exposed to incompatible levels (65 decibels) from the aircraft operations of the proposed action. There are schools, particularly in Saipan, located in the areas identified as receptors of significant Peak noise levels of 115 decibels from the planned expenditures of large caliber weapons during training events. While these Peak noise levels would be significant, they would be short-term and intermittent impacts when weather conditions are unfavorable. Reactions to these Peak noise events could affect children in a range from no reaction, to minor annoyance, activity interference or stress. However, these noise levels would be short-term in duration, occur infrequently during the 20 weeks of live-fire training. These noise events and other activities associated with the proposed training ranges on Tinian would not disproportionately present environmental health or safety risks to children on Tinian or Saipan. In accordance with the Executive Order, the anticipated noise level and frequency would not likely result in health risks to children. Therefore, Tinian Alternative 1 operations would result in less than significant impacts to children under Tinian Alternative 1.

4.15.3.2 Tinian Alternative 2

4.15.3.2.1 Construction Impacts

Construction impacts for Tinian Alternative 2 are similar to those for Alternative 1 (see Section 4.15.3.1.1). There would be no disproportionate or adverse health risks to affect environmental justice populations and children would not be exposed to increased health and safety issues. Tinian Alternative 2 construction activities would result in an increase in population; less than significant or beneficial impacts to economic conditions; less than significant impacts to public services; there could be the potential for significant impacts to community character and cohesion; and there would be less than significant impacts to environmental justice populations and children.

4.15.3.2.2 Operation Impacts

Operation impacts for Tinian Alternative 2 are similar to those for Alternative 1 (see Section 4.15.3.1.2). The only difference that would affect socioeconomics is the relocation of the International Broadcasting Bureau; however, there would be no net reduction in electricity consumption due to the proposed action, and therefore no adverse impacts are anticipated in relation to the proposed action. There would be no disproportionate or adverse health risks to affect environmental justice populations and children would not be exposed to increased health and safety issues.

Tinian Alternative 2 operations would lead to an increase in population; less than significant or beneficial impacts to economic conditions; less than significant impacts to public services; there could be the potential for significant impacts to community character and cohesion; and there would be less than significant impacts to environmental justice populations and children.
4.15.3.3 Tinian Alternative 3

4.15.3.3.1 Construction Impacts

Construction impacts for Tinian Alternative 3 are similar to those for Alternative 1 (see Section 4.15.3.1). There would be no disproportionate or adverse health risks to affect environmental justice populations and children would not be exposed to increased health and safety issues.

Tinian Alternative 3 construction activities would lead to an increase in population; less than significant or beneficial impacts to economic conditions; less than significant impacts to public services; there could be the potential for significant impacts to community character and cohesion; and there would be less than significant impacts to environmental justice populations and children.

4.15.3.3.2 Operation Impacts

Operation impacts for Tinian Alternative 3 are similar to those for Alternative 1 (see Section 4.15.3.1.2). The only difference that would affect socioeconomics is the relocation of the International Broadcasting Bureau; however there would be no net reduction in electricity consumption due to the proposed action and therefore no adverse impacts are anticipated in relation to the relocation. There would be no disproportionate or adverse health risks to affect environmental justice populations and children would not be exposed to increased health and safety issues.

Tinian Alternative 3 operations would result in an increase in population; less than significant or beneficial impacts to economic conditions; less than significant impacts to public services; there could be the potential for significant impacts to community character and cohesion; and there would be less than significant impacts to environmental justice populations and children.

4.15.3.4 Tinian No-Action Alternative

The periodic military non-live-fire training exercises that have occurred in the Military Lease Area of Tinian are expected to continue. These activities are short term events that would produce minimal impacts to the socioeconomic conditions of the island. In addition, the impacts from the four proposed live-fire training ranges, described in the September 2010 Record of Decision in the Guam and CNMI Military Relocation EIS (DoN and Department of the Army 2010) span from beneficial, to less than significant, and significant (see Table 16.2-1; DoN 2010a). More jobs would be created during construction creating beneficial impacts; however, fewer agricultural leases would be available and reduce revenues. Less than significant impacts would occur to tourism revenues. Under Mariana Islands Range Complex training, no impacts to Tinian’s economy would occur (see Table 3.16-4; DoN 2010b). The no-action alternative, therefore, would introduce mixed, but generally less than significant, impacts.

For environmental justice, establishing the four ranges would remove the availability of conducting agricultural activities for some who are low income and leasing land; however, while this could be considered significant unless other lands were made available, it would not be disproportionate. No significant impacts to children would occur by operating the four ranges (see Table 19.2-4; DoN 2010a). In terms of the Mariana Islands Range Complex training, no disproportionate health and safety impacts to low-income, minority, and children populations (see Table 3.18-1; DoN 2010b). Therefore, less than significant impacts would be expected from the no-action alternative.
4.15.3.5 Summary of Impacts for Tinian Alternatives

Table 4.15-1 provides a comparison of the potential impacts to socioeconomics and environmental justice resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
<td>Operation</td>
</tr>
<tr>
<td>Socioeconomic and Environmental Justice</td>
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<td>NI</td>
</tr>
<tr>
<td>Population¹</td>
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<td>NI</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td>Economic Conditions</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Tourism</td>
<td>BI</td>
<td>BI</td>
<td>BI</td>
<td>BI</td>
</tr>
<tr>
<td>Gross Domestic Product</td>
<td>BI</td>
<td>BI</td>
<td>BI</td>
<td>BI</td>
</tr>
<tr>
<td>Employment and Income</td>
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<td>BI</td>
<td>BI</td>
<td>BI</td>
</tr>
<tr>
<td>Government Revenues</td>
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<td>BI</td>
<td>BI</td>
<td>BI</td>
</tr>
<tr>
<td>Housing</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
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<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
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<td>LSI</td>
<td>NI</td>
<td>LSI</td>
</tr>
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<td>Airports and Sea Ports</td>
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<td>BI</td>
<td>BI</td>
</tr>
<tr>
<td>Power Utility Rates</td>
<td>NI</td>
<td>BI</td>
<td>NI</td>
<td>BI</td>
</tr>
<tr>
<td>Public Services</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Education</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Emergency Services</td>
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<td>BI</td>
<td>LSI</td>
<td>BI</td>
</tr>
<tr>
<td>Public Health</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Community and Social Topics</td>
<td>LSI/LSI</td>
<td>LSI/LSI</td>
<td>LSI/LSI</td>
<td>LSI/LSI</td>
</tr>
<tr>
<td>Environmental Justice and Protection of Children</td>
<td>NI</td>
<td>NI</td>
<td>NI</td>
<td>NI</td>
</tr>
</tbody>
</table>

Legend: BI = beneficial impact; LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts.

Note¹: A change in population is not considered an impact itself. However, population change has the potential to drive positive or negative impacts to other socioeconomic factors.
4.15.4 Pagan

Economic conditions (i.e., tourism, gross domestic product, employment and income, government revenues, housing, agriculture, airport and sea port, and power utility rates) and public services are non-existent on Pagan. Because there are no residents on Pagan, Executive Orders for Environmental Justice and the Protection of Children are not relevant and no analyses of these issues were provided in this EIS/OEIS. The following discusses only those aspects of socioeconomics impacts anticipated on Pagan.

4.15.4.1 Pagan Alternative 1

4.15.4.1.1 Construction Impacts

Because the island is currently undeveloped and unpopulated, there would be no impacts related to population change, public services, or community character and cohesion associated with Pagan Alternative 1 construction activities. Pagan Alternative 1 construction activities would result in beneficial economic impacts due to construction-related economic activity and revenues provided to the CNMI government.

4.15.4.1.2 Operation Impacts

There would be no impacts related to population change associated with Pagan Alternative 1 operational activities because the island is currently unpopulated, with no socioeconomic infrastructure. However, any potential future settlement may be smaller with the proposed action than without it. Appendix Q, Socioeconomic Impact Assessment Study, indicates that there is potential for existing transitory economic activities that occur on Pagan to continue and for new ones to be developed. These activities include the continuance of very limited ecotourism and potential open-ocean aquaculture operations. Given the existing level of these activities, and accounting for some expansion, assuming appropriate planning takes place, while there may be a reduced land area available, these activities could take place either concurrent with training activities or during times when training would not be occurring on Pagan. Since ecotourism and aquaculture activities could take place at similar magnitudes, with or without the proposed action, the proposed action is not anticipated to have an effect on these activities.

The CNMI government would see an increase in revenues from payments made by the U.S. federal government associated with military use of Pagan. Because the increased revenue would improve the CNMI government’s financial position, the increased revenues would constitute a beneficial impact to the CNMI.

4.15.4.1.2.1 Community and Social Topics

More detailed information on Community and Social Topics can be found in Appendix Q, Socioeconomic Impact Assessment Study, Sections 3.5, 4.4, and 5.4.

Potential impacts to Pagan include decreased access to recreational and cultural opportunities (see Section 2.5.1.4.1.2, Public Access, for information on access restrictions), and decreased the opportunity for former Pagan residents or their descendants to be able to re-settle or homestead the island. Pagan Alternative 1 operations could affect community character by replacing some recreational and cultural opportunities on Pagan with military training. Pagan Alternative 1 operations would convert land that
could be used for subsistence activities and farming into lands sustaining active live-fire military training, thereby affecting the place-based relationship that communities are able to have with their ancestral homeland. Access restrictions associated with Pagan Alternative 1 operations would also affect the opportunity for those with ties to the island to practice and pass down knowledge of cultural activities while on the island.

These localized changes may impact the perceptions that some former residents and their descendants have of Pagan. Therefore, there is a potential for changes to community character and cohesion to occur as a result of Pagan Alternative 1 operations.

### 4.15.4.2 Pagan Alternative 2

The only differences between Pagan Alternatives 1 and 2 are that the southern High Hazard Impact Area would not be established and the northern impact area would decrease in size. These changes would not affect the analysis presented for Alternative 1. Therefore, socioeconomic impacts associated with Pagan Alternative 2 would be the same as those presented for Pagan Alternative 1.

#### 4.15.4.2.1 Construction Impacts

There would be no population, public services, or community character and cohesion impacts associated with Pagan Alternative 2 construction activities. There would be beneficial economic impacts due to construction-related revenues provided to the CNMI government.

#### 4.15.4.2.2 Operation Impacts

Pagan Alternative 2 operations would result in less than significant impacts to the population and beneficial impacts to economic conditions from U.S. federal land acquisition. However, there is a potential for direct significant impacts to community character and cohesion resulting from Pagan Alternative 2 operations.

### 4.15.4.3 Pagan No-Action Alternative

There would be no live-fire training on Pagan under the no-action alternative. There would continue to be periodic visits to Pagan for eco-tourism, scientific surveys and military training for search and rescue. These activities would be short term and have less than significant impacts on the socioeconomic conditions of Pagan.

### 4.15.4.4 Summary of Impacts for Pagan Alternatives

Table 4.15-2 provides a comparison of the potential impacts to socioeconomics and environmental justice resources for the two Pagan alternatives and the no-action alternative.
### Table 4.15-2. Summary of Impacts for Pagan Alternatives

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Socioeconomics and Environmental Justice</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Population</td>
<td>NI</td>
<td>NI</td>
<td>NI</td>
</tr>
<tr>
<td>Economic Conditions</td>
<td>BI</td>
<td>BI</td>
<td>BI</td>
</tr>
<tr>
<td>Public Services</td>
<td>NI</td>
<td>LSI</td>
<td>NI</td>
</tr>
<tr>
<td>Community and Social Topics</td>
<td>NI</td>
<td>Potential for SI</td>
<td>NI</td>
</tr>
</tbody>
</table>

**Legend:** BI = beneficial impact; LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts.

**Note:** A change in population is not considered an impact itself. Population change has the potential to drive positive or negative impacts to other socioeconomic factors; however, Pagan has no socioeconomic infrastructure that could be impacted by population change.
4.16 **Hazardous Materials and Waste**

Section 4.16 evaluates potential direct and indirect impacts resulting from hazardous materials, toxic substances, hazardous waste, and contaminated sites associated with the proposed action. Section 3.16, *Hazardous Materials and Waste* and Appendix R, *Hazardous Materials and Waste Technical Memo*, provide definitions for the terms used in this section (e.g., hazardous materials, hazardous waste, toxic substances) and general background information on the hazardous materials and waste resource category. Information from this section is also used in the impact analysis in Section 4.3, *Water Resources*; Section 4.9, *Terrestrial Biology*; Section 4.10, *Marine Biology*; Section 4.13, *Transportation*; and Section 4.17, *Public Health and Safety*.

**4.16.1 Approach to Analysis**

The methodology for identifying and evaluating impacts to hazardous materials and waste as they relate to the proposed action and alternatives includes the assessment of transport, storage, dispensing, handling, and disposal of hazardous materials, toxic substances, and/or hazardous waste (i.e., hazardous substances) on and to and from Tinian and Pagan and the potential for increased human health risk or environmental exposure, as well as changes in the quantity and types of hazardous substances transported, stored, used, and disposed of during construction and operation. Existing contaminated sites were also identified and the locations of these sites were compared with the locations of the proposed construction and operation activities associated with the proposed action, and the existing and proposed avoidance measures.

Knowledge of existing processes and available data were used to predict the type and quantity of hazardous materials, toxic substances, and hazardous waste that would likely be used, encountered, or generated through implementation of the proposed action. These estimates were compared with current usage and generation rates, waste types, and the capability for managing hazardous materials, toxic substances, and hazardous waste. Quantitative impact criteria are not available, so the significance of impacts is determined qualitatively based on the degree of change as well as compliance with regulatory standards, where applicable.

4.16.2 Resource Management Measures

Resource management measures that are applicable to hazardous materials and waste include the following:

4.16.2.1 Avoidance and Minimization Measures

- As part of the planning process, hazardous materials and waste storage facilities were specifically sited away from areas prone to flooding or geological hazards. In addition, encroachment and intersection with known contaminated sites was minimized to the maximum extent practicable.

4.16.2.2 Best Management Practices and Standard Operating Procedures

Best management practices and standard operating procedures that are applicable for hazardous materials and waste are listed below and described in Appendix D, Best Management Practices.

- Erosion Control Measures. The erosion control measures such as retention ponds, swales, silt fences, fiber rolls, gravel bag berms, mulch, and erosion control blankets would be implemented during construction and operations to eliminate and/or minimize nonpoint source pollution in surface waters due to sediment.
- Spill Prevention, Control, and Countermeasures. Spill Prevention, Control, and Countermeasures such as the preparation of a Spill Prevention Control and Countermeasure Plan would be implemented to ensure that personnel are trained as to proper labeling, container, storage, staging, and transportation requirements for hazardous substances and to ensure personnel are properly trained with regards to spill prevention, control, and cleanup methods.
- Facility Response Programs. Facility Response Programs such as the preparation of a Facility Response Plan would be implemented to outline the procedures to assess, respond, and report releases, leaks, or spills of hazardous substances.
- Hazardous Waste Management Programs. Hazardous Waste Management Programs would include waste minimization plans that provide protocols designed to encourage and promote the efficient use of hazardous waste, substitute products that are less toxic whenever feasible, minimize their use, and promote recycling and reuse of hazardous waste.
- Hazardous Materials Management Programs. Hazardous Material Management Programs would implement procedures for the transportation, storage, use, and disposal of hazardous materials. Procedures would also include waste minimization plans that provide protocols designed to encourage and promote the efficient use of hazardous materials, substitute products that are less toxic whenever feasible, minimization of their use, and promote recycling and reuse of hazardous materials.
- Occupational Health and Safety Administration Compliance. Occupational Health and Safety Administration Compliance would include the preparation and implementation of a construction health and safety program that complies with federal and local health and safety regulations.
- Pest Control Measures. Pest Control Measures would include the development and implementation of a comprehensive Integrated Pest Management Plan. This Plan would
encompass all activities regarding the importation, handling, storage, use, and application of pesticides.

- Munitions and Explosives of Concern Protocol, Procedures, and Guidance. Munitions and Explosives of Concern Protocol, Procedures, and Guidance would include compliance with Naval Ordnance Safety and Security Activity Instruction 8020.15D Explosives Safety Review, Oversight, and Verification of Munitions Responses and other directives to reduce the potential exposure to unexploded ordnance; implement routine firing range clearance operations; implement all applicable U.S. military munitions and explosives of concern operations guidance to minimize or eliminate potential hazards; implement land use controls, and provide training on identifying and responding to munitions and explosives of concern.

- Range Management Measures: Range management measures may include the use of impoundments, traps, or other structures to catch lead particles in sediments transported away from objective or target areas and engagement zones by runoff and the application of buffering agents such as limestone, gypsum, and dolomite to maintain a more neutral pH in areas where lead may come in contact with rainwater (e.g., berms in static ranges).

- Radon Control Measures. Radon Control Measures include radon resistant construction methods, installation of radon abatement systems, and periodic radon monitoring.

- Range Environmental Vulnerability Assessment Program as described below.

As discussed in Section 4.3.2, Resource Management Measures (for Water Resources), the Range Environmental Vulnerability Assessment program was developed to understand the current environmental conditions at all operational ranges and ensure range activities are not causing an adverse impact to human health and/or the environment. The Range Environmental Vulnerability Assessment program assesses the potential environmental impacts of military munitions use on existing operational ranges and determines whether there has been a release or a substantial threat of a release of munitions constituents to an off-range area. The primary pathways evaluated under the Range Environmental Vulnerability Assessment program include surface water, groundwater and sediment transport.

Operational ranges that are addressed under the Range Environmental Vulnerability Assessment program include target/impact areas, firing positions, small arms ranges, and training and maneuver areas. The Range Environmental Vulnerability Assessment program also assesses areas with historical training munitions use within operational range boundaries. The Range Environmental Vulnerability Assessment program does not evaluate future ranges or ranges that are covered under a separate program (e.g., cleanup of closed ranges under the Munitions Response Program, permitted Open Burning/Open Detonation sites under the Resource Conservation and Recovery Act). The Range Environmental Vulnerability Assessment program provides a snapshot of the current environmental conditions of operational ranges across the Marine Corps and a detailed assessment of potential munitions constituent migration from operational ranges to off-range areas. The Range Environmental Vulnerability Assessment program uses munitions expenditures data, sampling information, any changes to range use or operations along with data from previous assessments to conduct the analysis. Reevaluations occur at a minimum of every 5 years.

See Section 4.3, Water Resources, for discussion of impacts associated with hazardous materials to these resources.
4.16.3 Tinian

4.16.3.1 Tinian Alternative 1

4.16.3.1.1 Construction Impacts

4.16.3.1.1.1 Hazardous Materials

The majority of construction activities, including vegetation removal, grading, excavation, and construction, would take place in the Military Lease Area. There would also be construction activity at the Tinian International Airport, the Port of Tinian, and the proposed Primary Military Munitions Supply Route (Supply Route) from the Port of Tinian to the Munitions Storage Area on the northwestern end of Tinian International Airport (see Figures 4.16-1 and 4.16-2).

Construction activities would cause a short-term increase in the use of hazardous materials that would end when the construction is finished. Most of the hazardous materials expected to be used are common to construction (e.g., diesel fuel, gasoline, and propane; hydraulic fluids, oils, and lubricants; welding gases; paints and solvents; adhesives; and batteries). The increased volume and use of hazardous materials during the construction period would present a potential for increased accidental spills and releases of hazardous materials, resulting in potential impacts to human health and the environment. The hazardous materials would be handled, stored, and disposed according to applicable best management practices; standard operating procedures; and federal and CNMI regulations.

Hazardous materials would be brought to construction sites using existing or proposed public transportation routes. Transportation of all materials would be conducted in compliance with the U.S. Department of Transportation regulations and CFR Title 49. Following the best management practices and standard operating procedures and compliance with federal and CNMI regulations would reduce the likelihood and volume of accidental releases, allow for faster spill response times, and enable timely cleanup.

Construction of the amphibious landing area at Unai Chulu and Bulk Fuel Storage Facility at the Port of Tinian would have the potential for accidental fuel spills in marine and nearshore waters. However, best management practices and standard operating procedures to manage and minimize potential accidental releases of fuel, petroleum, oils, and lubricants would be followed.

The proposed Supply Route leading from the Port of Tinian to the Military Lease Area would not overlap sections of an above ground and underground pipeline that carries diesel from the Mobil bulk fuel storage tank at the Port of Tinian to the Commonwealth Utility Corporation Tinian power plant (Figure 4.16-3); therefore, there would be no impacts to the existing diesel pipeline.

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, construction activities associated with Tinian Alternative 1 would not significantly increase the potential for impacts from hazardous materials. Therefore, Tinian Alternative 1 construction would result in less than significant direct and indirect impacts with respect to hazardous materials.
Figure 4.16-1
Tinian All Action Alternatives Hazardous Materials / Waste Use, Storage Areas and Contaminated Sites for Range Training Area
Figure 4.16-2
Tinian All Action Alternatives Hazardous Materials/Waste Use and Storage Areas Base Camp, Munitions Storage, and Airport Improvements

Source: NAVFAC Pacific 2013
Figure 4.16-3
Tinian All Action Alternatives Hazardous Materials/Hazardous Waste Use and Storage Areas for Tinian Port and Supply Route

Source: NAVFAC Pacific 2013
4.16.3.1.1.2 Toxic Substances

Although unlikely, construction and demolition may reveal asbestos-containing materials, lead-based paint, or polychlorinated biphenyls that were used in building materials or electrical equipment at the time of original construction. If any of these toxic substances are encountered, properly trained and licensed contractors would be used to ensure that all U.S. military, federal, and CNMI hazardous waste testing, handling, and disposal procedures and requirements are followed for their collection and disposal. Because the U.S. Environmental Protection Agency banned lead-based paint in 1978, and banned most uses of polychlorinated biphenyls in 1979, these toxic substances would not be used to construct the proposed new facilities on Tinian; nor would asbestos-containing materials be used.

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, construction activities associated with Tinian Alternative 1 would not significantly increase the potential for impacts from toxic substances. Therefore, Tinian Alternative 1 construction would result in less than significant direct and indirect impacts with respect to toxic substances.

4.16.3.1.1.3 Hazardous Waste

Construction activities would result in a short-term increase in the generation of hazardous waste that would end when construction is finished. Hazardous waste generated from construction activities includes pesticides, herbicides, solvents, adhesives, lubricants, corrosive liquids, batteries, and aerosols. Due to the projected increase in generation of hazardous waste, this alternative would have the potential to result in adverse impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the hazardous waste would be handled and disposed per applicable best management practices and standard operating procedures (see Appendix D, Best Management Practices). Construction contractors would be required to comply with all applicable requirements concerning handling, storage, and disposal of construction-related hazardous waste. All hazardous waste would be shipped off the island to the appropriate disposal facility site. Existing public transportation routes, including shipping by commercial carrier, would be utilized for the conveyance of hazardous waste to the disposal facility site. Transportation of all hazardous waste would be conducted in compliance with U.S. Department of Transportation regulations and CFR Title 49.

Based upon the above analysis and through implementation of resource management measures described in Section 4.16.2, the temporary increase in the generation, transport, storage, and handling of hazardous waste during construction activities associated with Tinian Alternative 1 would not significantly increase the potential for impacts from hazardous waste. Therefore, Tinian Alternative 1 construction would result in less than significant direct and indirect impacts with respect to hazardous waste.

4.16.3.1.1.4 Contaminated Sites

As shown in Figure 4.16-1, several contaminated sites have been identified within or near the proposed Tinian Alternative 1 construction areas. Consideration and careful attention during project design phases would be given prior to construction to either avoid these sites as much as practicable. Proposed RTA facilities and infrastructure would exclude the Tinian Mortar Range (also called Chiget Mortar Range) (see Figure 4.16-1). If proposed construction projects cannot be designed to avoid these contaminated...
sites, then various best management practices and construction operational protocols would be followed to protect human health and the environment.

In addition, best management practices that would be used include, but are not limited to, development of site-specific health and safety plans; the use of engineering controls (e.g., dust suppression) and administrative controls; and the use of personal protective equipment (see Appendix D, Best Management Practices, for a discussion of proposed best management practices).

Explosives safety documentation would be prepared and would outline specific measures that would be implemented to ensure the safety of workers and the public. This would reduce the potential hazards related to the exposure to unexploded ordnance. It would also be in accordance with Department of Defense Instruction 3200.16, Operational Range Clearance (Department of Defense 2005), Department of Defense Instruction 4140.62, Material Potentially Presenting and Explosive Hazard (Department of Defense 2014), Department of Defense Directive 6055.9, Department of Defense Ammunition and Explosive Safety Submission (DoN 2010a), and Naval Ordnance and Safety and Security Activity Instruction 8020.15D (DoN 2011). Best management practices that would be implemented include having qualified operational range clearance or unexploded ordnance personnel perform surveys to identify and remove potential unexploded ordnance before the start of ground-disturbing activities to minimize potential impacts. However, additional safety precautions could include operational range clearance or unexploded ordnance personnel supervision during earth moving and providing a safety awareness/hazardous assessment brief to construction contractors and equipment operators to train them to identify whether materials are unexploded ordnance that potentially present an explosive hazard. Any unexploded ordnance identified during construction would be disposed of in accordance with applicable regulations.

The design of Tinian Alternative 1 would either avoid the disturbance and dispersion of soil and groundwater at contaminated sites, or use of best management practices to minimize impacts. Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, construction activities associated with Tinian Alternative 1 would not significantly increase the potential for impacts to contaminated sites. Therefore, Tinian Alternative 1 construction would result in less than significant direct and indirect impacts with respect to contaminated sites.

### 4.16.3.1.2 Operation Impacts

#### 4.16.3.1.2.1 Hazardous Materials

*Munitions and Explosives of Concern*

*Figure 4.16-1* shows the locations of live-fire range complexes and the Convoy Course associated with Tinian Alternative 1. Activities associated with live-fire range operations would result in increased hazardous materials in the form of munitions and explosives of concern and heavy metals. This is because unexploded ordnance, military munitions, and munitions constituents (i.e., chemical components of munitions) have the potential to contain high explosives, explosives constituents, and potentially leachable compounds (i.e., heavy metals that dissolve in water). Training ranges within Range Complexes A, B, C, and D as well as the Convoy Course objective areas would receive spent munitions (e.g., bullets, grenades, rockets, mortars). The High Hazard Impact Area (within Range...
Complex A) would receive high explosive munitions such as grenades, mortars, and rockets, as well as inert aviation ordnance.

In general, when munitions are fired, the explosives constituents are consumed in the explosion. Trace amounts of explosives may be detectable on remaining metal components, such as small arms projectiles and hand grenade and mortar fragments. Inert aviation ordnance used on Tinian would be filled with materials such as concrete that do not contain any hazardous constituents. Spotting charges in the inert aviation ordnance and explosives in flares would also be almost entirely consumed in firing the munition except for the dudged munitions and fusing failures.

With the implementation of resource management measures described in Section 4.16.2, the negligible amounts of explosives constituents remaining on projectiles and fragments would not be a source of potential contamination to surface water or groundwater. Munitions constituents, in particular heavy metals (i.e., lead, nickel, chromium, cadmium, and copper), do not break down easily and tend to build up in surface soils. They may rust or otherwise react with natural substances, but do not break down like organic compounds. Therefore, the volume of expended material within the training areas would gradually increase over time (DoN 2010b). As discussed in Section 4.3, Water Resources, Low Impact Development features would be utilized to control stormwater runoff from the ranges. Range management activities may include the use of impoundments, traps, or other structures to catch lead particles in sediments transported away from objective or target areas and engagement zones by runoff and the application of buffering agents such as limestone, gypsum, and dolomite to maintain a more neutral pH in areas where lead may come in contact with rainwater (e.g., berms in static ranges). These, range management activities would minimize the accumulations of munitions constituents.

The majority of munitions constituents released to the environment originate from munitions that either partially detonate or do not detonate at all (DoN 2010b). Munitions constituents in partially or unexploded ordnance are contained within the munition itself and release of munitions constituents due to corrosion of the casing may take a long time to occur, although salt spray and humidity may accelerate deterioration of the casing (DoN 2010b). Unexploded ordnance would occur in Range Complex A (High Hazard Impact Area).

The RTA would be managed in accordance with current Marine Corps range management policies and procedures, which are designed to ensure the safe, efficient, effective, and environmentally sustainable use of the ranges. To minimize potential impacts of munitions constituents accumulating and/or migrating in soil and surface water/groundwater, routine range clearance operations would be scheduled and conducted, as needed. Munitions that fail to function as intended during the training activity would be tracked by the Range Control Facility and rendered safe by Explosive Ordnance Disposal Technicians. Applicable U.S. military munitions and explosives of concern operations guidance protocols would also be implemented to mitigate adverse impacts from munitions and explosives of concern, including deposits that have the potential to leach into the subsurface. Best management practices would be implemented to minimize or eliminate direct runoff of munitions and explosives of concern and surficial soil into adjacent areas. Live-fire training would produce ammunition shell casings that would be collected and sent to an authorized recycling center.

All surface danger zone boundaries for munitions impacts extend over much of the Military Lease Area and portions of the adjacent open ocean, so it is unlikely that munitions would land outside the Military
Lease Area. However, it is possible that munitions could fall into ocean waters (i.e., due to ricochet or breakup of munitions after detonation). In the unlikely event that a fragment should land in the ocean, concentrations of munitions constituents would be very low due to the dilution from seawater.

**Fuels, Petroleum, Oils, and Lubricants**

Training and maintenance activities would require the use of vehicles that would result in an increase in the amount of fuel, petroleum, oils, and lubricants used. During training exercises, the Forward Arming and Refueling Point would be staged on existing pavement at North Field, within berms containing impervious liners or secondary containment. The Forward Arming and Refueling Point for North Field would be a temporary, mobile field facility that would be set up and broken down in the Drop Zone as part of the training exercise, so it would not have a designated permanent location (see Figure 4.16-1).

Beach and amphibious training maneuvers and the use of Amphibious Assault Vehicles would have the potential for accidental fuel spills in marine and nearshore waters. However, best management practices and standard operating procedures would be used to manage and minimize potential accidental releases of fuel, petroleum, oils, and lubricants (see Appendix D, Best Management Practices).

Used military vehicles with potential contaminants would not be used as targets at any of the training ranges. All targets would be three dimensional representations constructed of sheet metal.

**Figure 4.16-2** shows the locations of hazardous materials and hazardous waste use/storage areas that would be constructed for all alternatives. Hazards materials storage facilities on Tinian would be constructed using best management practices for construction in any unavoidable areas that are known to have seismic and tsunami hazards to minimize potential impacts from geologic hazards. A fueling station would be constructed at the Tinian base camp and two military bulk fuel storage areas (with a 30-day fuel capacity of 500,000 gallons [1,900,000 liters]) would be established at the port (see Figure 4.16-3). The operation of the Bulk Fuel Storage facility and off-load terminal would require an Oil Pollution Act of 1990 permit. Fuel would be delivered by military or civilian vessels to the military bulk fuel facility at the port then trucked to the expeditionary airfield-base for storage in a smaller aboveground storage tank. Air resupply may also be used to deliver bulk fuel to the expeditionary bulk fuel storage facility at the airfield base camp. The transport and transfer of fuel has the potential to result in accidental releases from spills. The military fuel storage facilities would be constructed with secondary containment and other controls to prevent and minimize leaks and spills (e.g., pumps with fuel-level sensors and controls with automatic shut-off capability) (Department of Defense 2013). Fuels would be handled according to permit requirements, best management practices and standard operating procedures designed to prevent and minimize leaks and spills. Personnel working in the fuel facilities would be trained in spill response procedures in accordance with the installations Facility Response Plan and Spill Prevention, Control, and Countermeasures Plan to minimize impacts to the environment in the event of an accidental release.

Tinian Alternative 1 operations would result in an increase to the disposal rate for spent petroleum products. All fuels, petroleum, oils, and lubricants would be stored, handled, transported, and disposed according to existing best management practices, standard operating procedures, and applicable federal and CNMI regulations and permit requirements, as well as U.S. military requirements.
Other Hazardous Materials

Training and maintenance would also involve the use of batteries, pesticides, herbicides, paints, solvents, fluorescent light fixtures, and flameless ration heaters for meals ready to eat. Most hazardous materials (such as paints, solvents, pesticides and herbicides) would be used up and thus not require disposal. Pesticides and herbicides would be used as part of range and facility management to control nuisance species and would be applied and managed in accordance with applicable regulations and manufacturer instructions. For those hazardous materials that do require disposal, a hazardous materials storage facility would be constructed at the base camp, where hazardous materials would be properly managed and stored in accordance with federal and CNMI regulations and U.S. military requirements. The storage facility would be constructed using best management practices for construction in unavoidable areas with seismic and tsunamic hazards to minimize potential impacts from geologic hazards. Batteries would be treated as recyclables. Fluorescent light fixtures would be containerized and shipped off-island. Human health, welfare, and the environment would be protected through the use of proven and effective best management practices and standard operating procedures to:

- Prevent, contain, and/or clean up spills and leaks
- Provide personnel training and operational protocol and procedures, including segregation of unused flameless ration heaters from solid waste for proper reuse or hazardous waste disposal (Breeh 2004)
- Ensure Defense Marketing and Reutilization Office’s ability to properly arrange for and coordinate the disposal of anticipated hazardous materials
- Ensure all U.S. military personnel and contractors are trained in accordance with the CNMI pesticide management regulations (Rabauliman 2013) regarding the importation, handling, use, and application of pesticides

Due to the projected increase in the use of hazardous materials, Tinian Alternative 1 operations would have the potential to result in direct and indirect impacts to human health and the natural environment (i.e., soils, surface water, groundwater, air, plants, and animals). Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, direct and indirect impacts from hazardous materials would be reduced to less than significant.

4.16.3.1.2.2 Toxic Substances

Toxic substances, including depleted uranium or radioactive munitions, would not be used as part of operations. Facilities use and maintenance would not require the use or disposal of lead based paint, asbestos containing materials, or polychlorinated biphenyls as these substances have been banned from use.

Radon hazards on Tinian have not been identified; however, radon is known to exceed U.S. Environmental Protection Agency action levels in areas on Guam which has similar geologic formations (e.g., Mariana Limestone). Radon testing on Guam resulted in a definite correlation between the type of surficial geology and radon concentrations. In almost all cases, elevated radon concentrations were found in buildings located above Barrigada Limestone and Mariana Limestone but not in those located above alluvial clay deposits, beach deposits, and volcanic rocks (Burkhart et al. 1993). A large portion of
the geology of Tinian consists of Mariana Limestone, and therefore, there is a potential for radon intrusion into structures constructed on the island where this geology is present.

To minimize this potential impact, radon control measures such as using resistant construction techniques and abatement systems would be incorporated into building/facility designs. In addition, the U.S. military would periodically test facilities constructed in known radon zones in accordance with Office of the Chief of Naval Operations Instruction 5090.1D, Chapter 25-3.2, once determined, to verify that no unacceptable radon gas buildup occurs, and would install radon abatement systems as appropriate.

Tinian Alternative 1 would have potential adverse impacts from toxic substances as a result of radon gas. Based upon the above analysis and through implementation of resource management measures described in Section 4.16.2, Resource Management Measures, operational activities under Tinian Alternative 1 result in less than significant direct or indirect impacts to radon. In addition, there would not be direct or indirect impacts associated with other toxic substances.

### 4.16.3.1.2.3 Hazardous Waste

#### Spent Munitions

Military munitions that are used for their “intended purposes” are not considered waste per the Military Munitions Rule (40 CFR 266.202). In general, military munitions become subject to Resource Conservation and Recovery Act hazardous waste transportation, storage, and disposal requirements (i.e., judged not to have been used for their “intended purposes”) when:

- Transported off-range for storage
- Reclaimed and/or treated for disposal
- Buried or land filled on- or off-range
- Munitions land off-range and are not immediately rendered safe or retrieved

With careful management of range clearance and maintenance, and the recovery and recycling of range related scrap metal range operations would not result in increases in hazardous waste volumes on Tinian.

#### Other Hazardous Waste

There could be increased generation of hazardous waste as a result of operational activities associated with Tinian Alternative 1. Specific increases in hazardous waste generated could include: off-specification pesticides and herbicides; spent or off-specification solvents; corrosive or toxic liquids; and spent or off-specification aerosols. These materials would primarily be generated as a result of firing range maintenance, vehicle maintenance, and aircraft maintenance.

Tinian Alternative 1 operations would result in an increase to the Tinian hazardous waste disposal rate. To accommodate the increase in hazardous waste generation, a satellite hazardous waste accumulation site would be constructed at the Tinian base camp. Hazards waste storage facilities on Tinian would be constructed using best management practices in unavoidable areas with seismic and tsunamic hazards to minimize potential impacts from geologic hazards. The satellite accumulation area would be managed in accordance with applicable regulations and the facility Hazardous Waste Management Program to minimize the likelihood of accidental releases and resulting impacts. Waste collected at the satellite
accumulation area would be transported to Guam for recycling/disposal through the Defense Reutilization and Marketing Office in accordance with federal, Guam, and CNMI regulations and U.S. military requirements. There would be sufficient capability at Guam facilities to accommodate recycling and disposal of hazardous waste generated under Tinian Alternative 1.

Tinian Alternative 1 would generate increased volumes of hazardous wastes on Tinian. However, hazardous waste would be managed (stored, transported, disposed) according to best management practices and standard operating procedures that would minimize the potential for accidental spills and releases that could expose people and the environment to hazardous waste.

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, Tinian Alternative 1 operations would not significantly increase the potential for impacts from hazardous waste. Therefore, Tinian Alternative 1 operations would result in less than significant direct and indirect impacts with respect to hazardous waste.

### 4.16.3.1.2.4 Contaminated Sites

Contaminated sites have been identified within or near the proposed RTA and Supply Route (Table 4.16-1). If contaminated soil, groundwater, or munitions and explosives of concern are encountered or disturbed during training activities, there could be potential direct and indirect impacts to human health to the natural environment (i.e., soils, surface water, groundwater, air, plants, and animals). These impacts would be minimized through avoidance and the use of appropriate best management practices and standard operating procedures. These may include redesigning or re-routing the proposed training area to avoid a contaminated site and/or having qualified unexploded ordnance personnel perform surveys to identify and remove potential munitions and explosives of concern before training activities begin. Where appropriate, limited testing of soils and groundwater may also occur to identify potential health risks where hazardous wastes are suspected to be present. Additional precautions, such as unexploded ordnance personnel supervision during training activities, and/or providing munitions and explosives of concern awareness training to personnel before training activities begin could also be taken.

Disturbance of contaminated sites would be avoided to the maximum extent practicable. Where contaminated sites cannot be avoided, the use of best management practices and standard operation procedures regarding munitions and explosives of concern and hazardous waste management would minimize potential impacts.

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, Tinian Alternative 1 operations would not increase the potential for impacts to contaminated sites. Therefore, Tinian Alternative 1 operations would result in less than significant direct and indirect impacts with respect to contaminated sites.
### Table 4.16-1. Potentially Contaminated Sites Within or Near Training Areas Under Alternative 1

<table>
<thead>
<tr>
<th>Training Area</th>
<th>Contaminated Site</th>
<th>Potential Hazard</th>
<th>Applicable Resource Management Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex A</td>
<td>E-2</td>
<td>Petroleum residues, small ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>E-11</td>
<td>Petroleum residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>E-12</td>
<td>Ordnance</td>
<td>Munitions and Explosives of Concern Protocol, Procedures, and Guidance</td>
</tr>
<tr>
<td></td>
<td>E-18</td>
<td>Agricultural chemical residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td>Range Complex B</td>
<td>L-2</td>
<td>Petroleum residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>L-5</td>
<td>Petroleum residues, Asbestos; Unidentified chemical hazards</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td>Range Complex C</td>
<td>L-7</td>
<td>Petroleum</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>L-12</td>
<td>Petroleum, Metals, Ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td>Tracked Vehicle Drivers Course</td>
<td>E-1</td>
<td>Petroleum residues, small ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>E-17</td>
<td>Agricultural chemical residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>L-2</td>
<td>Petroleum residues, Asbestos</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>L-4</td>
<td>Petroleum Residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>L-5</td>
<td>Petroleum residues, Asbestos; Unidentified chemical hazards</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>L-8</td>
<td>Ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance;</td>
</tr>
<tr>
<td>Training Area</td>
<td>Contaminated Site</td>
<td>Potential Hazard</td>
<td>Applicable Resource Management Measures</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------</td>
<td>------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td>R-1</td>
<td>Petroleum Residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>R-15</td>
<td>Agricultural chemical residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>Masalog Ridge Area Site</td>
<td>Ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>E-1</td>
<td>Petroleum residues, small ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>E-13</td>
<td>Ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>E-17</td>
<td>Agricultural chemical residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>E-18</td>
<td>Agricultural chemical residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>E-29</td>
<td>Unidentified chemical hazards</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>L-2</td>
<td>Petroleum residues, Ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>L-5</td>
<td>Petroleum residues, Asbestos</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
<tr>
<td>L-7</td>
<td>Petroleum</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
<td></td>
</tr>
</tbody>
</table>
Table 4.16-1. Potentially Contaminated Sites Within or Near Training Areas Under Alternative 1

<table>
<thead>
<tr>
<th>Training Area</th>
<th>Contaminated Site</th>
<th>Potential Hazard</th>
<th>Applicable Resource Management Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Supply Route</td>
<td>R-1</td>
<td>Petroleum, Ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>R-4</td>
<td>Petroleum</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>R-6</td>
<td>Petroleum residues, Unidentified chemical hazards</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>R-15</td>
<td>Agricultural chemical residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>L-4</td>
<td>Petroleum</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>L-6</td>
<td>Petroleum</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>L-7</td>
<td>Petroleum</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td>All training areas</td>
<td>Site Wide</td>
<td>Munitions and Explosives of Concern; Sodium arsenate, Petroleum</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
</tr>
</tbody>
</table>


4.16.3.2 Tinian Alternative 2

4.16.3.2.1 Construction Impacts

Tinian Alternative 2 would use similar construction materials and methods as described in Section 4.16.3.1 for Tinian Alternative 1. Alternative 2 would also follow the same best management practices, standard operating procedures, and regulatory compliance which would minimize the potential impacts associated with hazardous materials, toxic substances, hazardous waste, and contaminated sites as described in Section 4.16.3.1 for Tinian Alternative 1. The primary difference related to hazardous materials and waste is that a larger construction footprint would be created under Tinian Alternative 2 due to the addition of a Battle Area Complex and associated Urban Assault Course at the International Broadcasting Bureau (Range Complex C) and the addition of five more Convoy Course engagement areas. Within Range Complex C, the International Broadcasting Bureau would no longer be operational. Its buildings would be stripped and the antennae removed. These actions would result in a temporary increase in hazardous materials and waste being used/generated on Tinian. The potential for construction activities to encroach or intersect with contaminated sites would be the same as described...
under Alternative 1 for all RTAs except Range Complex C and the Convoy Course. The increased area of this range would potentially encounter seven additional contaminated sites, as summarized in Table 4.16-2. The difference in the amount of construction or number of contaminated sites within the Alternative 2 footprint would not change the effectiveness of the best management practices and standard operating procedures in preventing and minimizing adverse environmental impacts.

Based upon the above analysis and the implementation of the resource management measures described in Section 4.16.2, activities associated with Tinian Alternative 2 would not significantly increase the potential for impacts from hazardous materials, toxic substances, hazardous waste, and contaminated sites. Therefore, Tinian Alternative 2 construction would result in less than significant direct and indirect impacts with respect to hazardous materials, toxic substances, hazardous waste, and contaminated sites.

4.16.3.2.2 Operation Impacts

Tinian Alternative 2 training and maintenance activities would be similar to those described in Section 4.16.3.1 for Tinian Alternative 1 with regards to hazardous materials, toxic substances, hazardous wastes, and contaminated sites. Tinian Alternative 2 would also follow the same best management practices, standard operating procedures, and regulatory compliance which would minimize the potential impacts associated with hazardous materials, toxic substances, hazardous waste, and contaminated sites as described in Section 4.16.3.1 for Tinian Alternative 1. The only difference is that maneuver activities would take place over a larger area for Tinian Alternative 2 as compared with Tinian Alternative 1, because Alternative 2 would include the southern Battle Area Complex, and six additional engagement zones associated with the Convoy Course. Due to the larger Battle Area Complex and Convoy Course, Tinian Alternative 2 would likely use more petroleum based hazardous materials and generate more non-petroleum-based hazardous waste (e.g., pesticides) than Tinian Alternative 1.

Disturbance of contaminated sites would be avoided to the maximum extent practicable. Where contaminated sites cannot be avoided, the use of resource management measures identified in Section 4.16.2 would minimize potential impacts to contaminated sites.

The differences in the size of the training area, hazardous materials and waste volumes, and number of contaminated sites would not change the effectiveness of the best management practices and standard operating procedures in preventing and minimizing adverse environmental impacts.

Based upon the above analysis and the implementation of the resource management measures described in Section 4.16.2, Tinian Alternative 2 operations would not significantly increase the potential for impacts from hazardous materials, toxic substances, hazardous waste, and contaminated sites. Therefore, Tinian Alternative 2 operations would result in less than significant direct and indirect impacts with respect to hazardous materials, toxic substances, hazardous waste, and contaminated sites.
### Table 4.16-2. Potentially Contaminated Sites Within or Near Training Areas Under Alternative 2

<table>
<thead>
<tr>
<th>Training Area</th>
<th>Contaminated Site</th>
<th>Potential Hazard</th>
<th>Applicable Resource Management Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Complex C</td>
<td>E-6</td>
<td>Asphalt plant release area, hazardous substances</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>E-15</td>
<td>Medical waste</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>E-17</td>
<td>Agricultural chemical residues</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>E-22</td>
<td>Metals, toxic substances, petroleum residues, ordnance, hazardous materials and wastes</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>E-25</td>
<td>Metals, ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td></td>
<td>E-26</td>
<td>Petroleum residues, ordnance</td>
<td>Erosion control measures; Hazardous Waste Management Program; Munitions and Explosives of Concern Protocol, Procedures, and Guidance; Occupational Safety and Health Administration Compliance</td>
</tr>
<tr>
<td>Convoy Course</td>
<td>E-20</td>
<td>Petroleum</td>
<td>Erosion control measures; Hazardous Waste Management Program; Occupational Safety and Health Administration Compliance</td>
</tr>
</tbody>
</table>

4.16.3.3  Tinian Alternative 3

4.16.3.3.1  Construction Impacts

Tinian Alternative 3 would use similar construction materials and methods as described in Section 4.16.3.1 for Tinian Alternative 1. Alternative 3 would also follow the same best management practices, standard operating procedures, and regulatory compliance to minimize potential impacts associated with hazardous materials, toxic substances, hazardous waste, and contaminated sites as described in Section 4.16.3.1 for Tinian Alternative 1. Differences would include slightly less construction within Range Complex D as there would be no northern Battle Area Complex and associated Urban Assault Course under Tinian Alternative 3; increased construction for six additional engagement zones associated with the Convoy Course; and increased construction associated with the southern Battle Area Complex and associated Urban Assault Course (Range Complex C). Within Range Complex C, the International Broadcasting Bureau would no longer be operational. Its buildings would be stripped and the antennae removed. The potential for construction activities to encroach or intersect with contaminated sites would be the same as described under Tinian Alternative 2 and summarized in Tables 4.16-1 and 4.16-2. These actions would result in a temporary increase in hazardous materials and waste being used/generated on Tinian. The difference in the amount of construction for Tinian Alternative 3 would not change the effectiveness of the resource management measures identified in Section 4.16.2 in preventing or minimizing adverse environmental impacts.

Based upon the above analysis and the implementation of the resource management measures described in Section 4.16.2, construction activities associated with Tinian Alternative 3 would not significantly increase the potential for impacts from hazardous materials, toxic substances, hazardous waste, and contaminated sites. Therefore, Tinian Alternative 3 construction would result in less than significant direct and indirect impacts with respect to hazardous materials, toxic substances, hazardous waste, and contaminated sites.

4.16.3.3.2  Operation Impacts

Tinian Alternative 3 training and maintenance activities would be similar to those described in Section 4.16.3.1 for Tinian Alternative 1 with regard to hazardous materials, toxic substances, hazardous wastes and contaminated sites. Tinian Alternative 3 would also follow the same best management practices and standard operating procedures to minimize potential impacts associated with hazardous materials, toxic substances, hazardous waste, and contaminated sites as described in Section 4.16.3.1 for Tinian Alternative 1. The only difference is that training activities would take place over a slightly larger area for Tinian Alternative 3 as compared with Tinian Alternative 1, because Alternative 3 would not have the northern Battle Area Complex and associated Urban Assault Course (Range Complex D) but it would have the larger southern Battle Area Complex and associated Urban Assault Course at the International Broadcasting Bureau (Range Complex C). Tinian Alternative 3 would also have six additional engagement zones associated with the Convoy Course. Due to the larger training area, Alternative 3 would likely use slightly more petroleum based hazardous materials and generate slightly more non-petroleum based hazardous waste (e.g., pesticides) than Tinian Alternative 1. The differences in the size of the maneuver area and hazardous materials and waste volumes would not change the effectiveness of the best management practices and standard operating procedures in preventing or minimizing adverse environmental impacts.
The potential for training operations to encroach or intersect with contaminated sites would be the same as described under Tinian Alternative 2 and summarized in Tables 4.16-1 and 4.16-2. Disturbance of contaminated sites would be avoided to the maximum extent practicable. Where contaminated sites cannot be avoided, the use of resource management measures identified in Section 4.16.2 would minimize potential impacts to contaminated sites.

Based upon the above analysis and the implementation of the resource management measures described in Section 4.16.2, Tinian Alternative 3 operations would not significantly increase the potential for impacts from hazardous materials, toxic substances, hazardous waste, and contaminated sites. Therefore, Tinian Alternative 3 operations would result in less than significant direct and indirect impacts with respect to hazardous materials, toxic substances, hazardous waste, and contaminated sites.

4.16.3.4 Tinian No-Action Alternative

Hazardous materials used in the periodic non-live-fire training exercises that have and would continue to occur on Tinian and any hazardous waste generated during these brief exercises would be managed properly through use of best management practices and in compliance with all applicable regulations. The four planned live-fire training ranges included in the Guam and CNMI Military Relocation Final EIS (DoN 2010c) would result in less than significant impacts with respect to hazardous materials, toxic substances, hazardous waste, and contaminated sites (see Table 17.2-12; DoN 2010c). On Tinian, Mariana Islands Range Complex operations would not incur any impacts to hazardous materials and waste (DoN 2010b). Existing hazardous materials, toxic substances, hazardous wastes and contaminated sites in the proposed action areas on Tinian would remain in their current conditions. Therefore, the no-action alternative would result in less than significant impacts on Tinian with respect to hazardous materials and waste.
4.16.3.5 Summary of Impacts for Tinian Alternatives

Table 4.16-3 provides a comparison of the potential impacts to hazardous materials and waste resources for the three Tinian alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction</td>
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<td>Contaminated Sites</td>
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Legend: LSI = less than significant impact.
4.16.4 Pagan

4.16.4.1 Pagan Alternative 1

4.16.4.1.1 Construction Impacts

4.16.4.1.1.1 Hazardous Materials

The development and construction of Pagan Alternative 1 facilities would take place entirely within the North Range Complex. Construction activities would cause a short-term increase in the use of hazardous materials that would end when the construction is finished. Most of the hazardous materials expected to be used are common to construction (e.g., diesel fuel, gasoline, and propane; hydraulic fluids, oils, and lubricants; welding gases; paints and solvents; adhesives; and batteries). The increased volume and use of hazardous materials during the construction period would present a potential for increased accidental spills and releases of hazardous materials, resulting in potential impacts to human health and the environment. The hazardous materials would be handled, stored, and disposed according to applicable best management practices; standard operating procedures; and federal and CNMI regulations.

The best management practices and standard operating procedures described in Section 4.16.2 would be followed to minimize or prevent accidental releases of hazardous materials during construction on Pagan. Storage of construction related hazards materials on Pagan would occur using best management practices and in accordance with applicable standards to minimize risks and potential impacts from seismic and volcanic hazards. The use, transport, storage, and handling of hazardous materials would be in accordance with applicable federal and CNMI regulations and U.S. military requirements. Laguna Sanhalom, a surface water, is surrounded by but not included in the northern High Hazard Impact Area. Laguna Sanhalom and Laguna Sanhiyon and surrounding areas have been designated “No Maneuver Areas” where no construction activities are proposed and no direct or indirect construction impacts are anticipated.

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, the construction activities associated with Pagan Alternative 1 would not significantly increase the potential for impacts from hazardous materials. Therefore, Pagan Alternative 1 construction would result in less than significant direct and indirect impacts with respect to hazardous materials.

4.16.4.1.1.2 Toxic Substances

No demolition would take place under Pagan Alternative 1 construction activities, so it is unlikely that toxic substances in materials from existing buildings would be encountered. In the event that asbestos-containing materials, lead-containing paint, or polychlorinated biphenyls are discovered, these materials would be managed by properly trained and licensed personnel to ensure that applicable hazardous waste testing, handling, and disposal procedures and requirements are followed. No toxic-substance building materials would be used in the construction of facilities under Pagan Alternative 1.

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, the construction activities associated with Pagan Alternative 1 would not significantly
increase the potential for impacts from toxic substances. Therefore, Pagan Alternative 1 construction would result in less than significant direct and indirect impacts with respect to toxic substances.

4.16.4.1.1.3 Hazardous Waste

Construction activities would result in a short-term increase in the generation of hazardous waste that would end when construction is finished. Hazardous waste generated from construction activities includes pesticides, herbicides, solvents, adhesives, lubricants, corrosive liquids, batteries, and aerosols. Due to the projected increase in generation of hazardous waste, this alternative would have the potential to result in adverse impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the hazardous waste would be handled and disposed per applicable best management practices and standard operating procedures (see Appendix D, Best Management Practices) to reduce the likelihood and volume of accidental releases, allow for accelerated spill response times, and allow for the timely implementation of cleanup measures. Hazardous waste generated during construction on Pagan would be temporarily stored on the island to minimize risks from seismic and volcanic hazards. Long-term storage of hazardous wastes would not occur on Pagan. The generation, transport, storage, and handling of hazardous waste would be in accordance with applicable federal and CNMI regulations and U.S. military requirements. All hazardous waste would be shipped off the island to the appropriate disposal facility site. Transport of hazardous wastes from Pagan, including shipping by commercial carrier, would utilize existing transportation routes to the maximum extent practicable, for the conveyance of hazardous waste to a licensed disposal facility site. Currently, there are no existing commercial carrier transportation routes to Pagan. Transportation of all hazardous waste would be conducted in compliance with U.S. Department of Transportation regulations and CFR Title 49.

The temporary increase in the generation, transport, storage, and handling of hazardous waste during construction activities associated with Pagan Alternative 1 would not significantly increase the potential for impacts from hazardous waste. Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, Pagan Alternative 1 construction would result in less than significant direct and indirect impacts with respect to hazardous waste.

4.16.4.1.1.4 Contaminated Sites

Contaminated sites on Pagan have not been well documented but are likely to be present as a result of activities conducted during World War II (Figure 4.16-4). Construction activities at proposed tactical amphibious landing beaches are likely to encroach or intersect with contaminated sites and these areas are co-located with Japanese defense positions. In addition, erosion may have transported contaminated soil from upward defense positions to these low lying, coastal areas. The Japanese airfield is also likely to be contaminated with petroleum products and munitions and explosives of concern as a result of its use during World War II. Several firing positions and helicopter landing sites may also encroach on or intersect with Japanese defense positions and that may be contaminated with munitions and explosives of concern. If Pagan Alternative 1 cannot be constructed without avoiding contaminated sites, then the same resource management measures as described in Section 4.16.2 would be followed. Through the use of the identified resource management measures, impacts resulting from the disturbance of contaminated sites would be minimized.
Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, the construction activities associated with Pagan Alternative 1 would not significantly increase the potential for impacts from contaminated sites. Therefore, Pagan Alternative 1 construction would result in less than significant direct and indirect impacts with respect to contaminated sites.

4.16.4.1.2  Operation Impacts

4.16.4.1.2.1  Hazardous Materials

*Munitions and Explosives of Concern*

Figure 4.16-4 shows the locations of live-firing positions and High Hazard Impact Areas associated with Pagan Alternative 1. Activities associated with live-fire range operations would result in increased hazardous materials in the form of munitions and explosives of concern and heavy metals. This is because unexploded ordnance, military munitions, and munitions constituents (i.e., chemical components of munitions) have the potential to contain high explosives, explosives constituents, and potentially leachable compounds (i.e., heavy metals that dissolve in water). Pagan Alternative 1 would have two High Hazard Impact Areas (Figure 4.16-4). As described in Section 2.5.2, the High Hazard Impact Areas on Pagan would receive artillery, mortars, inert aviation ordnance, 5-inch naval machine gun rounds, and rifle fire. Live-fire weapons such as artillery and mortars and small-caliber munitions would be used in the Live-Fire Maneuver Area in the North Range Complex, where they would be fired at temporary objectives in the High Hazard Impact Areas (non-maneuver area). No weapons would be used in the Non-Live-Fire Maneuver Area in the South Range Complex.

In general, when munitions are fired, the explosives constituents are consumed in the explosion. Trace amounts of explosives may be detectable on remaining metal components, such as small arms projectiles and hand grenade and mortar fragments.

With the implementation of resource management measures identified in Section 4.16.2, the negligible amounts of explosives constituents remaining on projectiles and fragments would not be a source of potential contamination to surface water or groundwater. Munitions constituents, in particular heavy metals (i.e., lead, nickel, chromium, cadmium, and copper), do not break down easily and tend to build up in surface soils. They may rust or otherwise react with natural substances, but do not break down like organic compounds. Therefore, the volume of expended material within the training areas would gradually increase over time (DoN 2010b). As discussed in Section 4.3, *Water Resources, Low Impact Development* features would be utilized to control stormwater runoff from the ranges. Additional range management activities may also include the use of impoundments, traps, or other structures to catch lead particles in sediment transported away from the range area by runoff and the application of buffering agents such as limestone, gypsum, and dolomite to maintain a more neutral pH in areas where lead may come in contact with water. These, range management activities would minimize the accumulations of munitions constituents.
Figure 4.16-4
Pagan Alternative 1
Hazardous Materials / Waste Use or Storage Area
4-482
The majority of munitions constituents released to the environment originate from munitions that either partially detonate or do not detonate at all (DoN 2010b). Munitions constituents in partially or unexploded ordnance are contained within the munition itself and release of munitions constituents due to corrosion of the casing may take a long time to occur, although salt spray and humidity may accelerate deterioration of the casing (DoN 2010b). Unexploded ordnance is likely to occur in the High Hazard Impact Area.

The RTAs on Pagan would be managed in accordance with current Marine Corps range management policies and procedures, which are designed to ensure the safe, efficient, effective, and environmentally sustainable use of the ranges. To minimize potential impacts of munitions constituents accumulating and/or migrating in soil and surface water/groundwater, routine range clearance operations would be scheduled and conducted, as needed. Munitions that fail to function as intended during the training activity would be tracked by the Range Control Facility and rendered safe by Explosive Ordnance Disposal Technicians. Applicable U.S. military munitions and explosives of concern operations guidance protocols would also be implemented to mitigate adverse impacts from munitions and explosives of concern, including deposits that have the potential to leach into the subsurface. The resource management measures described in Section 4.16.2, including the use of the Range Environmental Vulnerability Assessment program, would be implemented to minimize potential impacts from munitions and explosives of concern.

Pagan Alternative 1 surface danger zones would extend over open ocean waters but all impact areas for munitions would be on land. In the unlikely event that fragments should land in the ocean, concentrations of munitions constituents would be very low through dilution.

**Fuels, Petroleum, Oils, and Lubricants**

Training on Pagan would include vehicle transport and maneuvers, resulting in the temporary storage and use of fuel, petroleum, oils, and lubricants on Pagan. No long-term storage of these materials would occur on Pagan. A Forward Refueling Point would be specified to provide aircraft refueling. The Forward Arming and Refueling Point for Pagan at the airfield would have a concrete containment berm to prevent accidental releases of fuel. Bulk fuel would be delivered by aircraft carrying approximately 5,000 gallons (19,000 liters) of fuel per delivery. Beach and amphibious training maneuvers and the use of Amphibious Assault Vehicles would have the potential for accidental fuel spills in marine and nearshore waters. However, the same best management practices and standard operating procedures to manage and minimize potential accidental releases of fuel, petroleum, oils, and lubricants described in Appendix D, *Best Management Practices*, would be followed on Pagan.

**Other Hazardous Materials**

Training and maintenance would also involve the use of batteries, pesticides, herbicides, paints, solvents and flameless ration heaters for meals ready to eat. Most hazardous materials (such as paints, solvents, pesticides, and herbicides) would be used up and thus not require disposal. For those hazardous materials that do require disposal, a temporary, hazardous materials storage site would be designated at the base camp to properly manage and store the materials in accordance with federal and CNMI regulations and U.S. military requirements. All hazardous materials would be removed from Pagan at the completion of the training activity and properly disposed of in accordance with applicable federal and CNMI regulations and U.S. military requirements. No long-term storage of hazardous materials
would occur. The same best management practices and standard operating procedures as described in Section 4.16.2 would be followed on Pagan to prevent and minimize accident spills and releases, and protect human health, welfare, and the environment.

Due to the projected increase in the use of hazardous materials, Pagan Alternative 1 operations would have the potential to result in direct and indirect impacts to human health and to the natural environment (i.e., soils, surface water, groundwater, air, plants and animals).

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, operations associated with Pagan Alternative 1 would not significantly increase the potential for impacts from hazardous materials. Therefore, Pagan Alternative 1 operations would result in less than significant direct and indirect impacts with respect to hazardous materials.

**4.16.4.1.2.2 Toxic Substances**

No depleted uranium or radioactive munitions would be used for live-fire training on Pagan. Use and maintenance of the training areas would not require the use or disposal of lead based paint, asbestos containing materials, or polychlorinated biphenyls as these substances have been banned from use. No human-occupied facilities would be constructed on Pagan. Therefore, there would be no impacts with regards to radon.

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, Pagan Alternative 1 operations would not significantly increase the potential for impacts from toxic substances. Therefore, operations associated with Pagan Alternative 1 would result in less than significant direct and indirect impacts with respect to toxic substances.

**4.16.4.1.2.3 Hazardous Waste**

Pagan Alternative 1 operational activities would result in the generation of hazardous wastes. Munitions would be brought to Pagan by units arriving for training, stored temporarily, and used during the exercise. Any unused munitions would be packed and returned with the units. As long as the proposed live-fire ranges on Pagan remain on “active” or “inactive” status, the expenditure of munitions and explosives of concern would not likely represent an increase in hazardous waste volumes.

Other hazardous waste associated with training and maintenance activities on Pagan would primarily be used for firing range maintenance, vehicle maintenance, and aircraft maintenance and would include pesticides, herbicides, solvents, corrosive or toxic liquids, and aerosols. All hazardous waste would be containerized and removed from Pagan by trained personnel with the training units when they depart the island and would be recycled or disposed of at an appropriately permitted off-island facility. Transportation of hazardous waste would be properly manifested from either the point of generation or from the satellite accumulation area. The increases in hazardous waste would be managed (stored, transported, disposed) according to best management practices and standard operating procedures that would minimize the potential for accidental spills and releases that could expose people and the environment to hazardous waste.

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, Pagan Alternative 1 operations would not significantly increase the potential for impacts from hazardous waste. Therefore, Pagan Alternative 1 operations would result in less than significant direct and indirect impacts with respect to hazardous waste.
4.16.4.2.4 Contaminated Sites

Several potentially contaminated sites have been identified within or near the proposed RTAs on Pagan. If contaminated soil, groundwater, or munitions and explosives of concern are encountered or disturbed during training activities, there could be potential direct and indirect impacts to human health to the natural environment (i.e., soils, surface water, groundwater, air, plants, and animals). These impacts would be minimized through the use of appropriate resource management measures. These may include relocating the training area to avoid a contaminated site and/or having qualified unexploded ordnance personnel perform surveys to identify and remove potential munitions and explosives of concern before training activities begin. Where appropriate, limited testing of soils and groundwater may also occur to identify potential health risks where hazardous wastes or environmental contamination are suspected to be present. Additional precautions, such as unexploded ordnance personnel supervision during training activities, and/or providing munitions and explosives of concern awareness training to personnel before training activities begin could also be taken. The identification and removal of munitions and explosives of concern, hazardous wastes, and/or environmental contamination prior to initiating training activities, in addition to training military personnel to the hazards associated with unexploded military munitions, would minimize potential impacts during operations.

Disturbance of contaminated sites would be avoided to the maximum extent practicable. Where contaminated sites cannot be avoided, the use of resource management measures described in Section 4.16.2 would minimize potential impacts.

Based on the above analysis and the implementation of the resource management measures described in Section 4.16.2, operations associated with Pagan Alternative 1 would not increase the potential for impacts to contaminated sites. Therefore, Pagan Alternative 1 operations would result in less than significant direct and indirect impacts with respect to contaminated sites.

4.16.4.2 Pagan Alternative 2

4.16.4.2.1 Construction Impacts

Pagan Alternative 2 would use similar construction materials and methods as those described in Section 4.16.4.1 for Pagan Alternative 1. Alternative 2 would also follow the same resource management measures which would minimize the potential impacts associated with hazardous materials, toxic substances, hazardous waste, and contaminated sites. The only difference is that Pagan Alternative 2 would have no isthmus High Hazard Impact Area, and the northern High Hazard Impact Area would be smaller than that for Pagan Alternative 1 (Figure 4.16-5). With either alternative, only a small portion of the High Hazard Impact Area would be improved for target placement. Under Alternative 2 no target placement improvements would occur on the isthmus of Pagan. The difference in the size of the northern High Hazard Impact Area would not create much difference between the two alternatives from a hazardous materials/waste perspective at that location. Construction impacts associated with hazardous materials, toxic substances, hazardous waste, and contaminated sites for Pagan Alternative 2 would be similar to those identified under Pagan Alternative 1 in Section 4.16.4.1.
Figure 4.16-5
Pagan Alternative 2
Hazardous Materials / Waste Use or Storage Area

Legend

Proposed Actions
- Field Artillery Direct Fire Range Firing Position *
- Field Artillery Indirect Firing Position *
- Helicopter Landing Zone

Tactical Amphibious Landing Beaches
- Amphibious Assault Vehicles, Landing Craft Air Cushion, small boat and swimmer training
- Landing Craft Air Cushion, small boat and swimmer training
- Small boat and swimmer training

- Proposed Primary Munitions Supply Route *
- Proposed Bivouac/Basecamp Area (42 acres)

Munitions Storage Area Features *
- High Hazard Impact Area *

Legend
- Dedicated Live-Fire Maneuver Area *
- Non-Live Fire Maneuver Area *

Proposed Airfield Elements
- Airfield Runway
- Overrun
- Parking Apron
- Runway Apron
- Turnaround
- Forward Arming and Refueling Point *
- Hot Cargo Pad *
- Hot Cargo Pad (Explosive Siting) *

* Hazardous Materials / Waste Use or Storage Area
Based upon the above analysis and the implementation of the resource management measures described in Section 4.16.2, construction activities associated with Pagan Alternative 2 would not significantly increase the potential for impacts from hazardous materials, toxic substances, hazardous waste, and contaminated sites. Therefore, Pagan Alternative 2 construction would result in less than significant direct and indirect impacts with respect to hazardous materials, toxic substances, hazardous waste, and contaminated sites.

4.16.4.2.2 Operation Impacts

Pagan Alternative 2 training and maintenance activities would be similar to those described in Section 4.16.4.1 for Pagan Alternative 1 with regard to hazardous materials, toxic substances, hazardous waste, and contaminated sites. Pagan Alternative 2 would also follow the same resource management measures which would minimize the potential impacts associated with hazardous materials, toxic substances, hazardous waste, and contaminated sites as described in Section 4.16.4.1 for Pagan Alternative 1. The same amounts and types of munitions would be fired under either alternative, and the same types of training activities would take place. The only differences are that under Pagan Alternative 2, all munitions would impact in the smaller, northern High Hazard Impact Area; however, the target areas would be the same as those under Pagan Alternative 2. In addition, there would be no high impact hazard area on the isthmus; and there would be more area for ground maneuver training (see Figure 4.16-5). Due to the larger maneuver area, Pagan Alternative 2 would likely use more petroleum based hazardous materials and generate more non-petroleum based hazardous waste than Alternative 1. The differences in the size of the maneuver area and hazardous materials and waste volumes would not change the effectiveness of the resource management measures in preventing or minimizing adverse environmental impacts.

Based upon the above analysis and the implementation of the resource management measures described in Section 4.16.2, Pagan Alternative 2 operations would not significantly increase the potential for impacts from hazardous materials, toxic substances, hazardous waste, and contaminated sites. Therefore, Pagan Alternative 2 operations would result in less than significant direct and indirect impacts with respect to hazardous materials, toxic substances, hazardous waste, and contaminated sites.

4.16.4.3 Pagan No-Action Alternative

The no-action alternative for Pagan would involve the continued infrequent visitations of low impact trips by small groups of eco-tourists, scientific surveys, and military non-live-fire training related to search and rescue. All visits would be approved by the CNMI government. The impacts would be short-term and very minor and would not involve the on-island use of any substantial quantities of hazardous materials or generation of hazardous waste. Therefore, the no-action alternative would result in less than significant impacts on Pagan with respect to hazardous materials and waste.
4.16.4.4 Summary of Impacts for Pagan Alternatives

Table 4.16-4 provides a comparison of the potential impacts to hazardous materials and waste resources for the two Pagan alternatives and the no-action alternative.

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Legend: LSI = less than significant impact.
4.17 **Public Health and Safety**

Section 4.17 describes the potential impacts to public health and safety as a result of the proposed action. The region of influence for construction activities includes the Military Lease Area on Tinian, Tinian International Airport, Port of Tinian, Unai Chulu, and Pagan. Areas of potential exposure to operational activities include airspace, land, waters, within and adjacent to the proposed military RTAs, including areas underlying airspace used for military training. Impacts to public health and safety may result from construction, military training operations, and/or materials used during military training, such as unexploded ordnance and munitions. Munitions include, but are not limited to, inert aviation ordnance, naval and field artillery projectiles, aerial rockets, mortar rounds, man-portable rockets, hand grenades, machine gun/pistol rounds, flares, and other pyrotechnic devices.

In addition, impacts to public health and safety may result from direct (e.g., traffic accidents and personal injuries), social (e.g., health care services and public services), or environmental (e.g., water quality, air quality, noise, and hazardous materials and waste) effects. Potential impacts to the police department, fire department, and health services are presented in Section 4.15, *Socioeconomics*. Potential impacts to environmental resources including water, air, and noise environment, are discussed in Sections 4.3, *Water Resources*; 4.4, *Air Quality*; and 4.5, *Noise*, respectively. For detailed information on hazardous materials, see Section 4.16, *Hazardous Materials and Waste*.

The analysis presented in this section focuses on potential health and safety impacts to the general public from associated construction and operational activities of the proposed action. Potential effects to construction and military personnel are not addressed in this EIS/OEIS. Safety risks to construction personnel are addressed under 29 CFR 1910 *et seq.*, *Occupational Health and Safety Standards*. Health and safety risks to military personnel are an inherent and unavoidable aspect of military training due largely to the nature of military missions and the need to train under realistic conditions. Additional risks result from the non-training operations including military travel and transport, handling, and storage of munitions. To reduce such risks to the extent possible during training, all proposed training operations and exercises are designed and conducted in accordance with comprehensive military safety procedures, rules, and regulations.

The health and safety impacts related to the geologic hazards described Section 3.2, *Geology and Soils*, are not analyzed for construction and military personnel. The U.S. military would require appropriate plans (e.g., evacuation plans) and safety protocols related to geological hazards to be in place prior to the commencement of construction and operations to provide for adequate protection for construction and military personnel. As discussed above, safety risks to construction personnel are addressed under 29 CFR 1910 *et seq.*, *Occupational Health and Safety Standards*. All proposed operations (i.e., training, maintenance) would be designed and conducted in accordance with established military safety procedures, rules and regulations. As discussed in Section 4.2, *Geology and Soils* (impact analysis), the proposed action would result in less than significant impacts to geological hazards (i.e., the proposed action would not significantly increase the likelihood of geological hazards to occur). The public’s exposure to geological hazards would not increase as a result of the proposed action and, therefore, the health and safety impacts associated with geologic hazards on the public are not analyzed.
4.17.1 Approach to Analysis

Impacts to public health and safety were assessed by evaluating the relative scope and location of proposed construction and operation activities and their potential to alter or impact the existing conditions for public health and safety. Potential impacts associated with military training activities (i.e., range safety, including wildfire) and unexploded ordnance/munitions are considered as part of the operation impact analysis. Impact significance was determined by analyzing the extent or degree to which implementation of the proposed action would potentially result in an increased risk to public health and safety. Factors considered in evaluating the effects of the proposed activities on public health and safety include:

- Proximity of construction or operation activities to the public
- Frequency and duration of events
- Range safety procedures (access control, public notification, natural resource protection)
- Post-training procedures (site clean-up)

The U.S. military is required to comply with applicable regulations and laws under the enforcement authorities of both federal and local government entities. In accordance with Naval Ordnance Safety and Security Activity Instruction 8020.15D, an Explosives Safety Submission document must be prepared that details how explosive safety standards would be applied to munitions responses (DoN 2011). The Explosives Safety Submission document would address how a proposed action complies with applicable environmental requirements related to the management of munitions and explosives of concern, and would outline specific measures to be taken to ensure the safety of the public. Accordingly, documented procedures would be established to ensure that the public are not endangered by proposed military training events conducted on or around the islands of Tinian and Pagan.

The management of RTAs would be linked to the overall management of the Joint Region Marianas Mariana Islands Range Complex. As the Executive Agent for the U.S. Pacific Command for this action, Marine Corps policies and procedures are assumed to provide the basis for joint and multi-national range and training area management. Marine Corp Order P3550.10, Policies and Procedures for Range and Training Area Management, establishes Marine Corps responsibilities and prescribes policies and procedures concerning safety and management of Marine Corps operational ranges and training areas, to include associated training facilities (DoN 2005).

4.17.2 Resource Management Measures

Resource management measures applicable to public health and safety include the following.

4.17.2.1 Avoidance and Minimization Measures

- As described in Chapter 2, Proposed Action and Alternatives, Section 2.4.1.3, Operation and Management of Tinian Range and Training Area, the Military Lease Area would become an active military training area that includes hazardous activity. Gates and fencing would be employed for access control and security and signs will be posted to warn the public of hazards. Varying degrees of public access would be provided to certain portions of the Military Lease Area and waters off the Military Lease Area during the training periods.
• As described in Chapter 2, Proposed Action and Alternatives, Section 2.5.1.4, Operation and Management of Pagan Range and Training Area, a range safety program will be established per Marine Corps Order 3570.1C, Range Safety, detailing procedures for RTA safety, emergency response (medical and fire), explosive ordnance disposal, training mishap investigations, safety training, and range inspections.

• As described in Chapter 2, Proposed Action and Alternatives, Section 2.5.1.2.3, Munitions Storage Area, the Munitions Storage Area on Pagan would be secured by chain-link fencing with barbed wire. To provide for the safe conduct of military training, both for the public and the training participants, designated sea space and airspace would be selected to support training for all the Tinian and Pagan alternatives. Both the planned sea space and airspace would be scheduled for use during training and these active time periods would be provided to the public via the current Notice to Mariners and Notice to Airmen processes.

• As described in Chapter 2, Proposed Action and Alternatives, danger zones would be established around live-fire RTAs under the proposed action and its alternatives. The purpose of the danger zones are established for safe separation of non-participating military personnel and the public from live-fire training. These zones delineate areas (air, land, and sea) in which personnel and/or equipment may be endangered by ground weapons firing or detonation activities. The establishment of charted Special Use Airspace and danger zones on aeronautical and surface navigation charts provides safety information to the public including vertical hazard altitudes that could be a danger to other airspace users. Application of these safety and notification procedures would ensure safety of flight, water operations, and non-training personnel.

4.17.2.2 Best Management Practices and Standard Operating Procedures

Best management practices and standard operating procedures that are applicable for public health and safety are listed below and described in Appendix D, Best Management Practices.

• Federal Aviation Administration notification: including the Construction Safety and Phasing Plan and coordination with the Commonwealth Ports Authority and commercial aviation operators
• Bird Aircraft Strike Hazards Plan
• Traffic Management Plan and Work Zone Traffic Management
• Range Training Area and Management Plan
• Public Access Plan
• Gates, Fencing, and Signs
• Fire Management Plan
• Explosives Safety Submission
• Hazards to Electromagnetic Radiation to Ordnance safety program

The Department of Defense would prepare a fire prevention and management plan specific to proposed RTA activities on Tinian and Pagan prior to initiation of live-fire training. The fire management plan would address the preventative and immediate actions required for fire hazards connected with RTA training. Adequate water supply and manpower would be identified to ensure safe training and protection of public safety and property. On Tinian, a 90-foot (30-meter) wide firebreak would be provided around the High Hazard Impact Area. Water trucks and hydrants would be located at the base
camp and Munitions Storage Area on Tinian. Prescribed burns for vegetation maintenance could occur within the High Hazard Impact Area on Tinian only after assessment of fire conditions.

An organization, such as a Marine Corps Base Guam Range Management Division, would be the designated range control facility organization with responsibility for the range and training facilities. This organization would provide safety, control, maintenance, environmental compliance, and administrative functions for aviation, ground, and combined arms training events within RTAs, to include both live-fire and non-live-fire events.

A range control facility would be established on Tinian to oversee safety, control, maintenance, and administrative functions for air, ground, and sea training activities within the Tinian RTA. Approximately 95 personnel on Tinian would be required for base camp support, range management, range operations, and range maintenance. Military personnel and/or civilian staff on Tinian would be responsible for base camp support, range management, range operations, and range maintenance. Anticipated public health and safety responsibilities of the Range Management Division include:

- **Safety**: Establish and implement required safety regulations such as a range safety program that includes specific safety regulations for each type of training facility. Develop, publish, and coordinate procedures for medical emergency response and evacuation and explosive ordnance disposal response management. Conduct training, face-to-face personnel briefs with required individuals, and conduct inspections.

- **Control**: Schedule, publish notices (electronically and other) to the public, operate a fire desk (a centralized, manned, coordinating military office/agency for range control operations), and provide management of airspace, control personnel, and aircraft movement and access. Provide and coordinate communications and radar surveillance. Establish and man the physical range control facility on Tinian. Administer a web-enabled scheduling system, the Range Facility Management Support System, to schedule training facilities, providing a standard, integrated system to efficiently schedule and manage firing ranges and training areas and providing training support for units. Perform pre-training range sweeps (for people and animals), and active observation during live-fire training. Operate Observation Posts manned or with cameras/radar, to survey the sea space and airspace. Initiate “cease fire” if situations arise where live-fire training could not be conducted safely.

- **Maintenance**: Provide and coordinate range clearance and environmental compliance and monitoring. Construct and maintain targets and training devices. Provide and maintain range boundary signs, fences, security cameras and gates, and coordinate range maintenance.

### 4.17.3 Tinian

#### 4.17.3.1 Tinian Alternative 1

#### 4.17.3.1.1 Construction Impacts

#### 4.17.3.1.1.1 Aircraft Operations

Tinian Alternative 1 would include construction of the proposed training facilities at the Tinian International Airport, including new taxiways connecting to the north of existing Runway 08/26 within
the existing Tinian International Airport boundary. Through implementation of the Construction Safety and Phasing Plan and coordination with the Commonwealth Ports Authority, Tinian Alternative 1 construction activities would result in less than significant direct or indirect impacts to public health and safety with regards to aircraft operations.

### 4.17.3.1.2 Ground Operations

Construction personnel would be required to maintain boundary signs, fences, and barricades to provide notice to the public of active construction zones. In addition, security personnel or construction safety flaggers would provide warnings to the public of ongoing construction activities along roadways and publicly visited areas (e.g., recreational areas). Because the public would be excluded from entering active construction areas, potential risks to public health and safety would be reduced. Therefore, construction of Tinian Alternative 1 construction activities would result in less than significant direct or indirect impacts to public health and safety with regards to ground operations.

### 4.17.3.1.3 Marine Operations

Proposed improvements at the Port of Tinian would include construction of a new biosecurity station and construction of a new bulk fuel storage facility, parking, and a stormwater retention pond. In addition, improvements would be made on land in the vicinity of the existing public boat ramp to facilitate egress from the ramp to the roadway. No in-water construction is proposed at the Port of Tinian.

Proposed construction at Unai Chulu to develop the amphibious landings would include in-water construction in the nearshore waters of the beach. Construction techniques would require large construction equipment and temporary construction work areas. Public beach access at Unai Chulu would be prohibited during construction activities. Construction personnel would be required to maintain boundary signs, fences, and barricades to provide notice to the public of active construction zones. In addition, security personnel or construction safety flaggers would provide warnings to the public of ongoing construction activities along roadways leading to the beach. Because the public would be excluded from entering active construction areas, potential risks to public health and safety would be reduced.

Based upon the above analysis and implementation of the resource management measures identified in Section 4.17-2, Alternative 1 construction activities would result in no direct or indirect impacts to public health and safety with regards to marine operations.

### 4.17.3.1.2 Operation Impacts

#### 4.17.3.1.2.1 Aircraft Operations

Various levels of Special Use Airspace will be designated as described in Section 4.6, *Airspace*, to provide for the safe separation of military air traffic and activities of civilian and non-participating air traffic. Special Use Airspace is airspace wherein activities must be confined or limited due their nature. For example, artillery fire must be confined to Special Use Airspace to ensure public aviation safety. Also, public aviation must be restricted from certain Special Use Airspace to ensure their safety. Three types of Special Use Airspace are planned to meet the safety and control aspects of military training:
Military Operation Areas: airspace designated to separate or segregate certain nonhazardous military activities from other air traffic and to identify where these activities are taking place.

Warning Areas: airspace to alert nonparticipating pilots of the potential danger of military training that contains activity that may be hazardous to nonparticipating aircraft.

Restricted Areas: airspace identified above an area on the surface of the earth within which the flight of aircraft is subject to restrictions.

Range control would monitor and control aircraft and unmanned aircraft system access and activities within the Special Use Airspace. Range control would also observe the airspace and sea space areas affected by live-fire and execute procedures to support safe passage of watercraft and aircraft. Planned live-fire range activities would be specified in published range regulations, with detailed procedures to accommodate the cease fire of activities in response to non-authorized aircraft. Real-time communications between on-site range safety personnel, range users, aircraft, and oversight personnel would be in place at all times during range use. Procedures would be implemented and enforced to ensure the cessation of all live-fire activities in the event of conflicting aircraft over flight, or non-authorized personnel.

Aircrew operating in Tinian airspace would be required to follow applicable procedures outlined in the Bird Aircraft Strike Hazards Plan, or similar measures developed by civilian airport authorities.

Based upon the above analysis and implementation of the resource management measures identified in Section 4.17.2, Tinian Alternative 1 operations would result in less than significant direct or indirect impacts to public safety with regard to aircraft operations.

4.17.3.1.2.2 Ground Operations

As described in Section 4.13, Transportation Resources, the altered circulation patterns resulting from the permanent closure of existing roads within the High Hazard Impact Area under Tinian Alternative 1 would not significantly increase the rate of traffic-related accidents. Proposed roadway improvements would decrease accident rates and increase overall transportation safety on Tinian.

Restricting public access to portions of or all of the Military Lease Area during military training activities would occur under the proposed action. Varying degrees of public access may be allowed to certain inactive areas in the Military Lease Area. Live-fire training activities would occur for 20 training weeks per year. Outside of the 20 live-fire training weeks per year, non-live-fire training activities would occur.

Active live-fire training areas would not be accessible by the public, and it would be standard protocol to provide sufficient lead-time to ensure range clearance before any training activities were conducted. In addition, the U.S. military would provide and maintain boundary signs, fences, security cameras, and/or gates in the following areas, to which public access would not be permitted at any time:

- High Hazard Impact Area
- Munitions Storage Area
- Airport improvements
- Base camp
- Fenced and gated range training areas
- Surface Radar
- Observation Posts
Unauthorized civilian entry during military training operations could result in accidents that impact public health and safety. To facilitate range safety, ground access would be controlled by traffic control points on existing roads into the Military Lease Area. Sea space and airspace restrictions would be established and published electronically by U.S. military using current methods of notifications (including Notices to Mariners and Airmen), along with schedules of when the ranges and associated danger zones are restricted. Training periods would be published electronically and signs posted to inform residents and visitors of when they are and are not allowed access to the Military Lease Area. The RTA would be patrolled each morning before use to ensure no unauthorized individuals are present.

Range control would monitor and control access of personnel and vehicles within the Military Lease Area. Planned live-fire ranges would be specified in published range regulations, with detailed procedures to accommodate the cease fire of activities in response to intruder personnel. Real-time communications between on-site range safety personnel, range users, and oversight personnel would be in place at all times during range use. Procedures would be implemented and enforced to ensure the cessation of all live-fire activities in the event of conflicting aircraft over flight, or transit of watercraft or personnel.

Live-fire operations that could result in unexploded ordnance would be restricted to the High Hazard Impact Area which would be fenced and public access restricted at all times. Activities associated with firing range operations could result in increased exposure to munitions and explosives of concern. This clearing would occur based on tabulated range usage. The Tinian RTA would be managed in accordance with current military range management policies and procedures that are designed to ensure the safe, efficient, effective, and environmentally sustainable use of the range area. Routine range clearance would be employed that involves the destruction or removal and proper disposal of munitions, including target debris, munition packaging, and crating materials.

There is also a potential for wildfire during operations within the RTA that could affect public health and safety. Range safety procedures would include measures to minimize the risk of wildfire and would provide a response plan for the event of a wildfire. To ensure public safety and protection of property, a fire management plan would be developed to address the preventative and immediate actions required to address potential fire hazards associated with military training, including considerations of both water supply and manpower.

The effects of electromagnetic environments created by stationary and mobile/portable antenna/transmitter systems (such as the International Broadcasting Bureau), located in the vicinity of ordnance operations (transportation, assembly, and loading operation areas) may present hazardous situations. A Hazards to Electromagnetic Radiation to Ordnance safety program and instruction (detailed directions pertaining to types of munitions authorized for use, based on specific transmitters/antennas in use) would provide emission control procedures for safely minimizing operational restrictions due to Hazards to Electromagnetic Radiation to Ordnance. This includes safe separation distances for all personnel (military and non-military), ground vehicles, ships, and aircraft.

Implementation of range safety and access control procedures would prevent the public from accessing the Tinian RTA during live-fire training events. The High Hazard Impact Area and certain training areas would be fenced and gated to restrict the public from entering during non-training periods. Based upon the above analysis and implementation of the resource management measures identified in Section
4.17-2, Tinian Alternative 1 operations would result in less than significant direct or indirect impacts to public safety with regard to ground operations.

### 4.17.3.1.2.3 Marine Operations

Planned sea space activation would serve to segregate non-participating ships from potentially hazardous military training. The sea space immediately underlying the airspace would be designated as danger zones. Specific danger zones would be broadcasted to the public. Danger zones are defined water areas used for military training, aviation ordnance, rocket firing or other hazardous operations and are designed to separate military operations from non-participating marine vessels. Danger zones would be closed to the public on a full-time or intermittent basis during training and open to the public when no training is occurring in that area. Public access would be prohibited or limited in restricted areas.

Range control would monitor and control access of personnel, vehicles, aircraft, and unmanned aircraft system activities within the Military Lease Area and supporting Special Use Airspace. Range control would also observe the sea space areas affected by live-fire and execute procedures to support safe passage of watercraft. Planned live-fire ranges would be specified in published range regulations, with detailed procedures to accommodate the cease fire of activities in response to intruder watercraft. Real-time communications between on-site range safety personnel, range users, and oversight personnel would be in place at all times during range use. Procedures would be implemented and enforced to ensure the cessation of all live-fire activities in the event of conflicting transit of watercraft or personnel.

Based upon the above analysis and implementation of the resource management measures identified in Section 4.17-2, Tinian Alternative 1 operations would result in less than significant direct or indirect impacts to public safety with regard to marine operations.

### 4.17.3.2 Tinian Alternative 2

#### 4.17.3.2.1 Construction Impacts

The impacts to public health and safety resulting from construction activities associated with Tinian Alternative 2 would be the same as those described for Tinian Alternative 1. Tinian Alternative 2 would also follow the same resource management measures as described in Section 4.17.2. See Section 4.17.3.1, Tinian Alternative 1, for a discussion of impacts. Tinian Alternative 2 construction activities would result in less than significant direct or indirect impacts to public health and safety with regard to aircraft and ground operations; and no impact to public health and safety with regard to marine operations.

#### 4.17.3.2.2 Operation Impacts

The impacts to public health and safety from Tinian Alternative 2 operations would be the same as those described for Tinian Alternative 1. Tinian Alternative 2 would also follow the same resource management measures as described in Section 4.17.2. See Section 4.17.3.1, Tinian Alternative 1, for a discussion of impacts. Tinian Alternative 2 operations would result in less than significant direct or indirect impacts to public health and safety.
4.17.3.3  Tinian Alternative 3

4.17.3.3.1  Construction Impacts

The impacts to public health and safety resulting from construction activities associated with Tinian Alternative 3 would be the same as those described for Tinian Alternative 1. Tinian Alternative 3 would also follow the same resource management measures as described in Section 4.17.2. See Section 4.17.3.1, Tinian Alternative 1, for a discussion of impacts. Tinian Alternative 3 construction activities would result in less than significant direct or indirect impacts to public health and safety with regard to aircraft and ground operations; and no impact to public health and safety with regard to marine transportation.

4.17.3.3.2  Operation Impacts

The impacts to public health and safety resulting from operations associated with Tinian Alternative 3 would be the same as those described for Tinian Alternative 1. Tinian Alternative 3 would also follow the same resource management measures as described in Section 4.17.2. See Section 4.17.3.1, Tinian Alternative 1, for a discussion of impacts. Tinian Alternative 3 operations would result in less than significant direct or indirect impacts to public health and safety.

4.17.3.4  Tinian No-Action Alternative

The periodic non-live-fire military training exercises in the Military Lease Area on Tinian would be expected to continue under the no-action alternative. The impacts to public health and safety would be less than significant during these short term duration events. The military training exercises of troop and vehicle movements would be limited to within and to/from the Military Lease Area where there would be no public access. As documented in the Guam and CNMI Military Relocation EIS (DoN 2010a), the four planned live-fire training ranges would have less than significant impacts (see Table 18.2-4; DoN 2010a). Also, for the Mariana Islands Range Complex training (see Table 3.19-2; DoN 2010b), there would be less than significant impacts to public health and safety on Tinian. Therefore, overall, the no-action alternative would have less than significant impacts.
4.17.3.5 Summary of Impacts for Tinian Alternatives

Table 4.17-1 contains a comparison of the potential impacts to public health and safety resources for the three Tinian alternatives and the no-action Alternative.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft Operations</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Ground Operations</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Marine Operations</td>
<td>NI</td>
<td>LSI</td>
<td>NI</td>
<td>LSI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; NI = no impact.
4.17.4  Pagan

4.17.4.1  Pagan Alternative 1

4.17.4.1.1  Construction Impacts

After the completion of an appropriate real estate agreement and notifications with the CNMI
government, construction activities associated with Pagan Alternative 1 could occur. Although there is
no permanent resident population on Pagan, members of the public (e.g., visitors) could be present on
the island during construction. However, they would be excluded from the construction areas.
Construction personnel would be required to maintain boundary signs, fences, and barricades to provide
notice to the public of active construction zones. In addition, security personnel or construction safety
flaggers would provide warnings to the public of ongoing construction activities along roadways and
publicly visited areas (e.g., recreational areas). There would be temporary closure of the Pagan airfield
during the removal of the lava flow and for the improvements on and adjacent to the runway. Based
upon the above analysis and the implementation of resource management measures in Section 4.17.2,
Pagan Alternative 1 construction activities would result in no direct or indirect impacts to public health
and safety.

4.17.4.1.2  Operation Impacts

4.17.4.1.2.1  Aircraft Operations

Various levels of Special Use Airspace would be designated as described in Section 4.6, Airspace, to
provide for the safe separation of military air traffic and activities from civilian and non-participating air
traffic.

Range control would occur via communications (i.e., radios) between military range personnel on Pagan
and the range control facility on Tinian along with surveillance capabilities supported by participating
tactical training agencies (i.e., groups of military units with tactical responsibility for a training asset) and
training assets. As with the Tinian alternatives (Section 4.17.3), range control personnel on Pagan would
oversee personnel, aircraft, and unmanned aircraft system access and activities for direct fire, indirect
fire, and aviation activity training.

Training periods would be published electronically by U.S. military using current methods of
notifications (including Notice to Airmen). The restricted airspace would be off-limits during live-fire
training.

Aircrews operating on Pagan would be required to follow applicable procedures outlined in the Bird
Aircraft Strike Hazards Plan.

Based upon the above analysis and the implementation of resource management measures in Section
4.17.2, Pagan Alternative 1 operations would result in less than significant direct or indirect impacts to
public safety with regard to aircraft operations.

4.17.4.1.2.2  Ground Operations

No permanent range control facilities are proposed for Pagan (i.e., no permanent observation towers or
radars). Military range personnel on Pagan during training exercises would oversee safety, control,
maintenance, and administrative functions for air, ground, and sea training activities within the RTA. Range personnel deployed to Pagan would utilize temporary lookouts (primarily located on high ground) that provide the ability to observe interlopers (non-authorized aircrafts, boats or civilians). In addition, an aircraft clearing pass (visual review) of the area would be a standard procedure to see if people, animals, vehicles, etc. are in the area prior to military operations.

Range control would occur via communications (i.e., radios) between military range personnel on Pagan and the range control facility on Tinian and surveillance supported by participating tactical training agencies and assets. As with Tinian, range control personnel on Pagan would oversee personnel, vehicles, aircraft, and unmanned aircraft system access and activities for direct fire, indirect fire, and aviation activity training.

Training periods would be published electronically by U.S. military using current methods of notifications. During training periods, public access would be restricted from accessing areas within the Pagan RTA encumbered by surface danger zones for safety reasons. Depending upon the type of training and training scenario, portions of the island could be available for public access.

Range safety procedures would include both preventative measures to minimize the risk of wildfire and a response plan in the event of a wildfire. The U.S. military would provide and maintain boundary signs, fences, and/or gates in areas around the High Hazard Impact Areas; public access to the two High Hazard Impact Areas would not be permitted at any time.

Pagan Alternative 1 would emphasize the use of air-to-ground missiles in conjunction with live-fire aerial and sea-to-surface munitions. Activities associated with firing range operations would result in unexploded ordnance and munitions constituents. If unexploded ordnance or military munitions are inadvertently discovered by a member of the public, the resulting effects could be serious or life threatening.

Live-fire operations that could result in unexploded ordnance would be restricted to the High Hazard Impact Areas which would be fenced (as feasible) and public access restricted at all times. Activities associated with firing range operations could result in increased exposure to munitions and explosives of concern. This clearing would occur based on tabulated range usage. The Pagan RTA would be managed in accordance with military range management policies and procedures, designed to ensure the safe, efficient, effective, and environmentally sustainable use of the range area. Range clearance on Pagan would occur on a case-by-case basis, based on the usage of the RTA. Range clearance involves the destruction or removal and proper disposal of munitions, including target debris, munition packaging, and crating materials.

Implementation of safety and access control procedures are designed to prevent the public from accessing the island during live-fire training events. The High Hazard Impact Area(s) would have signage posted to inform the public they are restricted from entering during non-training periods. Based upon the above analysis and the implementation of resource management measures in Section 4.17.2, Pagan Alternative 1 operations would result in less than significant direct or indirect impacts to public health and safety with regard to ground operations.
4.17.4.2.3 Marine Operations

The sea space immediately underlying the restricted airspace around Pagan would be designated as danger zones. Range control would occur via communications (i.e., radios) between military range personnel on Pagan and the range control facility on Tinian and surveillance supported by participating tactical training agencies and assets. Range control personnel on Pagan would also coordinate with exercise participants to ensure observation of the sea space areas surrounding Pagan impacted by live-fire effects to ensure procedures are executed to support safe passage of transiting watercraft.

Training periods would be published electronically by U.S. military using current methods of notifications (including Notice to Mariners). During training periods, public access would be restricted from accessing areas within the Pagan RTA encumbered by danger zones for safety reasons. Depending upon the type of training and training scenario, portions of the surrounding waterways may be available for public access.

Based upon the above analysis and the implementation of resource management measures in Section 4.17.2, Pagan Alternative 1 operations would result in less than significant direct or indirect impacts to public safety with regard to marine operations.

4.17.4.2 Pagan Alternative 2

Pagan Alternative 2 construction and training activities would have similar impacts to public health and safety as those identified for Pagan Alternative 1. The main differences that would affect public health and safety are the northern High Hazard Impact Area would be smaller and southern High Hazard Impact Area located across the isthmus would not be constructed.

4.17.4.2.1 Construction Impacts

The impacts to public health and safety from construction activities associated with Pagan Alternative 2 would be the same as those described for Pagan Alternative 1. Pagan Alternative 2 would also follow the same resource management measures as described in Section 4.17.2. See Section 4.17.4.1, Pagan Alternative 1 for a discussion of impacts. Based upon the above analysis and the implementation of resource management measures in Section 4.17.2, Pagan Alternative 2 construction activities would result in no direct or indirect impacts to public health and safety.

4.17.4.2.2 Operation Impacts

The impacts to public health and safety resulting from operations associated with Pagan Alternative 2 would be the same as those described for Pagan Alternative 1. Pagan Alternative 2 would also follow the same resource management measures as described in Section 4.17.2. See Section 4.17.4.1, Pagan Alternative 1 for a discussion of impacts. Based upon the above analysis and the implementation of resource management measures in Section 4.17.2, Pagan Alternative 2 operations would result in less than significant direct or indirect impacts to public health and safety.

4.17.4.3 Pagan No-Action Alternative

The periodic visits of eco-tourism, scientific surveys or military training related to search and rescue are assumed to continue on Pagan under the no-action alternative. The impacts to public health and safety of these activities would be considered to be less than significant.
4.17.4.4  Summary of Impacts of Pagan Alternatives

Table 4.17-2 contains a comparison of the potential impacts to public health and safety resources for the two Pagan alternatives and the no-action alternative.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Public Health and Safety</td>
<td>Construction</td>
<td>Operation</td>
<td>Construction</td>
</tr>
<tr>
<td>Aircraft Operations</td>
<td>NI</td>
<td>LSI</td>
<td>NI</td>
</tr>
<tr>
<td>Ground Operations</td>
<td>NI</td>
<td>LSI</td>
<td>NI</td>
</tr>
<tr>
<td>Marine Operations</td>
<td>NI</td>
<td>LSI</td>
<td>NI</td>
</tr>
</tbody>
</table>

Legend: LSI = less than significant impact; NI = no impact.
4.18 PROGRAMMATIC ANALYSIS OF FUTURE POTENTIAL PROJECT COMPONENTS

The proposed action presented in this EIS/OEIS includes until level and combined level RTA construction and operation as presented in Chapter 2, and analyzed in Chapter 4 for each resource. Two additional projects that are not included within the proposed action presented in this EIS/OEIS are anticipated to be implemented at a future and unknown date in support of the CJMT effort. The two projects are: (1) relocation of the existing International Broadcasting Bureau on Tinian and (2) construction and operation of a new dock and associated breakwater on Pagan. These two projects are presented and analyzed in the following section programmatically and in a broader context than the proposed action analyzed in this EIS/OEIS.

A programmatic approach is considered the most effective way to characterize these future potential projects. Programmatic environmental analyses of this type are conducted when a federal agency plans or contemplates a broad action or program, the specific details of which have not yet been defined. The intention is to comply with Council on Environmental Quality guidance that recommends integration of the environmental process with other planning efforts at the earliest possible time to ensure that planning and decisions reflect environmental value. A programmatic analysis at a conceptual level of detail provides early identification and analysis of potential impacts, methods to mitigate anticipated impacts, and a strategy to address issues at a tiered level if necessary.

The CJMT EIS/OEIS proposed action could require relocating the International Broadcasting Bureau facility on Tinian, currently located in the Military Lease Area. Based on a relocation study completed in 2014, other locations are being considered including on Tinian, in the CNMI or Guam. Specifically, Tinian Alternatives 2 or 3 could require relocating the International Broadcasting Bureau facility to accommodate a unit level RTA in the Military Lease Area. The new International Broadcasting Bureau facility must be completely and fully operational before relocation occurs.

Construction of a dock and associated breakwater on Pagan is also being considered. Proposed raining on Pagan could be enhanced by constructing and operating a new dock and associated breakwater on Pagan to facilitate movement of supplies, equipment and personnel.

If, in the future, there is a decision to move forward with either of these projects, then the appropriate level of project-specific environmental studies and consultations would be conducted. Additional NEPA analyses and agency consultations would be completed to address those changes as warranted. Subsequent NEPA documentation could tier from this EIS/OEIS and use the framework of the following programmatic analysis as a foundation to further address the potential impacts of those site-specific actions.

This section presents the programmatic environmental analyses of these two future potential project components. Section 4.18.1 is a programmatic analysis of potential environmental impacts of the International Broadcasting Bureau relocation, and Section 4.18.2 is a programmatic analysis of potential environmental impacts of a new Pagan dock and breakwater.
4.18.1 International Broadcasting Bureau Programmatic Analysis

The International Broadcasting Bureau on Tinian is one of two transmitter sites in the CNMI: one on Tinian and the other on Saipan. The Bureau’s mission is to promote freedom and democracy through communication of accurate, objective, and balanced news to audiences overseas. The International Broadcasting Bureau facility on Tinian provides high-power shortwave transmissions for the following organizations and target audiences:

- Radio Free Asia: China, North and South Korea, all of Southeast Asia, and Tibet
- Voice of America: China, East Asia, Korea, and South Asia
- Australian and British Broadcasting Corporations: Indonesia

The CJMT EIS/OEIS proposed action would require relocating the International Broadcasting Bureau facility on Tinian, currently located in the Military Lease Area, to another location in the CNMI or Guam. Specifically, Tinian Alternatives 2 or 3 would require relocating the International Broadcasting Bureau facility to accommodate the establishment of a unit level RTA in the Military Lease Area.

A relocation study to identify potential sites was conducted in 2013-14. This section introduces the objectives of that study, presents a summary of the siting requirements applied to identify potential relocation sites, identifies and describes the viable relocation sites, and then broadly or programmatically evaluates the environmental consequences of the International Broadcasting Bureau facility relocation to the alternative sites. If there is a decision to move forward with relocating the International Broadcasting Bureau in the future, then more detailed and project-specific environmental studies, consultations, NEPA documentation, and public review will be undertaken.

4.18.1.1 Relocation Study

The International Broadcasting Bureau-Voice of America Tinian Transmitter Station Relocation Study (Relocation Study) evaluated potential locations for siting the International Broadcasting Bureau. The scope of the Relocation Study limited the evaluation of potential locations to within the CNMI and Guam (DoN 2014a). Transmitter station operational requirements were based on those identified in the International Broadcasting Bureau-Voice of America Tinian Transmitter Station Requirements Study (DoN 2013) and then further refined as part of the Relocation Study.

According to the Relocation Study, relocation site considerations focused primarily on technical- and construction-related requirements. The following are the minimum requirements for a site to be suitable for transmitter establishment:

- Be relatively flat, and depending on location be between 200 and 285 acres (81 and 114 hectares) in size (i.e., large enough to accommodate the antennae array, associated facilities comprising the transmitter station, and security fencing)
- On property owned by the U.S. or by a host government that allows unrestricted rights to broadcast programming to meet the International Broadcasting Bureau’s mission
- Be positioned so that antennas can transmit to the target audiences
- Be separated from adjoining land uses to afford worker safety within, and minimize radio frequency interference outside of the transmitter site
- Have appropriate infrastructure such as roads, utilities (e.g., electricity, communication lines, potable water), and community support
- Be able to accommodate, in existing airports and sea ports, the weight and size of equipment (construction and transmitters) needed for station establishment

Potential relocation sites needed to be in the CNMI or on Guam to be considered viable because the sites need to be within an area where the station can broadcast to its audiences. The only locations where the minimum requirements listed above were met were on Rota, Saipan, Tinian, and Guam. In total, 7 sites were first identified for potential Tinian transmitter station relocation: 3 on Rota, 2 on Saipan, 1 on Tinian, and 1 on Guam. Through further refinement and requirements application, four sites were determined as feasible relocation candidates for more in-depth evaluation. These four candidate sites included one location each on Rota, Saipan, Tinian, and Guam (DoN 2014a).

4.18.1.1 Potential Rota Site
The potential transmitter site on Rota is located on the south side of the island on a plateau that is centrally located between the east and west coast, northeast of Teneto Village on the CNMI public land (Figure 4.18-1). The site is relatively flat and has sufficient area to support the relocation of the transmitter station. There is adequate infrastructure to support communications needs; however, the on-island power supply and access roads would need upgrading. There is sufficient separation from adjacent land uses to ensure safety and avoid radio frequency exposure. While there is capacity at the airport to accommodate cargo, ocean shipment of materials and equipment would be limited due to the crane capacity and water depth in harbor. Housing may be in short supply to accommodate the approximately 25 transmitter personnel.

4.18.1.2 Potential Saipan Site
The potential transmitter site on Saipan is located on the north side of the island near the west coast (east of Chalan Pale Arnold Road, west of Marpi Road). The southernmost array would be on the south side of Ayuyu Drive on both the CNMI Government and private lands (Figure 4.18-2). The site has steep terrain but is of sufficient size to accommodate the antennae field, associated facilities, and security fencing. There is adequate infrastructure to deliver electricity, support communications needs, and provide road access. There is sufficient separation from adjacent land uses to ensure safety and avoid radio frequency exposure. The airport and port are adequate to receive construction material and transmitter equipment shipments and enough on-island housing to accommodate the transmitter personnel.

4.18.1.3 Potential Tinian Site
The potential transmitter site on Tinian is located on the extreme south end of the island on the Carolinas plateau, which is centrally located between the east and west coast of the island (Figure 4.18-3). The site is relatively flat and of sufficient size to accommodate the antennae field, associated facilities, and security fencing. There is adequate infrastructure to deliver electricity, support communications needs, and provide road access. There is sufficient separation from adjacent land uses to ensure safety and avoid radio frequency exposure. The airport and port are adequate to receive construction material and transmitter equipment shipments and enough on-island housing to accommodate the transmitter personnel.
Figure 4.18-1
Potential Rota Site

Legend
- Green: Potential Relocation Site - Fenced Area

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

Philippine Sea
Pacific Ocean
Rota International Airport
Song Song Village
Sasanhaya Bay
Teneto Village
Wedding Cake Mountain
Alaguan Bay
Figure 4.18-3
Potential Tinian Site
4.18.1.4  Potential Guam Site

The potential transmitter site on Guam is located primarily on Government of Guam property with a small portion on private land, in the northwest portion of the island, south of Naval Computer and Telecommunications Station Finegayan and the former Federal Aviation Administration site, and west of South Finegayan Family Housing Area (Figure 4.18-4). The site is relatively flat and of sufficient size to accommodate the antennae field, associated facilities, and security fencing. There is adequate infrastructure to deliver electricity, support communications needs, and provide road access. There is sufficient separation from adjacent land uses to ensure safety and avoid radio frequency exposure. The airport and port are adequate to receive construction material and transmitter equipment shipments and enough on-island housing to accommodate the transmitter personnel. The potential site is notional and would be adjusted based on site-specific data (e.g., existing installation restoration sites).

4.18.1.2  Programmatic Analysis

This summary of the programmatic environmental consequences provides a general analysis of the potential impacts of establishing a transmitter facility at any of the four site locations identified in the Relocation Study (DoN 2014a). The programmatic approach identifies potential environmental issues that inform the decision maker during the environmental review process. If in the future there is a decision to move forward with relocating the International Broadcasting Bureau, then, the appropriate level of environmental studies, consultations, and NEPA documentation and public review will be undertaken. Consultation with agencies may be required. Potential consultations include:

- Endangered Species Act, Section 7: U.S. Fish and Wildlife Service and National Marine Fisheries Service
- Magnuson-Stevens Fishery Conservation and Management Act: National Marine Fisheries Service
- Marine Mammal Protection Act, National Marine Fisheries Service
- Coastal Zone Management Act: CNMI Bureau of Environmental and Coastal Quality and Guam Bureau of Statistics and Plans

The programmatic analysis of potential impacts associated with the International Broadcasting Bureau relocation is presented generally for all sites below. Where possible, site-specific information is presented for each resource.
Figure 4.18-4
Potential Guam Site
4.18.1.2.1 Geology and Soils

4.18.1.2.1.1 General

Given the known geology of the Mariana Islands, there is likely probability that sinkholes would be present at each of the sites. These geologic hazards would need to be identified and avoided or addressed during facility design and construction to avoid potential impacts. There also could be fault lines on the sites. For facilities, roadways, or other infrastructure where construction or other improvements that could not avoid fault lines, then engineering design would be required construction that would minimize any potential effects from earthquakes and associated fault ruptures. Buildings, facilities, and infrastructure would be designed, situated, and constructed in accordance with Unified Facility Criteria recommendations for seismic protection. The proposed International Broadcasting Bureau facility locations are each in a tsunami evacuation safe zone. A hazard communication and evacuation plan for site workers would be required as a construction safety best management practice.

Construction of the transmitter station would require site clearing, grubbing, and grading; excavating (cut); and filling. This could result in over 200 acres (81 hectares) of cleared land depending upon existing conditions at each site. Best management practices including soil and erosion controls would need to be followed during construction to minimize impacts on soils and other natural resources. There would be impacts associated with changes to topography including slope instability and alteration of surface drainage patterns that would need to be managed. These temporary effects could occur when excavation and fill would take place to form level surfaces for site development. There is a potential for increased erosion, compaction, and soil loss from physical disturbance caused by construction activities and changes to existing topography. Project design and construction would incorporate engineering controls as best management practices (see Appendix D, Best Management Practices) to minimize erosion as required by the CNMI Earthmoving and Erosion Control Regulations.

Site-specific information is described below.

4.18.1.2.1.2 Rota

The site is relatively flat, with a slight difference of about 40 feet (12 meters) in elevation across the site. This location has sufficient area for the transmitter station. The limestone formations may have sinkholes and below-ground voids, so further geotechnical investigation would be needed for this site. The majority of the soils are shallow, well-drained, and appear suitable for construction of the transmitter station. The site is above Sinapalu Village, which is designated as a tsunami evacuation safe zone. The site has no known fault zones or seismic features.

4.18.1.2.1.3 Saipan

There are relatively steep grades at this site, increasing from elevation 520 feet (158 meters) to 820 feet (250 meters) above MSL across the site. The site has a relatively constant rise across the proposed antenna field. The site continues to rise toward the north. These grades could be overcome through design and site grading. The limestone formations may have sinkholes and below-ground voids, so further geotechnical investigation would be needed for this site. The majority of the soil types are shallow, well-drained, and appear suitable for construction of the transmitter station. There are moderately steep soils and rock outcrops on a limestone plateau and side slopes. The site is above
Capitol Hill, which is designated as a tsunami evacuation safe zone. The site has no known fault zones or seismic features.

4.18.1.2.1.4 Tinian

The site is relatively flat, with a change of about 40 feet (12 meters) across the site. It has sufficient area for the transmitter station. The limestone formations may have sinkholes and below-ground voids, so further geotechnical investigation would be needed for this site. The majority of the soil types are shallow, well-drained, and appear suitable for construction of the transmitter station. The site is above Tinian International Airport, which is designated as a tsunami evacuation safe zone. The site has no known fault zones or seismic features.

4.18.1.2.1.5 Guam

The site is basically flat, with a change of only about 20 feet (6 meters) across the site. It has sufficient area for the transmitter station. The limestone formations may have sinkholes and below-ground voids, so further geotechnical investigation would be needed for this site. The majority of the soil types are shallow, well-drained, and appear suitable for construction of the transmitter station. The site is high enough in elevation to be designated as a tsunami evacuation safe zone. Minor faults and fault zones exist north of the site. Presence of faults near sites would need to be addressed in facility design. In general, construction on fault lines would be avoided as much as practicable.

4.18.1.2.2 Water Resources

None of the sites contain intermittent or perennial surface water systems, although potential wetland areas are located at the Rota site. The Guam site overlies the northern Guam aquifer. No known groundwater aquifers are located immediately beneath the other sites.

Construction of the transmitter station would include clearing, grubbing, and grading; excavating (cut); and filling. These activities, all of which would increase the potential for erosion and sedimentation from exposed earth. During the construction phase and prior to any ground-disturbing activities, a Stormwater Pollution Prevention Plan (as required by the National Pollutant Discharge Elimination System permit program) would be submitted by construction contractors and approved by regulatory authorities. As required by the CNMI Bureau of Environmental and Coastal Quality, an erosion and sediment control plan would be developed based on a 25 year/24 hour duration storm event. Best management practices (e.g., silt fencing) and engineering controls (e.g., soil stabilization) would be implemented to minimize potential impacts to water resources during construction.

A comprehensive drainage and Low Impact Development study would be performed for the transmitter station site. Findings from the comprehensive drainage and Low Impact Development study would be used to inform and design the post-development stormwater management system.

Best management practices that would be implemented during construction to protect groundwater resources include vegetation buffers to protect sinkholes; limiting use of heavy equipment in areas that support groundwater recharge; proper abandonment of historic groundwater wells; and proper management of spills and leaks of hazardous materials and waste. Construction activities could result in the accidental release of pollutants (e.g., oil or chemicals) due to failure of a materials handling best
management practice, which could affect groundwater quality through percolation. Any accidental release or spill of pollutants would be cleaned up immediately.

### 4.18.1.2.3 Air Quality

Operation of construction equipment and associated vehicles would result in short-term impacts to air quality at any of the potential sites. Operation of the facility once it is constructed would involve typical types of emissions sources such as vehicles, generators, and maintenance equipment. If average annual emissions during construction or annual operations are below the 250 tons (227 metric tons) per year threshold, construction would result in less than significant direct or indirect impacts to air quality. The transmitter station would not affect the operational capacity of existing utility systems. Therefore, no adverse air quality impacts from stationary sources (i.e., new or modified fixed or immobile facilities) would occur.

### 4.18.1.2.4 Noise

Earth-moving equipment (e.g., graders, excavators, dozers) and impact devices (e.g., pile drivers and jackhammers) are examples of heavy (large) equipment that would be used for construction. Smaller construction equipment includes generators, concrete saws, and compressors. Equipment and other construction activities typically generate noise levels ranging from 70 to 90 decibels at a distance of 50 feet (15 meters), see Appendix H, *Noise Study* (see Table 2.4-1) for specific equipment noise levels (U.S. Department of Transportation 2006).

From a noise perspective, construction activities are too distant to generate elevated noise levels that would be detectable in residential areas of Rota, Saipan, and Tinian. However, construction noise would potentially be audible at the military family housing area east of the Guam Site. In addition, construction noise would be audible to other sensitive land uses surrounding the various sites, such as World War II memorial sites (Rota and Tinian), a National Historic Landmark (Saipan), and a country club (Saipan). Operation of the facility would involve noise sources typical to an industrial facility. These would include vehicles and maintenance equipment. These activities would generate less noise than construction activities. Operational noise would not likely be audible at the sensitive land use locations mentioned above.

### 4.18.1.2.5 Airspace

The proposed sites are not adjacent to airports. The antenna heights would be the same as the existing International Broadcasting Bureau facilities, ranging between 150 feet (46 meters) and 400 feet (122 meters). Prior to constructing the new transmitter station, the Federal Aviation Administration would be contacted to ensure the tower height is compatible with aircraft safety restrictions.

### 4.18.1.2.6 Land and Submerged Land Use

It is possible that the U.S. military would need to prepare a Coastal Zone Management Federal Consistency Determination. Depending on the location, the determination would be submitted to the CNMI Bureau of Environmental and Coastal Quality or to the Guam Bureau.
4.18.1.2.6.1 Rota

The site is on publicly owned land (by the CNMI government) within the Sabana Conservation Area. Nearby land uses include a small botanical garden, a World War II memorial, a communications tower, and a small firing range. The communication tower would be incompatible with the proposed transmitter station and would need to be relocated. Other land uses would not be affected. Therefore, this site is moderately compatible with existing land uses.

4.18.1.2.6.2 Saipan

The site is a combination of private and publicly owned land (the CNMI government). The land south of the site (adjacent to the two proposed southernmost antennas) is owned by the Marianas Country Club. The antennas could affect access to several holes on the golf course. In addition, private land to the west would need to be acquired due to the proximity of the radio frequency hazard zone.

The northern portion of the transmitter site would be located in the National Park Service’s Marpi National Historic Landmark. This is also the location of the Suicide Cliff Overlook. The central portion of the site is on a recently disestablished Far East Broadcasting Corporation Station site. This area is owned by the CNMI government and leased to a private party. Overall, this site would not be compatible with current land uses in the area as it is immediately adjacent to a country club and the Marpi National Historic Landmark.

4.18.1.2.6.3 Tinian

The site is on publicly owned land (by the CNMI government) south of the Kastiyu Wildlife Preserve and west of a World War II memorial located at the cliff edge. The antenna and facilities placement would not affect the memorial or other land uses nearby. This site is compatible with existing land uses.

4.18.1.2.6.4 Guam

The site is a combination of private and publicly owned land (Guam government). The site is situated on a plateau with a cliff to the west. The areas north and south of the site are vacant, and the area to the east is military family housing. The lands are owned by the Government of Guam but are in the process of being returned to the people of Guam through a judicial process. The portion of the site to the south is on private land that would need to be acquired. This site is moderately compatible with existing land uses.

4.18.1.2.7 Recreation

For each of the potential sites construction materials and equipment would come through the harbor and/or airport. Materials would be delivered to the construction sites via surface roadways. Introducing slow-moving construction vehicles to the roadways could affect the public’s access to recreational resources on island. The increased traffic and slow operation of construction vehicles could result in negative impacts to visitor access to, and their overall experience of, recreational resources on island. Operations would not affect recreation.

4.18.1.2.8 Terrestrial Biology

Construction would involve vegetation removal to clear areas within the project site. In addition, birds in the immediate vicinity of construction activities may be disturbed by noise and human activities. Nests
may be susceptible to abandonment by adults and predation of eggs or young. This would temporarily displace birds, causing them to expend additional energy, some of which may be lost or have reduced breeding success. Direct mortality from construction equipment is unlikely because noise associated with pre-construction activities and human presence is likely to disperse wildlife prior to any equipment use, although vehicle traffic would increase the potential for wildlife collisions. The noise impacts would be short-term and minor. Impacts would be minimized by implementing resource management measures summarized in Section 4.9.2 and presented in detail in Appendix D, Best Management Practices. Endangered Species Act, Section 7 consultation may be needed with U.S. Fish and Wildlife Service.

4.18.1.2.8.1 Rota

The site is within the Sabana Conservation Area and is within critical habitat designated under the Endangered Species Act for a federally endangered bird, the Rota bridled white-eye, and adjacent to critical habitat for the federally endangered Mariana crow. Construction would include the removal of native limestone forest. Construction of the new transmitter station site would directly affect critical habitat, and there could be indirect effects. Potential indirect operational effects to the bird species include the potential for birds to strike the antennae or fencing, as well as be subject to the electromagnetic radiation from the antennae.

4.18.1.2.8.2 Saipan

The project area supports three endangered bird species: nightingale reed-warbler, Micronesian megapode, and Mariana swiftlet. Construction of the proposed transmitter station site would directly impact reed-warbler and megapode habitat. In addition, potential indirect operational effects to the bird species include the potential for birds to strike the antennae or fencing, as well as be subject to the electromagnetic radiation from the antenna.

4.18.1.2.8.3 Tinian

There are no known wildlife species of concern at this site.

4.18.1.2.8.4 Guam

The site is in an area defined by the U.S. Fish and Wildlife Service as “recovery habitat” for the endangered Guam Micronesian kingfisher, Guam rail, Mariana crow, and Mariana fruit bat. Construction of the proposed transmitter station site would directly impact recovery habitat, and there could be indirect effects. Impacts to recovery habitat would be unavoidable but would be minimized to the maximum extent possible.

4.18.1.2.9 Marine Biology

There would be no marine biology impacts associated with the proposed relocation. All potential sites under consideration would be on land and would not have a marine component.

4.18.1.2.10 Cultural Resources

Construction could adversely impact historic properties in the project footprint. There are no historic resources at the Rota and Guam sites. The Saipan site is within the Marpi National Historic Landmark and Suicide Cliff Overlook. The Tinian site does not have historic resources but is adjacent to a World
War II memorial. Cultural resource surveys would need to be conducted at each of the sites to confirm the presence or absence of archaeological resources. National Historic Preservation Act, Section 106 may be needed with Advisory Council on Historic Preservation, CNMI Historic Preservation Office, and/or Guam State Historic Preservation Office.

4.18.1.2.11 Visual Resources

Due to their height, all or most of the antennas would be visible from many key observation points surrounding each site. Due to topography at the Rota site, the antennas would not be visible from the northern, western, or southern areas outside the site. Due to topography in northern Saipan, the antennas would be visible along the western coastline. Suicide Cliff Overlook is north of the Saipan site, and views from this location would also be affected by the Saipan transmitter station facilities. The Tinian site is situated in the southeastern part of the island below a ridgeline, so views of the antennas would be limited primarily to that part of the island. The Guam site is relatively flat, so the antennas would be visible from most locations surrounding the site.

4.18.1.2.12 Transportation

Construction of the new International Broadcasting Bureau facilities would be limited to grading, excavation, construction of structures and antennae, and installation of automation equipment. Depending on how rapidly construction is completed, construction workers may be onsite for many months. Off-island workers would likely be used for to construct the facilities. They would reside on island throughout the construction phase. Throughout the construction period, intermittent impacts to traffic circulation may result from the movement of trucks containing construction and debris removal materials, as well as from construction workers commuting. This increase in traffic volumes on roadways could affect traffic circulation or roadway Level of Service. Construction truck movements may result in generally isolated impacts that could include, but would not be limited to, congestion, slower speeds in construction zones, temporary roadway closures, and short detours that may be caused by equipment movement, delivery of construction materials, removal of construction debris, and construction of roadway improvements.

Most of the construction activities would occur within the project footprint, and as such, very limited transportation and circulation impacts from construction are anticipated. Implementation of a traffic management plan and work zone traffic management would minimize construction impacts on vehicular travel and bicycle and pedestrian circulation, and access to destinations near the construction area.

Implementation of these best management practices (see Appendix D, Best Management Practices) would lessen potential construction effects to traffic circulation or roadway Level of Service for vehicles, public transit, pedestrians, or bicycles, increase the rate of traffic related accidents, or reduce transportation safety.

The antenna structures are potential hazards for aircraft. However, none of the sites is near an airfield or airport. Although construction materials may be shipped to the island, the number of vessel trips would likely be minimal.

Site-specific information is described below.
4.18.1.2.12.1 Rota

Transportation of construction materials to Rota would be limited due to the crane capacity and water depth at the harbor. Thus, additional shipments would be needed for this site in relation to the other sites. Delivery of fuel oil would be via fuel tanker trucks from the east harbor. The road from Sinapalu to the Sabana Conservation Area would need improvement to provide access for construction and daily access for workers once the site is operational. A new road would be required to provide access to the operations support area. The access road from the west side of the island would need to be closed to prevent access to the plateau before the hazard area of the antenna field. The Rota International Airport can accommodate Boeing 757s with restricted landing and takeoff loads. Prior to constructing the new transmitter station, the Federal Aviation Administration would be contacted to ensure the tower height is compatible with aircraft safety restrictions. The Rota West Harbor has a narrow channel and cannot accommodate large vessels. It has boat slips and a couple of storage companies. There is no bulk fuel storage at this harbor, and the crane is rated to lift only 20-ton (18,144-kilogram) containers.

4.18.1.2.12.2 Saipan

A roadway (Ayuyu Drive) bisects the site, so the antenna arrays would be placed on either side of the road. This would require the road to be closed to the general public, thus affecting local vehicle traffic. Delivery of fuel oil would be via fuel tanker trucks from the Port of Saipan. Ayuyu Drive from Chalan Pale Arnold Road to Matansa Drive would require improvement to about 8,400 feet (2,560 meters) of road. This would be necessary to provide access for construction vehicles, as well as daily access for employees once the site is operational. Saipan International Airport can accommodate DC-10s and Boeing 747s. Prior to constructing the new transmitter station, the Federal Aviation Administration would be contacted to ensure the tower height is compatible with aircraft safety restrictions. The Port of Saipan has a deep channel, and it has two fuel storage facilities plus a bulk cement company.

4.18.1.2.12.3 Tinian

Delivery of fuel oil would be via fuel tanker trucks from Tinian Harbor. Fuel oil is delivered to the harbor fuel tanks one time per month. The current access road would require improvements, and a new road would be needed to access the administration area. The Tinian International Airport currently accommodates single-engine aircraft with a capacity of 36 passengers. Prior to constructing the new transmitter station, the Federal Aviation Administration would be contacted to ensure the tower height is compatible with aircraft safety restrictions. The main wharf at the Tinian Harbor is 2,000 feet (610 meters) long and has two piers on the southwest side, both of which are in a state of disrepair.

4.18.1.2.12.4 Guam

The site is close to existing roadways. Transportation of construction materials to Guam is not restricted by the harbor or airport size. Delivery of fuel oil would be via fuel tanker trucks from the Golf Pier in the harbor. The existing road from Route 3 and some of Royal Palm Drive would need improvement to support construction and operations of the facility. A new road would be required to the entrance of the site. The Guam International Airport can accommodate large aircraft. Prior to constructing the new transmitter station, the Federal Aviation Administration would be contacted to ensure the tower height is compatible with aircraft safety restrictions. Apra Harbor is a deepwater port that includes a container terminal, fuel oil piers, and laydown yards.
4.18.1.2.13 Utilities

Site-specific information is described below.

4.18.1.2.13.1 Rota

The electrical power system on the island would require additional generating capacity as well as replacement of some overhead power lines to support operation of the transmitter station. An additional 6.0 megawatts of generating capacity would need to be added to the island power supply. Water supply via filtered rainwater is adequate for the proposed facility. Bottled water would be used for drinking water. Wastewater would be handled with an onsite package sewage treatment system with discharge to a leach field. Solid waste would be collected and disposed of by private contractors. However, there is not a permitted landfill on Rota. Commercial carriers for telephone, internet, and television are available on the island.

4.18.1.2.13.2 Saipan

The overhead power line feeder from Power Plant I and II may be insufficient to provide adequate power to the site. This feeder line would need to be replaced. In addition, the transmitter transmission lines to the two southernmost antennas would need to be routed over Ayuyu Drive. Water supply via filtered rainwater is adequate for the proposed facility. Bottled water would be used for drinking water. Wastewater would be handled with an onsite package sewage treatment system with discharge to a leach field. Solid waste would be collected and disposed of by private contractors. Commercial carriers for telephone, internet, and television are available on the island.

4.18.1.2.13.3 Tinian

The existing overhead power lines from the power plant are insufficient to provide adequate power. These lines would need to be replaced. Water supply via filtered rainwater is adequate for the proposed facility. Bottled water would be used for drinking water. Wastewater would be handled with an onsite package sewage treatment system with discharge to a leach field. Solid waste would be collected and disposed of by private contractors. However, there is not a permitted landfill on Tinian. Commercial carriers for telephone, internet, and television are available on the island.

4.18.1.2.13.4 Guam

The site is close to existing roadways and utility infrastructure. It has adequate on-island power, municipal potable water, and municipal sanitary sewer system. Solid waste and hazardous waste can be collected and disposed of by private contractors. Commercial carriers for telephone, internet, and television are available on the island.

4.18.1.2.14 Socioeconomics and Environmental Justice

At any of the potential locations, construction work associated with the relocation would generate economic benefits. If the International Broadcasting Bureau is relocated to Rota, then some temporary construction workforce housing would likely need to be constructed to support construction activities.

International Broadcasting Bureau operations should generate economic benefits. Sufficient public services and housing capacity exist on Guam, Saipan, and Tinian to avoid stresses related to the
estimated 25 permanent employees. However, additional population related to these employees may put some strain on Rota public services.

### 4.18.1.2.15 Hazardous Materials and Waste

Candidate sites would be screened for the presence of contamination on land proposed for development or use following the potential relocation. Neither Rota nor Tinian has a permitted landfill that would handle hazardous waste. Any hazardous materials used during construction or operations would be handled according to applicable federal and local regulations. Any generated hazardous waste would be collected and transferred by private contractors to licensed operators for regulated disposal of hazardous waste.

#### 4.18.1.2.15.1 Hazardous Materials

Construction activities would include vegetation removal, grading, excavation, and construction. Construction activities would cause a short-term increase in the use of hazardous materials that would end when the construction is finished. Most of the hazardous materials expected to be used are common to construction (e.g., diesel fuel, gasoline, and propane; hydraulic fluids, oils, and lubricants; welding gases; paints and solvents; adhesives; and batteries). The increased volume and use of hazardous materials during the construction period would present a potential for increased accidental spills and releases of hazardous materials, resulting in potential impacts to human health (direct impacts) and the environment (i.e., soils, surface water, groundwater, air, plants and animals [indirect impacts]). The hazardous materials would be handled, stored, and disposed according to applicable best management practices, standard operating procedures, and federal and CNMI or Guam regulations.

Hazardous materials would be brought to construction sites using existing or proposed public transportation routes. Transportation of all materials would be conducted in compliance with the U.S. Department of Transportation regulations and CFR Title 49. Following the best management practices and standard operating procedures and compliance with federal and CNMI/Guam regulations would reduce the likelihood and volume of accidental releases, allow for faster spill response times, and enable timely cleanup. Similar procedures would be implemented for operation of the proposed International Broadcasting Bureau facilities.

#### 4.18.1.2.15.2 Toxic Substances

Construction and demolition of any buildings on these candidate sites may reveal asbestos-containing materials, lead-based paint, or polychlorinated biphenyls that were used in building materials or electrical equipment at the time of original construction. If any of these toxic substances are encountered, properly trained and licensed contractors would be used to ensure that all U.S. military, federal, and CNMI/Guam hazardous waste testing, handling, and disposal procedures and requirements are followed for their collection and disposal. Because the U.S. Environmental Protection Agency banned lead-based paint in 1978, and banned most uses of polychlorinated biphenyls in 1979, these toxic substances would not be used to construct the proposed new facilities; nor would asbestos-containing materials be used. Similar procedures would be implemented for operation of the proposed International Broadcasting Bureau facilities.
4.18.1.2.15.3 Hazardous Waste

Construction activities would result in a short-term increase in the generation of hazardous waste that would end when construction is finished. Hazardous waste generated from construction activities includes pesticides, herbicides, solvents, adhesives, lubricants, corrosive liquids, batteries, and aerosols. Due to the projected increase in generation of hazardous waste, this potential relocation would have the potential to result in adverse impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the hazardous waste would be handled and disposed per applicable best management practices and standard operating procedures (see Appendix D, Best Management Practices). Construction contractors would be required to comply with all applicable requirements concerning handling, storage, and disposal of construction-related hazardous waste. All hazardous waste would be containerized and shipped off the island to the appropriate disposal facility site. Existing public transportation routes, including shipping by commercial carrier, would be utilized for the conveyance of hazardous waste to the disposal facility site. Transportation of all hazardous waste would be conducted in compliance with U.S. Department of Transportation regulations and CFR Title 49. Similar procedures would be implemented for operation of the proposed International Broadcasting Bureau facilities.

4.18.1.2.15.4 Contaminated Sites

The design of the proposed International Broadcasting Bureau facilities would either avoid the disturbance and dispersion of soil and groundwater at contaminated sites, or use of best management practices to minimize them. Construction would not increase the potential for impacts to contaminated sites.

If contaminated sites are present at the project locations, consideration and careful attention during project design phases would be given prior to construction to avoid these sites. If the proposed construction location cannot be designed to avoid these contaminated sites, then various best management practices and construction operational protocols would be followed to protect human health and the environment.

In addition, special design techniques and methodology would be required to ensure the long-term structural integrity of proposed construction projects. Best management practices that would be used include, but are not limited to, development of site-specific health and safety plans; the use of engineering controls (e.g., dust suppression) and administrative controls; and the use of personal protective equipment (see Appendix D, Best Management Practices) for a discussion of proposed best management practices.

For construction on these candidate sites, explosives safety documentation would be prepared that outlines specific measures that would be implemented to ensure the safety of workers and the public. This would reduce the potential hazards related to the exposure to unexploded ordnance. It would also be in accordance with Department of Defense Instruction 3200.16 Operational Range Clearance (Department of Defense 2005), Department of Defense Instruction 4140.62 Material Potentially Presenting and Explosive Hazard (Department of Defense 2014), Department of Defense Directive 6055.9, Department of Defense Ammunition and Explosive Safety Submission (DoN 2010) and Naval Ordnance and Safety and Security Activity Instruction 8020.15D (DoN 2011). Best management practices that would be implemented include having qualified operational range clearance or unexploded
ordnance personnel perform surveys to identify and remove potential unexploded ordnance before the start of ground-disturbing activities. The identification and removal of the unexploded ordnance before the start of construction activities would minimize potential impacts. However, additional safety precautions could include operational range clearance or unexploded ordnance personnel supervision during earth moving and providing a safety awareness/hazardous assessment brief to construction contractors and equipment operators to train them to identify whether materials are unexploded ordnance that potentially present an explosive hazard. Any unexploded ordnance identified during construction would be disposed of in accordance with applicable regulations.

4.18.1.2.16 Public Health and Safety

Construction personnel would be required to maintain boundary signs, fences, and barricades to provide notice to the public of active construction zones. In addition, security personnel or construction safety flaggers could provide warnings to the public of ongoing construction activities along roadways and publicly visited areas (e.g., recreational areas). Because the public would be excluded from entering active construction areas, potential impacts to public health and safety would not result in any safety risk.

Each of the four sites are located away from ordnance facilities, and fencing would restrict access to the site by the general public. Therefore, hazards of electromagnetic radiation to ordnance and personnel would not create a safety risk. Diesel fuel could be used on the site without a safety risk.

4.18.2 Pagan Dock and Breakwater

A planned 200-foot (61-meter) dock and associated 300-foot (91-meter) breakwater would be located on the west side of Pagan, at the southern end of Red Beach. The dock/breakwater would support loading/off-loading operations for a joint high speed vessel and landing craft. The dock and breakwater would accommodate landing craft logistical operations, and possibly a Littoral Combat Ship. Biosecurity inspections and wash downs of vehicles and equipment as needed would be conducted in these areas. A design has not been completed. However, it could consist of a 150-foot (56-meter) jetty extending from shore to a loading platform (dock) with its seaward face in water about 20 feet (6 meters) deep. The jetty width could be 20-35 feet (6-11 meters). The dock could be a concrete slab supported by a steel sheet pile structure. The proposed location for the dock and associated breakwater is shown in Figure 4.18-5.

Consultation with agencies may be required. Potential consultations include:

- Endangered Species Act, Section 7: U.S. Fish and Wildlife Service and National Marine Fisheries Service
- Marine Mammal Protection Act: National Marine Fisheries Service
- Magnuson-Stevens Fishery Conservation and Management Act: National Marine Fisheries Service
- National Historic Preservation Act, Section 106: Advisory Council on Historic Preservation, and CNMI Historic Preservation Office
- Coastal Zone Management Act: CNMI Bureau of Environmental and Coastal Quality
- Section 404 of the Clean Water Act: U.S. Army Corps of Engineers
Figure 4.18-5
Proposed Pagan Pier and Breakwater
A programmatic analysis of impacts is presented below. If, in the future, there is a decision to move forward with the proposed dock and breakwater, then the appropriate level of project-specific environmental studies, consultations, and NEPA documentation and public review will be undertaken.

### 4.18.2.1 Geology and Soils

The proposed dock and its associated breakwater would be constructed according to appropriate Department of Defense and accepted seismic engineering standards to ensure stability and safety in the event of an earthquake. An earthquake/seismic hazard and volcanic hazard communication and evacuation plan for personnel involved in construction and training on Pagan would be implemented to minimize the potential for exposure to seismic hazards, including tsunamis. Construction would be limited to in-water areas at Red Beach and would have minimal effects to onshore geology and soils.

In-water construction would disturb marine sediments. Turbidity during construction would be monitored and minimized as much as possible. Operations at the dock would not affect topography, geologic units, or soils on Pagan. Using best management practices and standard operating procedures would lessen the potential for adverse impacts.

### 4.18.2.2 Water Resources

In-water construction would have short-term and localized impacts to nearshore waters. Potential impacts include turbidity, sedimentation, decreased water clarity, and potential accidental discharge of pollutants. In-water construction of both the dock and breakwater at Red Beach would result in direct impacts to nearshore waters. Both the dock and breakwater would fill waters of the U.S. that is regulated by the federal government. Construction activities would also temporarily disturb sediment and increase turbidity and thus impact water quality, clarity, and dissolved oxygen levels. Best management practices, including isolating the in-water construction area and potential use of silt curtains, would be utilized to capture sediment and debris caused by in-water construction activities. In-water construction would require authorization under Section 404 and Section 401 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, and the Coastal Zone Management Act.

Operations at the dock could potentially impact water quality. The accidental release of other pollutants associated with the use and maintenance of the dock could also impact nearshore water quality. However, accidental release of these pollutants would only occur as a result of a failure of a materials-handling best management practice, and any spills would be cleaned up immediately. Spill prevention plans and other best management practices would be implemented to minimize the impact of operations on nearshore water quality.

### 4.18.2.3 Air Quality

Construction of the proposed dock and breakwater would create air emissions from construction equipment. The proposed dock and breakwater would facilitate more marine traffic. However, operation of the dock would not result in new types of emissions from stationary sources. No sensitive land uses are located close to the proposed dock and breakwater location, and frequent trade winds would disperse emissions.
Existing volcanic gases would continue to be released from volcanic eruptions as part of natural geological processes. Sulfur dioxide, a criteria pollutant, is one of the most common gases released in volcanic eruptions and is hazardous to humans. Periodic sulfur dioxide releases due to volcanic eruptions could potentially have an adverse impact to air quality. However, volcanic eruptions are natural geological processes. Furthermore, construction and operation of the dock and breakwater would not have an impact to the frequency of such eruptions.

### 4.18.2.4 Noise

The Pagan dock and breakwater would involve construction of relatively minor harbor facilities. Equipment and other construction activities typically generate noise levels ranging from 70 to 90 decibels at a distance of 50 feet (15 meters) (U.S. Department of Transportation 2006). Construction activities for the proposed dock and breakwater would not impact any residential properties or noise-sensitive receptors such as schools, houses of worship, and hospitals as no such features exist on Pagan. Operations at the dock and breakwater would involve marine vessel activities, as well as ground-based equipment and vehicles. Noise would be similar to those conducted at Red Beach without these facilities.

Noise would be caused by construction equipment onshore and in nearshore waters of Red Beach. No blasting would be required. It has been found that noise levels traveling in the air, above water, from typical dredging in deeper water of harbors and rivers could be 87.3 decibels at 50 feet (15 meters), dropping to 61.2 decibels at 1,000 feet (305 meters), and to 55.2 decibels at 2,000 feet (610 meters) from the source (DoN 2010). The highest typical in-water noise levels for dredging operations in harbors and rivers are generally 150 to 162 decibels or 1 micro Pascal at 3 feet (1 meter) (Greene and Moore 1995). Proposed construction operations would occur within shallow waters, typically at or near low tide. Underwater noise levels would be, therefore, less than noise levels presented above for deep-water harbors and rivers. However, underwater noise from pile driving to construction the dock could affect marine mammals. It will be important to have future modeling done of underwater noise that simulates the distance and strength of underwater noise based on the number and type of piles as well duration of construction and presence of any marine mammals or sea turtles in the area. These studies would be done should the dock and its associated breakwater proposals move forward.

Noise impacts would not affect residential areas, schools, houses of worship, and hospitals (i.e., sensitive receptors). Operational noise would be consistent with noise proposed for Red Beach (see Section 4.5, Noise). This includes vessel activity, terrestrial vehicle activity, and human sources.

### 4.18.2.5 Airspace

The proposed dock and breakwater would not affect the airspace or airfield, nor would it alter new or existing airspace that would impact civilian air traffic.

### 4.18.2.6 Land and Submerged Land Use

Construction of the dock and breakwater harbor facilities would facilitate safe access to Pagan. There are currently no federal lands or privately owned lands on Pagan. The CNMI government owns all of Pagan. Under the CJMT EIS/OEIS proposed action, the federal government would seek to acquire a real estate interest for the entire island of Pagan (approximately 11,794 acres [4,773 hectares]) from the
CNMI government. This would include the area needed to construct the dock and breakwater. Therefore, construction and operation of the dock and breakwater would not create any new changes to land ownership, submerged land ownership and management, or the CNMI Areas of Particular Concern. The Territorial Submerged Lands Act was amended to convey certain submerged lands to the CNMI government, which included submerged lands around Pagan. The submerged lands around Pagan are now owned by the CNMI government. The proposed dock and breakwater would not affect compatibility with plans and polices or with current land uses. This project would allow easier public access to Pagan when military training is not occurring.

Since 1981, Pagan has been largely closed to public access due to volcanic risk. Operation of the dock and breakwater would not change the amount of time that Pagan is available to the public during the training. The remainder of the year all but the High Hazard Impact Areas would be open to the public, should the volcano risk be reduced. While unauthorized (i.e., no use permits obtained from the CNMI government), individual visitors use the land for subsistence. Scientific studies do occasionally take place on Pagan. There is also some recreation use with occasional ecotourism visits to Pagan by groups and individuals. None of these activities would be affected by operation of the dock and breakwater.

There is no CNMI land use designation for Pagan, so it is therefore assumed to be conservation. The proposed use of submerged land by the U.S. military for the dock and breakwater would constitute a change in submerged land use from the present use (conservation). The dock and breakwater would introduce a new use and thus a change in the use of submerged lands, but not completely incompatible. However, this use would be consistent with activities proposed to occur there for proposed CJMT training. This includes transport and offloading of equipment and personnel at Red Beach.

The proposed dock and breakwater would affect coastal uses and resources that are subject to Coastal Zone Management Act federal consistency requirements. These facilities would be consistent to the maximum extent practicable with the enforceable policies of the CNMI Bureau of Environmental and Coastal Quality. The proposed action would be consistent to the maximum extent practicable with the Coastal Zone Management Act and the enforceable policies of the CNMI Bureau of Environmental and Coastal Quality.

The proposed dock and breakwater would not be located in the CNMI Areas of Particular Concern. Therefore, the proposed dock and breakwater would be inconsistent with the intended special (protective) management of the CNMI Areas of Particular Concern. The impact on the corals, beaches, and marine environment, and potential measures to lessen these impacts, are discussed in detail in Section 4.18.2.9, Marine Biology.

**4.18.2.7 Recreation**

Pagan is officially uninhabited and does not contain any official recreational areas. Nevertheless, there have been discussions about developing Pagan as an eco-tourism destination and a staging area for visitors to the Marianas Trench National Marine Monument area. The proposed dock and breakwater would be permanent structures at Red Beach. Construction at this location would not limit the impact to the island’s potential recreational resources during the construction phase.

Operation of the proposed dock and breakwater would not result in additional closure of the northern portion of the island beyond what is proposed for the CJMT EIS/OEIS proposed action. Therefore, no
additional restrictions of recreational activities would occur due to operation of the dock and breakwater.

Consequently, the proposed dock and breakwater would not alter the areas available for recreational use. The proposed harbor improvements could provide beneficial impacts to the island recreational areas by facilitating safe access to the island for visitor traffic.

4.18.2.8 Terrestrial Biology

The construction of the dock and breakwater would occur in water and would not change the project footprint onshore. Additional vessel activities would occur at Red Beach, but overall noise levels would not substantially increase. The dock and breakwater would not cause additional foot traffic, vehicle traffic, or ordnance use at other places throughout the island. Therefore, vegetation communities, native wildlife, and special-status species would not be affected.

4.18.2.8.1 Vegetation Communities

Temporary disturbance would occur near the construction area for staging of construction vehicles, equipment and supplies. However, no vegetation communities or habitat would be permanently affected by construction activities. No native limestone forest would be affected by construction. Limestone forests on Pagan are important as they retain the functional ecological components of native forest. This habitat provides for the majority of Pagan’s native species, including candidate and listed special-status species, as well as maintaining water quality and reducing fire risk.

4.18.2.8.2 Native Wildlife

No long-term habitat loss would result from the construction of the proposed dock and breakwater. Damage of forested areas, particularly native limestone forest, by non-native mammals (i.e., feral goats and pigs) is a serious concern on Pagan. Construction of the proposed dock and breakwater would not affect the concentrations or locations of these animals on site or at other areas on the island. Therefore, the island vegetation community and its function would not be affected. In addition, implementation of best management practices would occur, as identified in Appendix D, Best Management Practices.

Since there would be no loss of forested habitats, there would not be resulting loss of nesting areas or other effects to native bird populations because suitable nesting habitat occurs throughout the island. Short-term construction noise may temporarily affect areas with suitable habitat for some, but birds could relocate to other suitable habitat and return when construction is completed. Nests in the immediate vicinity of construction activities also could be disturbed by noise and human activities and susceptible to abandonment and depredation. This would temporarily displace birds, some of which may be lost or have reduced breeding success. Construction noise impacts would be short-term and minor at Red Beach.

Increased traffic and human presence, as well as noise from construction, may temporarily displace wildlife species, causing them to expend additional energy. Direct mortality from construction equipment is unlikely since noise associated with pre-construction activities and human presence is likely to disperse wildlife prior to any equipment use.
4.18.2.8.3 Special-status Species

Direct impacts to special-status species from proposed construction activities can include the removal of habitat, fragmentation of remaining habitat, and associated noise and human activities. Red Beach is not within the vicinity of federally listed species habitat on Pagan. Therefore, there would be no impacts to these species resulting from construction. The proposed dock footprint also would not affect foraging habitat. Therefore, no effects from construction would occur to the Mariana fruit bat.

The proposed dock and breakwater construction activities would not reduce the amount of habitat available to Migratory Bird Treaty Act-listed birds on Pagan. There would be no loss of forested habitats, and therefore no resulting loss of nesting, roosting, or foraging areas. Therefore, adverse effects on the migratory bird populations on Pagan would not occur. Short-term construction noise may temporarily impact suitable habitat for some birds in the vicinity of the construction area, but they would relocate to other suitable habitat, and could return to the area following construction. In addition to the impacts to habitat identified above, nests in the immediate vicinity of construction activities may be disturbed by noise and human activities and susceptible to abandonment and depredation. This would temporarily displace birds, some of which may be lost or have reduced breeding success. Therefore, implementation of dock and breakwater construction activities would not result in less than significant impacts to Migratory Bird Treaty Act-listed birds. In addition, the potential best management practices minimize the potential for impacts.

No sea turtles have been observed nesting on the beaches of Pagan. In addition, sightings of sea turtles on the beaches of Pagan are rare, with one green sea turtle observed resting on Red Beach (Kessler 2011). Pre-construction monitoring could occur to ensure there are no sea turtles resting on the beach or in their nests. The monitoring could include pre-construction surveys to delineate boundaries around nest sites as well as postponing construction activities when a nesting sea turtle is observed near the proposed dock location.

4.18.2.9 Marine Biology

Actions that could potentially impact marine biology include in-water construction and associated increase in vessel traffic. The proposed dock and breakwater would affect marine biological resources near the new construction if habitats are disturbed or removed. There would be temporary impacts to mobile marine resources near construction due to increased noise levels. A Clean Water Act Section 404 permit would be required for construction and mitigation would be developed through consultation with regulatory agencies.

There would be impacts associated with the use of the new dock. The level of noise would not increase over that of the CJMT EIS/OEIS proposed action, but there would be more days per year that noise is generated on land that could result in impacts to marine mammals and sea turtles. There would be operational noise in the harbor associated with use of the new dock that could impact species in the area.

Consultation with agencies may be required. Potential consultations include:

- Endangered Species Act, Section 7: U.S. Fish and Wildlife Service and National Marine Fisheries Service
Magnuson-Stevens Fishery Conservation and Management Act: National Marine Fisheries Service
Marine Mammal Protection Act, National Marine Fisheries Service

4.18.2.9.1 Marine Habitats

Proposed in-water construction of the dock and breakwater could potentially impact marine habitats. This includes in-water construction activities as well as associated vessel traffic and land-based vehicle activities. The evaluation of potential impacts to marine habitats focuses on the ecological function of the physical substrate; impacts specific to marine biological organisms are described in the sections below. Construction activities at Red Beach could impact marine habitats by disturbing or altering the seafloor, water quality, or physical environment (e.g., underwater noise). Marine habitats may be exposed to direct and indirect physical disturbance. Construction activities could result in the loss of marine habitat anywhere from +3 feet (1 meter) mean-mean low water to -20 feet (6 meters) mean-mean low water.

The marine habitats (soft shore, hard bottom, and aquatic bed) currently found within the designated amphibious landing areas would be modified through direct, physical disturbance. Erosion or changes in sediment transport (extent to be determined following additional information via modelling or an engineering study) may result in long-term direct and indirect impacts to the abundance and distribution of marine organisms that utilize habitat impacted by such changes, particularly soft shore habitat and aquatic beds.

Physical alteration of hard bottom habitat could also impact ecological function at Red Beach. The removal of some coral and homogenization of the slope of the reef could result in changes to refuge availability, differences in wave energy propagation, the runoff profile of the beach, and filtration by marine organisms.

Alterations to a marine habitat’s exposure to wave action, sunlight (i.e., shading from the proposed dock), and tidal fluctuations may in turn affect the temperature, salinity, and pH of the water. Such changes could impact the distribution and composition of marine organisms (Cowardin et al. 1979).

Construction of the proposed dock and breakwater would result in direct temporary impacts to the water quality of nearshore waters, particularly to such parameters as turbidity, sediment deposition, and dissolved oxygen levels due to the physical process of constructing the proposed dock and breakwater. Construction of the proposed dock and breakwater could result in long-term and permanent, direct and indirect adverse impacts to marine habitat, since current habitat types and ecosystem function would be lost or degraded.) Impacts would be minimized to the maximum extent practicable through adherence to best management practices, such as limiting in-water work to low tidal conditions and installation of silt/turbidity curtains.

4.18.2.9.2 Marine Flora

Marine flora impacts at Red Beach could be minimized through design considerations and adherence to best management practices.
4.18.2.9.3 Marine Invertebrates

Construction activities would impact corals by removing coral, filling coral reefs or by stirring up the seafloor, leading to increased turbidity that could reduce water quality. Impacts to corals would be expected to affect other invertebrates, and design considerations and adherence to best management practices to protect the corals are expected to protect other invertebrates as well.

4.18.2.9.4 Coral

Construction impacts would primarily result from removal of corals and other invertebrates. Red Beach has low topographic complexity, low coral cover, and high sand cover. The areas of the footprints for the dock and breakwater have moderate topographic complexity, low coral cover, and low sand cover. There is minimal coral cover in the dock footprint (ranging from 1-10%), but more coral cover and diversity in the breakwater footprint (ranging from 10-30%). The majority of the coral at Red Beach was observed at depths shallower than 12 feet (4 meters) at the headlands to the north and south of Red Beach, but not directly in front of the sandy beach. By contrast, the footprint areas have greater species richness than any of the other beaches surveyed in 2013 (DoN 2014b), and the corals occur at greater depth than along the actual beach. In the footprint areas, small coral colonies of all species present are abundant and large colonies are uncommon. Corals would be directly affected in locations where piles for the dock would be driven. One Endangered Species Act-listed coral species (Acropora globiceps) was observed at Red Beach (DoN 2014b). In the footprint of the breakwater, all corals within the footprint would be directly affected by the material placed for the base of the breakwater.

4.18.2.9.5 Fish

Construction activities may have temporary adverse effect on fish species. However, impacts would be short term and localized. Changes to the structure and complexity of the environment by the addition of a dock and breakwater could change the distribution of some fish species by aggregating individuals and increasing interaction among species.

4.18.2.9.6 Essential Fish Habitat

There is Essential Fish Habitat is the vicinity of the proposed dock and breakwater. Construction activities could impact Essential Fish Habitat by disturbing or altering the seafloor, water quality, or physical environment (e.g., underwater noise) at Red Beach, which is designated as Essential Fish Habitat.

Potential impacts to water quality characteristics of the marine environment during coastal and inland operational activities would be reduced but not avoided by implementing best management practices to control sedimentation, control stormwater runoff, eutrophication (i.e., enriched in dissolved nutrients), and fuel or chemical spills.

Construction would result in Essential Fish Habitat within the footprints of the proposed dock and breakwater at Red Beach being permanently unavailable. The location of the jetty would be permanently unavailable, but after completion, the area along the jetty and beneath the dock would add structural complexity to the environment and would be available for fish and invertebrates to use. The habitat types and ecosystem function within these areas would be chronically lost or degraded. Construction may adversely affect Essential Fish Habitat under the Magnuson-Stevens Fishery
Conservation and Management Act. An Essential Fish Habitat Assessment would be prepared as part of future environmental studies of these proposed projects.

4.18.2.9.7 Sea Turtles

Sea turtle densities at Pagan during the 2-week survey conducted in August 2013 survey appear relatively uniform, with density calculations ranging between 49 sea turtles per square mile (19 sea turtles per square kilometer) on the northwestern coast to 101.3 sea turtles per square mile (39.1 sea turtles per square kilometer) on the western coast (DoN 2014c). However, few turtles were observed near Red Beach during the 2013 survey, and no sea turtles have been observed nesting on the beaches of Pagan. In addition, sightings of sea turtles on the beaches of Pagan are rare, with only one green sea turtle observed resting on Red Beach (Kessler 2011).

Construction activities could potentially impact sea turtles. Sea turtle hearing is less sensitive to impacts than marine mammals, although in the shallow waters of near the dock and breakwater locations they would likely be much closer to the noise source. The highest intensity in-water noise would be due to impulsive noise associated with pile driving. If construction or operational vessel noise exceeds 180 decibels in the area of a turtle, and they are unable to leave the area, adverse impacts to sea turtles could occur. Proposed construction could adversely affect sea turtles that may be exposed to sound levels capable of causing behavioral changes during construction. This could occur through a series of behavioral modification in the form of mild alert and startle responses, avoidance of the construction area, and alteration of swimming and diving patterns. It is not likely that turtles would be injured or killed by the construction noise source. In addition, their exposure would likely have no measurable impact on their ability to forage, shelter, reproduce, or avoid predators and other threats. Construction and operation could cause localized turbidity. However, construction best management practices would likely keep suspended sediments immediately adjacent to the construction activity. It would be unlikely that sea turtles would approach close enough to the construction to be exposed to project-related elevated turbidity.

Pre-construction monitoring could occur to ensure there are no sea turtles resting on the beach or in their nests. The monitoring could include pre-construction surveys to delineate boundaries around nest sites as well as postponing construction activities when a nesting sea turtle is observed near the proposed dock location. Construction could cause temporary habitat loss for sea turtles since turtles may be temporarily displaced for the duration of construction activities at Red Beach.

Section 7 consultation with National Marine Fisheries Service and the U.S. Fish and Wildlife Service under the Endangered Species Act may be required.

See Section 4.18.2.8, Terrestrial Biology, for impacts to sea turtle nesting.

4.18.2.9.8 Marine Mammals

Construction of the dock and breakwater may impact marine mammals acoustically as well as via an increase for the potential of marine mammal-vessel interaction. Once the breakwater has been constructed, it is not anticipated to impact marine mammals, as it will become a permanent structure. Operation of the dock structure will increase the potential for marine mammal-vessel interactions as vessels enter the embayment associated with Red Beach; however, the increase in the potential for
marine mammal-vessel interaction is not anticipated to be significant, based on the low number of marine mammal sightings in the area.

Marine mammals have been both visually and acoustically detected in the CNMI (DoN 2007; Ligon et al. 2011; HDR 2012; Hill et al. 2012, 2013a, 2013b, 2014; Oleson 2013), as well as specifically off Pagan (DoN 2014d). The Marine Mammal Survey conducted in support of this EIS/OEIS identified five marine mammals in the nearshore waters of Pagan using both acoustic and visual methods. These included sperm whales, common bottlenose dolphins, spinner dolphins, Cuvier’s beaked whales, and Blainville’s beaked whales. All of these species are afforded protections under the Marine Mammal Protection Act and the sperm whale is also protected under provisions of the Endangered Species Act.

Under the Marine Mammal Protection Act, National Marine Fisheries Service has defined levels of harassment for marine mammals. The National Marine Fisheries Service uses generic sound exposure thresholds to determine when an activity in the ocean produces sound that might result in impacts to a marine mammal such that a take by harassment might occur (National Marine Fisheries Service 2005). Recent studies of pile driving used to construct offshore wind turbines have validated the distances over which underwater sound from pile driving may exceed National Marine Fisheries Service thresholds (Bailey et al. 2010), as well as behavioral responses of harbor porpoises (Phocoena phocoena) to intense sound from pile driving (Thompson et al. 2010; Brandt et al. 2011). Current National Marine Fisheries Service practice regarding exposure of marine mammals to high level sounds is that cetaceans and pinnipeds exposed to impulsive sounds of 180 and 190 decibel root mean squared or above, respectively, are considered to have been taken by Level A (injurious) harassment. Level A acoustic harassment under the Marine Mammal Protection Act constitutes harm under the Endangered Species Act, whereas Level B acoustic harassment under the Marine Mammal Protection Act is also harassment under the Endangered Species Act. Since pinniped species are not known to occur in the vicinity of the project, acoustic thresholds for cetacean species will be discussed in this section. Impact pile driving is considered an impulse (non-continuous) sound source, and vibratory pile driving is a continuous sound source, so the two types of hammers are treated differently for Level B take thresholds.

Pile driving and/or vibratory pile extraction would generate underwater noise that potentially could result in disturbance to marine mammals. Transmission loss underwater is the decrease in sound intensity due to sound spreading and chemistry and viscosity-based absorption as an acoustic pressure wave propagates out from a source. Parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography.

Pile driving during the construction period (for the new sheet pile bulkhead and mooring dolphins) would comprise the project’s greatest noise source of concern in the underwater environment. The frequency and intensity of the sound energy generated by pile driving is primarily a function of the type and size (diameter or length) of the piling or sheet pile, the driving mechanism (e.g., impact or vibratory hammer), and the type of substrate into which the pile is being driven. Several different types of piles would be used during construction, including steel sheet piles, and round mooring piles. In the absence of site-specific acoustic data, measured source levels from similar pile driving events were used to estimate pile driving source levels for this project (California Department of Transportation 2012). Because pinniped haul out locations have not been observed in the project area, airborne noise levels are not evaluated relative to National Marine Fisheries Service airborne threshold criteria.
Table 4.18-1 provides the density estimates for those species that may potentially occur in the Project Area. No seasonal variation in marine mammal density was noted for these species. While the spinner dolphin, bottlenose dolphin, Cuvier’s beaked whale, Blainville’s beaked whale and sperm whale are the only species that have been either visually or acoustically detected during surveys around Pagan (DoN 2014d), any of the species presented in Table 4.18-1 may occur within the zone of influence associated with pile driving. For example, Hill et al (2014) found that satellite tagged marine mammals routinely moved great distances between islands or island groups. While none of the satellite tagged animals were shown to occur off Pagan, this does not preclude them from potentially occurring within the 120-decibel zone of influence.

Table 4.18-1. Density Estimates for Species Potentially Occurring in the Project Area

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Density Estimate (animals/km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Family Delphinidae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottlenose dolphin</td>
<td><em>Tursiops truncatus</em></td>
<td>0.00131&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>False killer whale</td>
<td><em>Pseudorca crassidens</em></td>
<td>0.00111</td>
</tr>
<tr>
<td>Melon-headed whale</td>
<td><em>Peponocephala electra</em></td>
<td>0.00428</td>
</tr>
<tr>
<td>Pantropical spotted dolphin</td>
<td><em>Stenella attenuata</em></td>
<td>0.00226</td>
</tr>
<tr>
<td>Pygmy killer whale</td>
<td><em>Feresa attenuata</em></td>
<td>0.00014</td>
</tr>
<tr>
<td>Rough-toothed dolphin</td>
<td><em>Steno bredanensis</em></td>
<td>0.00355&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Short-finned pilot whale</td>
<td><em>Globicephala macrorhynchos</em></td>
<td>0.00362&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>Spinner dolphin</td>
<td><em>Stenella longirostris</em></td>
<td>0.00699&lt;sup&gt;1,2&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Family Ziphiidae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cuvier’s beaked whale</td>
<td><em>Ziphius cavirostris</em></td>
<td>0.00621</td>
</tr>
<tr>
<td><strong>Family Hyperoodontidae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blainville’s beaked whale</td>
<td><em>Mesoplodon densirostris</em></td>
<td>0.00117&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Family Kogiidae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwarf sperm whale</td>
<td><em>Kogia sima</em></td>
<td>0.00291&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Family Physeteridae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sperm whales</td>
<td><em>Physeter macrocephalus</em></td>
<td>0.00123</td>
</tr>
</tbody>
</table>

Notes: <sup>1</sup> Derived from density data from the Hawaii Range Complex.  
<sup>2</sup> Based on density estimates for waters in a main Hawaiian Islands stratum (Barlow 2006).  
Sources: Barlow 2006; Fulling et al. 2011; DoN 2014d; Hill et al. 2014.

Results of visual surveys in 2013 indicate that spinner dolphins and bottlenose dolphins would be present around Pagan during project construction and would hear pile driving noise (DoN 2014d). Based on the density estimates in Table 4.18-2, deeper-water species that could occur in the greatest concentration in the area covered by the 120-decibel threshold are the melon-headed whale, short-finned pilot whale, and the rough-toothed dolphin. Based on information provided in Hill et al (2014), these species were detected in waters greater than 1,400 feet (430 meters) deep where the effects of the pile driving noise would likely be mitigated by environmental variables (e.g., bathymetry variation, temperature and salinity fluctuations). However, these species may also be sighted in the nearshore environment at depths of as little as 853 feet (260 meters). Of the species most likely found in the nearshore environment, the bottlenose and spinner dolphins would be the most likely species to be impacted by noise during construction. Hill et al (2014) found that median depths for was 289 feet (88
meters) for the bottlenose dolphins and 155 feet (47 meters) for spinner dolphins. Regardless, because of their highly mobile nature, it is expected that individuals would avoid the area and the construction would not pose a substantial risk to individuals, populations or the species as a whole.

Construction of the breakwater to the north of the dock would have short-term impacts to marine mammals. Noise as a result of adding material to the breakwater for establishment and stabilization purposes is not anticipated to reach levels that would exceed regulatory thresholds. Construction-related vessels may also be in the area associated with the breakwater, but they are not anticipated to substantially increase the likelihood for marine mammal-vessel interactions. Sightings data in the vicinity of Red Beach, and known habitat characteristics, indicates that dolphin species would be the most likely species to be in the vicinity of the construction. However, based on their highly mobile nature, it is expected that individuals would avoid the area and the construction would not pose a substantial risk to individuals, populations or the species as a whole. Furthermore, impacts would be minimized through design considerations and adherence to best management practices.

Use of the dock structure by vessels is not anticipated to pose a substantial risk to marine mammals. However, if a strike were to occur, the collision could cause major wounds and may be fatal to marine mammals. In addition, sound from surface vessel traffic may cause behavioral responses of marine mammals. While an increase in the number of vessels in the area would increase the potential for marine mammal-vessel interactions, the potential for strike is not anticipated to pose a risk to the populations or the species as a whole. Individuals may change direction to avoid incoming/outgoing vessels, but this change in behavior is anticipated to be short-term and no long-term effects are anticipated.

Consultation with National Marine Fisheries Service under the Marine Mammal Protection Act may be required.

### 4.18.2.9.9 Special-status Species

The DoN recorded the presence of coral species proposed for listing under the Endangered Species Act on Pagan. None were identified at Red Beach (DoN 2014b). No Endangered Species Act-proposed coral species were identified at Red Beach.

### 4.18.2.10 Cultural Resources

Historic properties could include Pre-Contact latte complexes, pre-World War II Japanese Administration sites, and World War II-era Japanese defensive sites. Construction of the proposed dock and breakwater would include in-water construction and some onshore ground disturbance. However, no historic properties are identified in the project footprint. Visual setting effects to historic properties would be less than significant because the proposed dock and breakwater would not be visible to most historic properties. Also, the proposed dock and breakwater would not affect areas identified as potential traditional cultural properties. Therefore, the proposed dock and breakwater would not alter or affect archaeological sites recommended eligible for listing in the National Register of Historic Places. There would be no direct impacts to historic properties.

In addition, potential impacts could be minimized by developing an agreement document through the Section 106 process with the CNMI Historic Preservation Office and other consulting parties. The agreement document would include the measures that will be taken to avoid, minimize, and/or mitigate
the effects of the undertaking on historic properties. Such measures typically include data recovery excavations, documentation, public education, and additional investigations. See Appendix N, Cultural Resources Technical Memo for a discussion of the consultation process.

4.18.2.11 Visual Resources

Construction would be required at Red Beach, and would involve creation of a new dock extending out from shore and a breakwater farther offshore (see Figure 4.18-5). The construction would mostly involve in-water construction activities, associated vessel activities, and some onshore activities. Because of the overlap between the construction period and operation, visual impacts are presented in Operation Impacts.

Permanent changes to the visual environment at Red Beach would occur. The harbor improvements would change the visual landscape of the harbor. However, since Pagan is essentially uninhabited, no impact would occur.

4.18.2.12 Transportation

The proposed dock and breakwater would not affect the air transportation facilities of Pagan.

Currently there are no roads, transit networks, pedestrian, bicycle facilities and no significant vehicular traffic patterns occur on Pagan. Only all-terrain vehicle pathways exist on Pagan and their use is limited. Construction of the proposed dock and breakwater would require heavy equipment, including, but not limited to: road graders, vibratory compactors, dump trucks, and backhoes. Construction would not increase the potential for impacts to traffic circulation or Level of Service for vehicles, public transit, pedestrians, bicycles, increase the rate of traffic related accidents, or reduce transportation safety.

There is currently no functional dock or appreciable marine vessel traffic to Pagan. Therefore, the proposed dock and breakwater would have a beneficial impact to marine transportation. Operation of a usable dock would facilitate transport of cargo through a more efficient method than transferring cargo directly to beaches via amphibious vehicles or rubber riding craft.

4.18.2.13 Utilities

There is no current electrical power utility, potable water utility, wastewater infrastructure, or information technology/communications infrastructure on Pagan. The proposed dock and breakwater would have no effects to existing or proposed utilities infrastructure on Pagan.

No permanent wastewater infrastructure exists for Pagan. It is anticipated that wastewater generated due to construction and operation of the proposed dock and breakwater would be managed with field sanitation devices. Field sanitation devices would include toilets with collection bags or burn-out latrines and field urinals. With the potential use of burn-out latrines, the burning of human waste would create air quality impacts. It is anticipated that the ash produced by the burn-out latrines would be collected in containers and shipped to the U.S. military transfer station located on Tinian or another suitable location, such as Saipan. Construction workers would be housed in temporary facilities onshore or on a support vessel.
A small stormwater management system at Red Beach would be proposed as part of the proposed projects. Construction activities would require a Stormwater Pollution Prevention Plan and appropriate use of erosion control procedures to protect ecology and water resources.

The primary solid waste impact would consist of green waste generated during construction. Green waste would be managed on site through composting and mulching operations. All waste generated during construction that cannot be processed and reused on Pagan would be shipped to an acceptable off-island location for proper handling and disposal or reuse.

4.18.2.14 Socioeconomics and Environmental Justice

Construction of the proposed breakwater and dock would generate economic activity, which would be beneficial to the CNMI economy. Temporary construction worker housing would need to be built to support construction activities.

The dock and breakwater would improve access to Pagan Harbor. This would facilitate visitor engagement in cultural and recreational activities as well as potential economic activities (such as mining and ecotourism), leading to a beneficial impact.

4.18.2.15 Hazardous Materials and Waste

The proposed dock and breakwater would increase use of hazardous materials and generation of hazardous waste during construction, but it would not increase the volume of hazardous materials and waste to be managed during operations.

4.18.2.15.1 Hazardous Materials

Construction for the proposed dock and breakwater at Red Beach would cause a short-term increase in the volume of construction-related hazardous materials that would cease at the completion of construction activity. Best management practices and standard operating procedures described for Tinian (see Appendix D, Best Management Practices) would be followed to minimize or prevent accidental releases of hazardous materials during construction on Pagan. The use, transport, storage, and handling of hazardous materials would be in accordance with applicable federal and CNMI regulations and U.S. military requirements. Similar procedures would be implemented for operation of the proposed dock.

4.18.2.15.2 Toxic Substances

No demolition would take place to construct either the new dock or its associated breakwater, so it is unlikely that toxic-substance building materials would be encountered. In the event that asbestos-containing materials, lead-containing paint, or polychlorinated biphenyls are discovered, these materials would be managed by properly trained and licensed personnel to ensure that applicable hazardous waste testing, handling, and disposal procedures and requirements are followed. No toxic-substance building materials would be used in construction. Similar procedures would be implemented for operation of the proposed dock.
4.18.2.15.3 Hazardous Waste

Construction activities would result in a short-term increase in the generation of hazardous waste (e.g., pesticides, herbicides, solvents, adhesives, lubricants, corrosive liquids, batteries, and aerosols) that would end when construction is finished. The projected increase in hazardous waste would have the potential to result in adverse impacts to human health and the environment. All construction would be conducted in compliance with all applicable requirements concerning handling of hazardous waste. Best management practices and standard operating procedures (see Appendix D, Best Management Practices) would be followed to reduce the likelihood and volume of accidental releases, allow for accelerated spill response times, and allow for the timely implementation of cleanup measures. The generation, transport, storage, and handling of hazardous waste would be in accordance with applicable federal and CNMI regulations and U.S. military requirements. All hazardous waste would be containerized and shipped off the island to the appropriate disposal facility site. Transportation of all hazardous waste would be conducted in compliance with U.S. Department of Transportation regulations and CFR Title 49. Similar procedures would be implemented for operation of the proposed dock.

4.18.2.15.4 Contaminated Sites

If the proposed dock and breakwater cannot be constructed without avoiding contaminated sites, then appropriate best management practices would be followed (see Appendix D, Best Management Practices). To reduce potential hazards related to exposure to munitions and explosives of concern, appropriate U.S. military requirements and best management practices be followed and implemented (see Appendix D, Best Management Practices). Through the use of best management practices and the identification and removal of munitions and explosives of concern, impacts resulting from the disturbance and dispersion of contaminated soil and groundwater would be minimized.

4.18.2.16 Public Health and Safety

The CNMI Homeland Security and Emergency Management Office would be notified of construction activities on Pagan. Because there is no permanent resident population on Pagan, construction of the proposed dock and breakwater would result in no direct or indirect impacts to public health and safety. The proposed dock and breakwater could potentially benefit public health and safety by providing a safer method to move people and cargo than the smaller vessels. The public would continue to be restricted from the island during training for health and safety reasons.
4.19 **SECTION 4(F) EVALUATION**

### 4.19.1 Introduction

Section 4(f) of the Department of Transportation Act of 1966, codified in Federal law at 49 U.S. Code § 303, declares that "[i]t is the policy of the United States Government that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites."

Section 4(f) specifies that the Secretary [of Transportation] may approve a transportation program or project requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if

1. "there is no prudent and feasible alternative that would avoid using those resources, and
2. the program or project includes all possible planning to minimize harm resulting from the use."

(FAA 2007:7-1)

In general, a Section 4(f) "use" occurs with a Department of Transportation approved project or program when (1) the proposed project or a reasonable alternative would physically occupy a portion of or all of a Section 4(f) resource; (2) the proposed project permanently incorporates the resource for project purposes through acquisition or easement; (3) alteration of structures or facilities located on Section 4(f) properties is necessary, even though the action does not require buying the property; (4) there is a temporary occupancy of Section 4(f) land that is adverse in terms of the Section 4(f) preservation purposes; or (5) when Section 4(f) land is not incorporated into the transportation project, but the project’s proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired (constructive use) (Federal Aviation Administration 2007:7-5).

Section 4(f) is considered satisfied with respect to historic sites and parks, recreation areas, and wildlife and waterfowl refuges if the Secretary makes a de minimis impact finding. These requirements apply only to actual physical impacts, not constructive use.

(1) De minimis findings for historic sites. The Federal Aviation Administration may make this finding on behalf of the Secretary if:

(a) under Section 106 of the National Historic Preservation Act, it has determined the project will not adversely affect or not affect historic properties;

(b) the Section 106 finding has received written concurrences from the State Historic Preservation Officer or the Tribal Historic Preservation Officer (and the Advisory Council on Historic Preservation, if the Advisory Council on Historic Preservation is participating); and

(c) the Section 106 finding was developed in consultation with parties consulting in the Section 106 process.
(2) De minimis findings for parks, recreation areas, and wildlife or waterfowl refuges. The Federal Aviation Administration may make this finding on behalf of the Secretary if:

(a) it has determined, after public notice and opportunity for public review and comment, that the project will not adversely affect the activities, features, and attributes of the eligible Section 4(f) property; and

(b) the officials with jurisdiction over the Section 4(f) property have concurred with the Federal Aviation Administration’s determination (Federal Aviation Administration 2007:7-1).

If there is no physical use and no temporary occupancy, but there is the possibility of constructive use, the Department of Transportation, or in the case of this project, the Federal Aviation Administration determines if the potential impacts would substantially impair the 4(f) property. Substantial impairment occurs when the protected activities, features, or attributes of the Section 4(f) property are extensively diminished. Generally, this means that the value of the resource, in terms of its Section 4(f) purpose and significance, will be meaningfully reduced or lost.

This Section 4(f) evaluation discusses the Tinian International Airport improvements and use of historic properties, which are the only potential Section 4(f)-protected resources affected by the proposed action in the area where the Department of Transportation is the approval authority. In the case of the proposed alternative, the Federal Aviation Administration is serving as the approval authority.

Section 4(f) protects historic properties (historic or archaeological properties on or eligible for inclusion on the National Register of Historic Places) that warrant preservation in place. If historic properties are determined to warrant preservation in place, then an individual Section 4(f) evaluation is done to analyze whether there is a feasible or prudent alternative that avoids the Section 4(f) property or an alternative that causes the least overall harm to Section 4(f) properties. Historic properties subject to data recovery (excavations and/or documentation) to mitigate impacts due not warrant preservation in place and are not considered 4(f)-protected resources; therefore, Section 4(f) would not apply. The Department of Transportation agency must consult with the State Historic Preservation Officer to determine whether or not they warrant preservation in place.

Typical airport actions that may cause Section 4(f) impacts include airside/landside expansion (new or expanded terminal and hangar facilities, new or extended runways and taxiways, navigational aids); land acquisition for aviation-related use, new or relocated access roadways, remote parking facilities, and rental car lots; substantial amounts of construction or demolition activity; and a significant change in aircraft operations that results in new or changed flight tracks and accompanying noise impacts.

The Department of Transportation has no approval authority for 4(f) resources on Pagan. Therefore, this section only evaluates 4(f) resources on Tinian.

As consultation is in process and no definitive mitigations (data recovery or preservation) have been determined for impacts to historic properties, the following discussion will outline the main elements of a 4(f) evaluation in the event that consultation determines that these historic properties warrant preservation in place and are 4(f)-protected resources. If it is determined through consultation with the CNMI Historic Preservation Officer and other consulting parties that impacts to historic properties at the Tinian International Airport area will be mitigated through data recovery, then they will not be considered 4(f)-protected resources and no 4(f) evaluation will be needed. If it is determined through
consultation that preservation in place is appropriate, then a more detailed Section 4(f) evaluation will be completed prior to the publication of the Final EIS/OEIS.

Public Law 105-85, div A, title X § 1079, Nov 18 1977, 111 Stat. 1916, Treatment of Military Flight Operations, provides that “no military flight operation (including a military training flight), or designation of airspace for such an operation, may be treated as a transportation program or project for purposes of section 303(c) of 49 U.S. Code. Therefore, impacts related to noise resulting from an increase in military aircraft activity is not included in this evaluation.

4.19.2 Description of the Proposed Action

As described in Chapter 2, the proposed action is to establish a series of live-fire ranges, training courses, and maneuver areas within the CNMI to reduce existing joint service training deficiencies and meet the U.S. Pacific Command Service Components’ unfilled unit level and combined level training requirements in the Western Pacific. Under the proposed action, unit level training would occur on the island of Tinian and combined level training would occur on the island of Pagan. The proposed action includes construction and operations on an area north of the Tinian International Airport runways. The following discussion presents the need for the project and the project description.

4.19.2.1 Need for Project

The purpose of the proposed action is to reduce joint training deficiencies for military services in the Western Pacific (see Section 1.3). Existing U.S. military live-fire, unit and combined level training ranges, training areas, and support facilities are insufficient to support U.S. Pacific Command Service Components’ training requirements in the Western Pacific, specifically in the Mariana Islands. The proposed action is needed to enable U.S. Pacific Command forces to meet their U.S. Code Title 10 requirements to maintain, equip, and train combat and humanitarian forces in the Western Pacific. The proposed action assists in correcting these training deficiencies by establishing live-fire unit and combined level RTAs in the CNMI. Establishing unit and combined level RTAs in the CNMI would support ongoing operational requirements, changes to U.S. force structure, geographic repositioning of forces, and support U.S. training relationships with allied nations.

4.19.2.2 Description of Alternatives

Selection of the project location included careful planning and full consideration of the existing airport environment and project locations were determined early in the planning process. The proposed airport improvement construction projects on Tinian International Airport are included under all action alternatives for Tinian. In addition to Tinian Alternatives 1, 2, and 3, this evaluation analyzes the no-action alternative. For a more detailed description of the operational siting criteria and alternatives refer to Chapter 2.

4.19.2.2.1 No–Action Alternative

As described in Chapter 2, the no-action alternative would continue current training activities on Tinian, including those contained in other Department of Defense documents such as the Mariana Islands Range Complex EIS/OEIS (July 2010 Record of Decision), and would complete construction of four live-fire ranges on Tinian contained in the September 2010 Record of Decision in the Guam and CNMI
Military Relocation EIS/OEIS (DoN and Department of the Army 2010). Under the no-action alternative, no improvements would be made to the area north of the Tinian International Airport runways. Thus no approval by an agency of the U.S. is associated with the no-action alternative and Section 4(f) would not apply.

4.19.2.2 Tinian Airport Improvements (all Tinian Alternatives)

Each of the three Tinian action alternatives has common elements. These include: (1) Land Use Agreements; (2) Construction and Improvements, (3) Training Operations, (4) Operations and Management; (5) Transportation; (6) Munitions; (7) Danger Zones; (8) Amphibious Operations; (9) Airspace Requirements; and (10) Sea Space Requirements. Included within these common elements are construction and operations associated with improvements at the Tinian International Airport.

To accommodate the anticipated aircraft training tempo and equipment/cargo needs, taxiways, directly north and adjacent to the runway of Tinian International Airport, would be constructed. Airport improvements are depicted on Figure 2.4-4 and would include: (1) tactical aircraft parking ramp; (2) cargo aircraft parking ramp; (3) connecting taxiways; (4) ordnance arming and de-arming pads; (5) hot cargo (i.e., munitions) pad/combat aircraft loading area; (6) expeditionary/temporary refueling area; (7) arresting gear pads; (8) munitions holding pads; (9) and access roads connecting to the airfield Ground disturbance associated with construction of the airfield improvements would be approximately 228 acres (93 hectares) with approximately 41 acres (17 hectares) of that being newly created impervious surface.

Use of the Tinian International Airport and adjacent range and training areas allows for the integration of air and ground force training at the unit level. Use of the airport also supports military training throughout the Pacific. The proposed Airport Layout Plan would require approval from the Commonwealth Ports Authority and Federal Aviation Administration. The Commonwealth Ports Authority manages and operates the airports and seaports throughout the CNMI. The U.S. military has been working with the Commonwealth Ports Authority to develop an Airport Layout Plan for the proposed improvements at Tinian International Airport. The Airport Layout Plan shows the existing airport layout and planned future development. The Commonwealth Ports Authority, as the airport sponsor, maintains the Airport Layout Plan and is required to submit any proposed changes on the Airport Layout Plan to the Federal Aviation Administration for review and approval to confirm that the proposed changes meet Federal Aviation Administration airport standards and requirements. The proposed new military development at Tinian International Airport, which is the subject of this EIS/OEIS, is shown on the Airport Layout Plan in Appendix S.

4.19.3 Description of Section 4(f) Properties

Two Section 4(f) resources have been identified within the potential footprint for the proposed improvements to the Tinian International Airport. These include 1) a Japanese Third Farm District (IV) archaeological site (-5043) and 2) a World War II American military site (West Field). These resources are located on public lands under the jurisdiction and control of the Commonwealth Ports Authority. Under the proposed action, the Department of Defense would lease the area north of Tinian International Airport (460 acres [186 hectares]) and construct parking ramps, taxiways, and other facilities described
above. No public parks, wildlife refuges, or public recreation area is located within or adjacent to the airport property.

Consistent with federal law, certain types of information related to cultural resources are protected from general distribution. National Historic Preservation Act and Archaeological Resources Protection Act each contain confidentiality restrictions to prevent inappropriate general releases of locational data for archaeological sites. In keeping with these restrictions, this section does not contain detailed locational descriptions or figures showing the specific locations of archaeological sites.

4.19.3.1 Japanese Third Farm District (IV) (Site SC-5043)

Site SC-5043, the Japanese Third Farm District (IV), contains the remnants of a Japanese sugarcane farm. It is located on the west side of 8th Avenue at the northwest corner of Tinian International Airport. The site is located on lands within a portion of the Military Lease Area and within the Tinian International Airport boundaries.

Although SC-5043 has been modified by World War II and modern farming, the fields and some concrete structures remain. In addition, a Japanese railroad berm segment crosses the site; there is also a Pre-Contact component consisting of ceramic sherds on the surface (Athens 2009:232). The Japanese Third Farm District is divided into various sites based on divisions created by World War II modifications or other factors. The “Third Farm District” was populated with tenant farmers cultivating sugarcane in the 1930s. In 1939 the Third Farm District contained 255 families (Tuggle 2009:51,231). Site SC-5043 was recommended eligible for listing on the National Register of Historic Places under Criterion A for its association with pre-war Japanese agriculture and under Criterion D for its potential to provide information on Japanese agricultural practices and Pre-Contact settlement on Tinian.

4.19.3.2 West Field (Site TN-6-0030)

Site TN-6-0030 (West Field) was originally constructed as an airfield by the Japanese. In 1945, following the 1944 American capture of Tinian, West Field was expanded to provide a base, together with the North Field, for B-29 operations against Japan (see Section 3.11, Cultural Resources). The site is located on lands within a portion of the Military Lease Area and within the Tinian International Airport boundaries. West Field measures approximately 1870 acres (757 hectares).

The West Field airfield originally included 3 airstrips, 18 miles of taxiways, 4 service aprons, 361 hardstands, and more than 675 buildings. The 444th, 462nd, and 468th Bomb Groups, under the 58th Bomb Wing, utilized this airfield after its completion. All three bomb groups received Distinguished Unit Citations for their missions against Japan (Crowl 1960: 572).

In 1994, West Field, site TN-6-0030, included three runways and taxiways and coral gravel hardstands. Runway #3 was used for Tinian’s airport, and a new airport building, access road, parking lots, and aircraft parking apron were constructed at the southeast corner. The other two runways and the taxiways had not been maintained, as they were no longer in use. Concrete building foundations are still extant in the northwest corner of the Army Air Corps area and the southeast corner of the Naval Air Base area. Currently, the area north of the airport runways contains historic taxiways, hardstands, and concrete pads associated with West Field.
Features associated with West Field between the central taxiway and the Tinian International Airport were recorded during an archaeological survey of the West Tinian Airport Improvement Area (Dixon and Tuggle 2002:A-5). These features include two complexes (N-8 and N-10). Feature Complex N-8 consists of three concrete pads and coral foundations. Feature Complex N-10 consists of a paved taxiway, 22 hardstands (paved areas for parking and maintenance of B-29 bombers), a Flack Tower, and a coral fill quarry (Dixon and Welch 2002:A-5, A-6). The site was recommended eligible for listing in the National Register of Historic Places:

The site is associated with WWII and the bombing of Japan prior to the war’s end with General Curtis Lemay of the 21st Bomber Command and Brigadier General Ramey of the 58th Bomb Wing, is an excellent architectural example of a B-29 bomber base and has information pertinent to our understanding of WWII American military history (Dixon and Tuggle 2002:A-6).

4.19.4 Impacts on the Section 4(f) Properties by the Project

Potential impacts of the project are discussed below as they relate to the Section 4(f) use of Site SC-5043 (Japanese Third Farm District [IV]), Site TN-6-0030 (West Field) on Tinian.

4.19.4.1 Japanese Third Farm District (IV) (Site SC-5043)

Potential adverse impacts to site SC-5043 include ground disturbance due to the construction of a new paved road and gravel shoulder, and erection of fences along the perimeter of the airport. The road would be comprised of two 10.0-foot (3.0-meter) wide paved lanes (one lane in each direction) with 4.0-foot (1.2-meter) wide graded gravel shoulders on both sides. Associated construction activities would include clearing overgrown vegetation, resurfacing existing paved roads, and reconstructing/upgrading existing dirt/gravel roads to paved roads. The total site size is 55.4 acres (22.4 hectares). Approximately 1.2 acres (0.48 hectare) or 2.2% of the site would be disturbed by construction and would be direct taking and a permanent use of the site. Although a small portion of the overall site, the site is considered important for its contribution to World War II history and research potential. As discussed in Section 4.11, ground disturbance within the boundaries of a historic property would be a significant direct impact under NEPA. The area would be fenced and, although no longer accessible to the public, this minimal loss of access to 2% of the site area would not be a significant impact to the site.

4.19.4.2 West Field (Site TN-6-0030)

Potential adverse impacts to site TN-6-0030 include ground disturbance (grading, excavating, digging, clearing, leveling, trenching, and drilling) during construction of proposed support facilities, roads, utilities, and training facilities. Ground disturbance associated with construction of the airfield improvements would be approximately 228 acres (93 hectares) with approximately 41 acres (17 hectares) of that being newly created impervious surface, most occurring within the boundary of Site TN-6-0030. Construction would affect a total of 12% of the site and would be direct taking and a permanent use of the site. Although the construction of support facilities, roads, utilities, and training facilities is consistent with the current use of the site, the new construction would impact a substantial portion of the site that is considered important for its association with World War II and its research potential. As discussed in Section 4.11, ground disturbance within the boundaries of this historic
property would result in significant impacts to the airstrips, taxiways, service aprons, and hardstands and would be a significant direct impact under NEPA. As this area of the site is already not accessible to the public, there would be no loss of access from the proposed action.

### 4.19.5 Avoidance Alternatives

This section considers potential alternatives that were considered but eliminated from detailed analysis as they would not meet the purpose or need of the proposed action.

#### 4.19.5.1 No-Action Alternative

Under the no-action alternative the proposed action would not take place. Additionally, the proposed Tinian RTA, including support facilities on the north side of the Tinian International Airport, would not be constructed. The identified training deficit would persist, and the existing Western Pacific RTAs would remain insufficient to support U.S. Pacific Command Service Components’ Title 10 training requirements for the region. Therefore, it has been determined that the no-action alternative is not feasible and prudent.

#### 4.19.5.2 Alternative 1. Locate Outside of the CNMI

The 2012 Training Needs Assessment: An Assessment of Current Training Ranges and Supporting Facilities in the U.S. Pacific Command Area of Responsibility (DoN 2013b), examined the unmet training requirements of four areas that make up the majority of the Pacific region force structure: Hawaii, Japan, Korea, and the Mariana Islands. The Assessment concluded that the Mariana Islands region has significantly more unmet training requirements than the other areas (i.e., Hawaii, Japan, and Korea) (see Section 1.3.5, Training Needs Assessment). The 2013 CNMI Joint Military Training Requirements and Siting Study (DoN 2013a), concluded that within the Mariana Islands, Guam training opportunities are limited to the existing activities plus future individual skills training for the Marine forces and that there is no additional capacity to address the U.S. Pacific Command’s unmet training requirements. Therefore, land, sea, and airspace on and around Guam were excluded from further consideration as it does not meet the purpose and need, and would not provide adequate training facilities. As such it is not a feasible and prudent alternative.

#### 4.19.5.3 Alternative 2. Locate at Single Location within the CNMI

Both unit level and combined level training must be included in the proposed action to meet unfilled training requirements in the Mariana Islands. Combined level training brings several units (U.S. and allied nations) together working as a team towards a single objective. Combined level training also involves maneuvering and use of live-fire ranges and training areas; however, because of the greater number of troops and tasks, this training requires larger areas. Separate range complexes are required to support each type of training because of the nature of unit and combined training along with the frequency of this training. Neither Tinian nor Pagan alone can support both levels of training identified as unfilled training requirements. Therefore, use of only one island (Pagan) does not meet the purpose and need, and the fundamental purpose of locating at two separate sites would not be served by this avoidance alternative. As such it is not a feasible and prudent alternative.
4.19.5.4 Alternative 3. Locate Airport Improvements at North Field

While training and support facilities would be located on Tinian, the airport improvements would occur at North Field rather than adjacent to existing runways at the Tinian International Airport. Location at North Field would require more extensive construction of a new runway in addition to the proposed support facilities and would be a significant impact to a National Historic Landmark. It also would create constraints on proposed live-fire training activities in the northern portion of Tinian. As such it is not a feasible and prudent alternative.

4.19.5.5 Alternative 4. Alternative Options at Tinian International Airport

In addition to proposed airport improvements is the proposed base camp. The base camp needs to be situated away from proposed training areas. Given space constraints within the Military Lease Area, the southern boundary of the Military Lease Area creates the largest separation between the base camp and proposed training activities. Location of the base camp east or west of Tinian International Airport would place it within airport safety zones, so these options were not considered feasible. A central location north of the airport is necessary to avoid interfering with proposed military approach, departure, and closed loop patterns that would occur at the ends of the runway. Therefore, locations of the base camp toward the western or eastern ends of the runway is not a feasible and prudent alternative.

Reducing the disturbance footprint to avoid the potential 4(f) resources was also considered. As part of the planning process, ground disturbance was minimized to the degree possible. However, as the West Field site (Site TN-6-0030) is very large and encompasses the entire airport area, it is not possible to avoid disturbing this historic property.

4.19.6 Measures to Minimize or Mitigate Harm

To the degree possible, historic properties were avoided when planning initial construction and operations areas for the proposed action. These efforts included siting ranges and support facilities in proximity to each other and to existing roads to minimize impacts to historic resources in the area. A constraints analysis was conducted in April, 2013 that examined the locations of ranges and support facilities in relation to historic properties and final siting decisions were made at that time. However, as discussed above, there is no alternative, except the no-action alternative, that would avoid all impacts to 4(f) resources. Avoidance alternatives would either have an impact on historic properties or not meet the purpose and need of the proposed action. Measures, however, can be taken to mitigate harm to the identified 4(f) resources.

4.19.6.1 No-Action Alternative

No action would be taken under this alternative. There would be no impacts to Section 4(f) properties under this alternative. No measures to minimize harm are proposed for this alternative.
4.19.6.2 Tinian Airport Improvements (All Tinian Alternatives)

Consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, and other interested parties for the entire proposed action is ongoing with the intent to identify measures to mitigate the significant impacts to historic properties. These potential mitigation measures would be formalized in an agreement document between the Department of Defense and various stakeholders representing the interests of the local government and the public. They may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures. Once completed, the Programmatic Agreement would be signed by the State Historic Preservation Officer, the Advisory Council on Historic Preservation, the Department of Defense as well as consulting parties such as representatives of the CNMI agencies. Interested parties such as preservation groups, historical societies, and traditional groups have been invited to contribute to the process of developing these measures. A copy of the executed programmatic agreement will be included in the Final EIS/OEIS. Under the requirements of the Transportation Act, the Federal Aviation Administration would consult with the CNMI State Historic Preservation Officer and other parties to determine if the two historic properties, the Japanese Third Farm District (IV) (SC-5043) and West Field (TN-6-0030, warrant preservation and place and are considered 4(f) protected properties or if other forms of mitigation are sufficient. At that point, Section 4(f) analysis may be completed.

4.19.7 Coordination

Compliance with Section 106 of the National Historic Preservation Act and its implementing regulations is being achieved through coordination among the Department of Defense, the Federal Aviation Administration, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation.

Representatives of the Department of Defense have met with the CNMI officials, the Tinian Mayor’s office, and public interest groups at public meetings in 2013 and at other informal meetings in 2013 and 2014. Several individuals are also participating as consulting parties in the Section 106 consultation process.

4.19.8 Concluding Statement

If the historic properties are considered to be 4(f) protected resources, based on the above considerations, there is no feasible and prudent alternative to the use of land from Japanese Third farm District (IV) and West Field. However, the proposed action includes planning to minimize harm to the Japanese Third Farm District (IV) and West Field resulting from such use; however, no other alternative would meet the project’s stated purpose and need.
4.20 **SUMMARY OF IMPACTS AND POTENTIAL MITIGATIONS**

Section 4.20 summarizes the impacts and potential mitigation measures for the Tinian alternatives and the Pagan alternatives analyzed in this EIS/OEIS. Table 4.20-1 and Table 4.20-2 provides a summary of the impacts for both construction and operation activities for the Tinian and Pagan alternatives.

As described in Section 4.1, this EIS/OEIS applies resource management measures before making impact determinations. Briefly, resource management measures could include avoidance and minimization measures, best management practices, and standard operating procedures.

The *Resource Management Measures* section discusses applicable (1) avoidance and minimization measures and, (2) best management practices and standard operating procedures, and how they serve to lessen impacts to specific resources.

- **Avoidance and minimization measures** are not necessarily required by law, regulation, or policy, but are designed and implemented specifically for the proposed action to further reduce environmental impacts (i.e. avoiding areas of the limestone forest, not landing Amphibious Assault Vehicles on certain beaches, avoiding wetlands). Examples of avoidance and minimization include moving target locations, moving firing positions, adjusting engagement zones, limiting weapons deployment, adjusting High Hazard Impact Area boundaries, and adjusting use of tactical landing beaches.

- **Best management practices** include standard operating procedures and commonly accepted practices routinely implemented by the DoN in design, construction, and operations to provide for the safety of personnel and equipment, as well as aid with regulatory compliance. The EIS/OEIS impact analysis (Chapter 4) assumes that resource management measures are successfully incorporated into the proposed action. Best management practices and standard operating procedures are described in Appendix D, *Best Management Practices*.

For the purpose of this EIS/OEIS, mitigation measures are additional project-specific measures to actively minimize, rectify, reduce, or provide compensation for impacts identified through the NEPA environmental review process. Mitigation measures are implemented and monitored as practicable in addition to the resource management measures that are included as part of the proposed action. Examples of potential mitigation measures include habitat restoration to mitigate for habitat removed during construction, and removal of existing non-native invasive species. The U.S. military’s commitment to a mitigation measure is determined on a project-by-project basis and documented in the Record of Decision and regulatory agency consultation and permits. A single mitigation could potentially reduce significant impacts to less than significant, but it may take multiple mitigation measures to achieve that desired result. Table 4.20-3 provides a summary of potential mitigation measures for both construction and operation activities for the Tinian and Pagan alternatives.

Under the no-action alternative, there would be impacts to resources as discussed in each individual resource section. The no-action alternative impacts and mitigation are included in Table 4.20-1 and Table 4.20-2.
4.20.1 Summary of Impacts for Tinian Alternatives

Table 4.20-1 contains a summary of impacts for Tinian alternatives for all resource areas.

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Tinian (Alternative 1)</th>
<th>Tinian (Alternative 2)</th>
<th>Tinian (Alternative 3)</th>
<th>No-Action Alternative</th>
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<td>Operation</td>
<td>Construction</td>
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<td>(Lake Hagoi, Bateha isolated wetlands)</td>
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### Table 4.20-1. Summary of Impacts for Tinian Alternatives

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### Table 4.20-1. Summary of Impacts for Tinian Alternatives

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### Table 4.20-1. Summary of Impacts for Tinian Alternatives

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Table 4.20-1. Summary of Impacts for Tinian Alternatives

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<td>Marine Habitat/Essential Fish Habitat (Coral Reef)</td>
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Table 4.20-1. Summary of Impacts for Tinian Alternatives

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<tr>
<th>Resource Area</th>
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### Table 4.20-1. Summary of Impacts for Tinian Alternatives

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*NI = Not Impact, LSI = Low Significant Impact, BI = Below Impact*
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Notes: 1# indicates Key Observation Point (see Section 4.12, Figure 4.12-1).  
2A change in population is not considered an impact itself. However, population change has the potential to drive positive or negative impacts to other socioeconomic factors.  
Legend: BI = beneficial impact; LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts. Not Applicable indicates an element or category with no potential for impacts.
4.20.2 Summary of Impacts for Pagan Alternatives

Table 4.20-2 contains a summary of impacts for Pagan alternatives for all resource areas.

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### Table 4.20-2. Summary of Impacts for Pagan Alternatives

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Table 4.20-2. Summary of Impacts for Pagan Alternatives
### Table 4.20-2. Summary of Impacts for Pagan Alternatives

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Public Safety and Health

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</table>

**Notes:** A change in population is not considered an impact itself. However, population change has the potential to drive positive or negative impacts to other socioeconomic factors.

**Legend:** BI = beneficial impact; LSI = less than significant impact; NI = no impact; SI = significant impact. Shading is used to highlight the significant impacts. **Not Applicable** indicates an element or category with no potential for impacts.
### 4.20.3 Summary of Potential Mitigation Measures

**Table 4.20-3** contains a summary of potential mitigation measures for Tinian and Pagan construction and operation phases.

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<th>Potential Mitigation Measures</th>
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<td></td>
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<tr>
<td>Tinian</td>
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<tr>
<td>The increase in military air traffic would not restrict access to Tinian International Airport. Private flights could experience minimal delays in departures and arrivals during the time when military aircraft are practicing approaches to the Tinian International Airport runway. Restricted Area 7203 was segmented to minimize impacts to commuter flight traffic between Tinian and Saipan. Civilian aircraft can be routed around the restricted airspace while staying within the minimum safety glide slope except for periods when Restricted Area 7203A/B/C/X/Y/Z/E/W are activated together. Indirect effects such as increased fuel consumption and time en route could be experienced. No impacts would be expected with activation of the Tinian Military Operations Area.</td>
<td></td>
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</table>
 *SI mitigated to LSI* | • Establish a Letter of Procedure or Joint Use Agreement to accommodate civilian arrivals and departures into the airport.  
 • Establish communication procedures between Tinian Range Control and Saipan International Airport Air Traffic Control to ensure priority access to Tinian International Airport for life-flight and other emergency-related activities.  
 • Add positive control measures (e.g., air traffic control tower at Tinian, short-range radar on Tinian or Saipan that would allow air traffic controllers to see aircraft operating below 2,000 feet [609 meters], and communications capability at Saipan or Tinian to ensure non-participating aircraft are advised of military operations.  
 • Establish communication procedures to provide immediate feedback between air traffic controllers and range control to accommodate smaller inter-island commuter aircraft travelling between Saipan and Tinian. |
| Saipan | | |
| Air and ground activities would have the potential to significantly impact current airspace procedures during the 140 days per year that the Restricted Areas 7203A/B/C and W are scheduled and activated for use. |  
 *SI mitigated to LSI* | • Establish a Letter of Procedure between the Federal Aviation Administration and the U.S. military that contains the procedures for access to the airspace and gives priority to large commercial aircraft. The agreement would ensure proper range scheduling. |
### Table 4.20-3. Summary of Potential Mitigation Measures

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Category</th>
<th>Potential Mitigation Measures</th>
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</thead>
<tbody>
<tr>
<td>Restricted areas would not be activated during times with scheduled Saipan International Airport commercial large passenger jet and jetliner activity. Existing procedures used to manage aircraft operations at Tinian North Field and deconflict military and civilian aircraft would be expected to continue.</td>
<td></td>
<td>procedures are in place to ensure no significant disruption of normal flights into and out of Saipan International Airport.</td>
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<td>- Electronically monitor each training event through the use of radar and other surveillance equipment such as an expeditionary control tower that would continually monitor the airspace to ensure the safety of the flying public during times when training is occurring.</td>
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<td>- Schedule and coordinate training events with Saipan International Airport arrivals and departures as to not conflict.</td>
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<td>- Establish procedures and communications that allow for air traffic controllers and range controllers to simultaneously see the airspace and ensure priority is given to any aircraft heading to or from Saipan International Airport. In the event of an unforeseen incursion into an active restricted airspace, the simultaneous ability to monitor activities on the ground and in the air should provide the ability to stop any training in seconds.</td>
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**LAND AND SUBMERGED LAND USE**

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<tr>
<th>Land Use</th>
<th>Potential Mitigation Measures</th>
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<tbody>
<tr>
<td><strong>Land Use Within the Military Lease Area – Existing and Planned Land Use</strong></td>
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<tr>
<td>There would be land use incompatibilities associated with the Tinian Military Retention Land for Wildlife Conservation and the agricultural and cattle grazing activities in the Lease Back Area.</td>
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<tr>
<th>Tinian Phase</th>
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<td>Construction</td>
<td>Operation</td>
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<td>Construction</td>
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SI mitigated to LSI
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<td></td>
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<td>Service on these potential conservation areas.</td>
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<td></td>
<td></td>
<td>• The DoN has identified and proposed a total of 2,554 acres (1,034 hectares) of land for grazing areas within the Military Lease Area. Of this total 1,010 acres (409 hectares) would be unencumbered and 1,544 acres (625 hectares) would be encumbered by surface danger zones.</td>
</tr>
<tr>
<td>RECREATION</td>
<td></td>
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<tr>
<td>Historic and Cultural Attractions</td>
<td>SI</td>
<td>• In as much as possible, training would be scheduled around peak tourist holidays, such as the three tour seasons that correspond to specific World War II anniversaries.</td>
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<tr>
<td></td>
<td></td>
<td>• There is no mitigation currently proposed to minimize this impact to the Shinto Shrine and Hinode American Memorial. The DoN is consulting with the CNMI Historic Preservation Officer and other interested parties regarding impacts to the Shinto Shrine and Hinode American Memorial as part of the Section 106 process (see Appendix N, Cultural Resources Technical Memo for a discussion of the consultation process). Potential mitigation will be determined through this consultation process and could include documentation and relocation of the Shinto Shrine and Hinode American Memorial.</td>
</tr>
<tr>
<td>Annual Events</td>
<td>SI</td>
<td>• In as much as possible, the DoN would coordinate with event sponsors to ensure that training events do not occur during annual events.</td>
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<td>mitigated to LSI</td>
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### Table 4.20-3. Summary of Potential Mitigation Measures

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<tr>
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<tbody>
<tr>
<td><strong>TERRESTRIAL BIOLOGY</strong></td>
<td>SI</td>
<td>• Department of Defense may implement forest enhancement on 6.3 acres (2.5 hectares) to replace the area of native limestone forest removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native limestone forest habitats.</td>
</tr>
<tr>
<td>Vegetation Communities</td>
<td></td>
<td>• To avoid and minimize impacts to native limestone forest on Tinian, the Department of Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as &quot;No Wildlife Disturbance Areas,&quot; with the following actions prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.</td>
</tr>
<tr>
<td>Alternatives 1, 2, and 3: The conversion of 6.3 acres (2.5 hectares) of native limestone forest on Tinian to developed land would be unavoidable.</td>
<td></td>
<td>• Department of Defense may implement forest enhancement in areas of tangantangan or herbaceous scrub habitat to replace the forested habitats removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native limestone forest habitats.</td>
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### Table 4.20-3. Summary of Potential Mitigation Measures

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<td></td>
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<td>native species that are characteristic of native forest habitats.</td>
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<td>X</td>
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<tr>
<td>Native Wildlife</td>
<td></td>
<td>• Alternative 1: The removal of 1,745 acres (706 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the Tinian monarch, and other native wildlife species would be unavoidable.</td>
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<td></td>
<td></td>
<td>• Alternative 2: The removal of 1,883 acres (762 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the Tinian monarch, and other native wildlife species would be unavoidable.</td>
<td></td>
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<td></td>
<td>SI</td>
<td>• Alternative 3: The removal of 1,862 acres (754 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the Tinian monarch, and other native wildlife species would be unavoidable.</td>
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<td>• Department of Defense may implement forest enhancement in areas of mixed introduced forest, tangantangan, or herbaceous scrub habitat to replace the forest habitat removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native forest habitats.</td>
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<td></td>
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<td>• Department of Defense may replace the current Tinian Military Retention Land for Wildlife Conservation by establishing a conservation area(s) for the protection of the Tinian monarch and other wildlife species with one or more conservation sites within the Military Lease Area. Forest enhancement and invasive species control may also be implemented within the replacement Wildlife Conservation site(s).</td>
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<td></td>
<td></td>
<td>• To improve habitat quality for native wildlife on Tinian, the Department of Defense may implement monitoring and control of non-native invasive species within forest habitat, including control of invasive plant, mammal, and insect species.</td>
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<td></td>
<td></td>
<td>• To avoid and minimize impacts to native wildlife species that use native limestone forest on Tinian, the Department of Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as &quot;No Wildlife Disturbance Areas,&quot; with the following actions prohibited: off-road vehicle travel;</td>
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<td>Impacts</td>
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<tr>
<td>Noise impacts to foraging Mariana common moorhens at the Mahalang sites from large-caliber munitions on the High Hazard Impact Area would be unavoidable.</td>
<td>SI</td>
<td>- To avoid impacts to Mariana common moorhens at the Lake Hagoi and two Bateha wetland sites, the Department of Defense will designate the three wetland sites as &quot;No Training Areas.&quot; Ground disturbance and vegetation removal of any kind will be prohibited within these &quot;No Training Areas.&quot; In addition, CJMT-associated aircraft overflights of these sites will be limited to a minimum altitude of 500 feet (152 meters) above ground level. Wetland &quot;No Training Area&quot; restrictions would be implemented upon initiation of CJMT training activities on Tinian.</td>
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<td>- To mitigate for loss of Mariana common moorhen foraging habitat at Mahalang, the Department of Defense may implement portions of the DoN Tinian Wetlands Management Plan at Hagoi and two Bateha sites. This may include invasive plant surveys, monitoring, and control; habitat restoration and improvement; baseline surveys for moorhen predators; and predator control at Hagoi and Bateha.</td>
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<td>- To avoid and minimize impacts to special-status species</td>
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Table 4.20-3. Summary of Potential Mitigation Measures

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<td></td>
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<td>that use native limestone forest on Tinian, the Department of Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as &quot;No Wildlife Disturbance Areas,&quot; with the following actions prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.</td>
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- To avoid and minimize impacts to nesting sea turtles, the Department of Defense will implement training protocols at all beaches used for amphibious operations on Tinian. Biologists trained in identifying sea turtle nests will survey landing beaches no more than 6 hours prior to the first craft landing or use of other beach landing equipment. Any potential sea turtle nests will be flagged, with a buffer zone of 20 feet (6 meters) from the edge of the nesting activity (area disturbed by the turtle) to ensure complete avoidance. The flagged area will be avoided by landing craft and personnel. Beach training activities will also be coordinated with monthly sea turtle nest monitoring, during which any potential turtle nests will be flagged, with a buffer zone of 20 feet...
Table 4.20-3. Summary of Potential Mitigation Measures

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<tr>
<td>(6 meters) to ensure avoidance. If an active nest with a pre-hatch hole is discovered on a beach during monitoring, night training over the next 5 nights will be conducted only on other beaches. If beach sand is compacted by landing craft, the beach topography will be restored within 3 days using non-mechanized methods (e.g., rakes or other hand tools). The Department of Defense will implement beach training protocols upon initiation of CJMT amphibious training activities.</td>
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**Special-status Species: Migratory Bird Treaty Act-listed Species**

- **Alternative 1:** The removal of 1,745 acres (706 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the collared kingfisher, Mariana fruit dove, and white-throated ground-dove, would be unavoidable.

- **Alternative 2:** The removal of 1,883 acres (762 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the collared kingfisher, Mariana fruit dove, and white-throated ground-dove, would be unavoidable.

- **Alternative 3:** The removal of 1,862 acres (754 hectares) of forested and herbaceous scrub habitats (including Tinian Military Retention Land for Wildlife Conservation) used by native landbirds, including the collared kingfisher, Mariana fruit dove, and white-throated ground-dove, would be unavoidable.

- Department of Defense may implement forest enhancement in areas of tangantangan or herbaceous scrub habitat to replace the mixed introduced forest and herbaceous scrub removed during construction. Forest enhancement would include removal of non-native vegetation and establishment of native species that are characteristic of native forest habitats.

- Department of Defense may establish a conservation area for the protection of the Tinian monarch and other wildlife species with one or more conservation sites within the Military Lease Area. Forest enhancement and invasive species control may also be implemented within the wildlife conservation site(s).

- To avoid and minimize impacts to Migratory Bird Treaty Act-listed species that use native limestone forest on Tinian, the Department of Defense will implement training restrictions within native limestone forest. All limestone forest habitat within the Military Lease Area will be designated as "No Wildlife Disturbance Areas," X
Table 4.20-3. Summary of Potential Mitigation Measures

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<td>with the following actions prohibited: off-road vehicle travel; vehicle parking except on existing roads or trails; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; and aircraft landings. Any maneuvers conducted in native limestone forest will be on foot (no off-road vehicle maneuvers), and units will be tactical, with no support camps. Limestone forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on Tinian.</td>
<td></td>
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<tr>
<td>• To improve habitat quality for native wildlife on Tinian, Department of Defense may implement monitoring and control of non-native species within forest habitat, including control of invasive plant, mammal, and insect species.</td>
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<tr>
<td>• To avoid and minimize impacts to Mariana fruit bats and sea turtles, hooded lights will be used to the maximum extent practicable at all new roads and facilities within sea turtle nesting habitat and fruit bat foraging and roosting habitat. “Night-adapted” lights will be installed in the briefing and bleacher areas. Illumination of forests, coastlines, and beaches will be kept to an absolute minimum. Lighting will be designed to meet minimum safety, anti-terrorism, and force protection requirements.</td>
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<tr>
<td>• To avoid impacts to Migratory Bird Treaty Act-listed species that use the Lake Hagoi and two Bateha wetland sites, the Department of Defense will designate the three wetland sites as &quot;No Training Areas.&quot; Ground</td>
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Tinian Phase | Pagan Phase

Construction | Operation | Construction | Operation
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<th>Pagan Phase</th>
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<td>disturbance and vegetation removal of any kind will be prohibited within these “No Training Areas.” In addition, CJMT-associated aircraft overflights of these sites will be limited to a minimum altitude of 500 feet (152 meters) above ground level. Wetland “No Training Area” restrictions would be implemented upon initiation of CJMT training activities on Tinian.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Pagan Vegetation Communities</strong>&lt;br&gt;Loss of 20 acres (8 hectares) of native forest habitat would result in an unavoidable impact.</td>
<td>SI</td>
<td>• To minimize the effects of construction on native vegetation communities on Pagan, Department of Defense may facilitate native habitat regeneration on Pagan by implementing feral ungulate removal. This would consist of active control (i.e. trapping, snaring, shooting) of animals, with the goal of eradicating all feral ungulates from southern Pagan.</td>
<td>X</td>
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<tr>
<td><strong>Pagan Special-status Species, Endangered Species Act-listed and Proposed Species and CNMI-listed Species</strong>&lt;br&gt;Large-caliber weapons firing would result in direct impacts to Mariana fruit bats associated with the northeastern colony and on the isthmus colony. Impacts would be unavoidable.</td>
<td>SI</td>
<td>• To minimize the effects of operations on Mariana fruit bats on Pagan, Department of Defense would facilitate native habitat regeneration on southern Pagan by implementing feral goat and pig removal. This would consist of active control (i.e. trapping, snaring, shooting) of animals, with the goal of eradicating all feral ungulates from southern Pagan. &lt;br&gt;• To improve habitat quality for Mariana fruit bats on Pagan, Department of Defense may implement monitoring and control of non-native invasive species within forest habitat, including control of invasive plant, mammal, and insect species. &lt;br&gt;• To avoid and minimize impacts to the Mariana fruit bat, Micronesian megapode, and tree snails, the Department of Defense will implement training restrictions within</td>
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### Table 4.20-3. Summary of Potential Mitigation Measures

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<td>native forest on southern Pagan. All native forest habitat on southern Pagan will be designated as “No Wildlife Disturbance Areas,” with the following actions prohibited: vehicle maneuvers; firing of live or inert munitions; mechanical vegetation clearing; digging or excavation without prior approval; open fires; flights below 500 feet (152 meters) above ground level, with the exception of personnel insertion/extraction via helicopter; and aircraft landings. Any maneuvers conducted in native forest will be on foot. In addition to restricting aircraft flights to a minimum of 500 feet (152 meters) above ground level in southern Pagan, a 0.5-mile (0.8-kilometer) lateral buffer zone will be established for the two fruit bat colonies in southern Pagan. In addition to avoiding and minimizing noise disturbance to fruit bat colonies, the proposed 0.5-mile (0.8-kilometer) buffer zone around each colony will significantly reduce the potential for aircraft strikes of fruit bats. Native forest “No Wildlife Disturbance Area” restrictions will be implemented upon initiation of CJMT training activities on southern Pagan.</td>
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<td><strong>Tinian Phase</strong></td>
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<tr>
<td>Construction</td>
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<td>DoD may consider transplantation of coral species.</td>
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<tr>
<td>Operation</td>
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<td>DoD may consider debris removal and disposal as a one-time effort to collect large quantities of debris from a area such as Dankulo Beach on Tinian.</td>
</tr>
<tr>
<td>Construction</td>
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<td>DoD may consider recreational mooring Buoys and/or Fish Aggregation Devices to avoid impacts to coral by dropping anchors and to reduce the potential effects on access to fishing areas.</td>
</tr>
<tr>
<td>Operation</td>
<td></td>
<td>Implementation of Marine Species Awareness Training for all lookouts and other key personnel.</td>
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<tr>
<td>Construction</td>
<td></td>
<td>Additional measures may be recommended during agency consultations.</td>
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<td><strong>Pagan Phase</strong></td>
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| **Marine Biology**                           | SI       |                                                                                             |
| Marine Habitat and Essential Fish Habitat    |          |                                                                                             |
| Construction of underwater landing areas for Amphibious Assault Vehicles at Unai Chulu would result in the loss of 20.6 acres (8.3 hectares) of marine habitat within these areas impacted by direct and indirect physical disturbance stressors at Unai Chulu. |
| Construction would cause short- and long-term impacts to ecological function, including abundance/distribution of marine organisms. |
| Construction would result in loss/alteration of hard-bottom habitat and bathymetry. |
| **Marine Invertebrates**                     | SI       | See above, Potential Mitigation Projects to Offset Impacts to Coral.                         |
| A total area of 20.6 acres (8.3 hectares) of marine habitat that includes coral reef substrate (coral colonies and coral reef habitat) and supports populations of non-coral invertebrates would be directly and indirectly impacted by the construction of the Amphibious Assault Vehicle landing area at Unai Chulu. Adjacent corals outside the Amphibious Assault Vehicles landing areas may be indirectly impacted from the construction activities due to movement of coral rubble, and from the movement of mobile species out of the construction area. Construction would cause direct loss of coral reef substrate: 10.3 acres (4.1 hectares). |
| Amphibious training activities at Unai Babui would directly impact 3.05 acres (1.2 hectares), 3.83 acres (1.55 hectares) would be directly impacted at Unai Lam Lam, and 4.50 acres would be directly impacted at Unai Babui. |
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<th>Impacts</th>
<th>Category</th>
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<td>(1.82 hectares) of marine habitat, including corals and coral reef habitat, would be directly impacted at Unai Masalok.</td>
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<tr>
<td><strong>Special-status Species - Coral</strong></td>
<td>SI</td>
<td>• See above, Potential Mitigation Projects to Offset Impacts to Coral.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Construction of the Amphibious Assault Vehicle landing area would cause a loss of 1,344 <em>Acropora globiceps</em> coral colonies at Unai Chulu.</td>
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<tr>
<td>• At Unai Chulu, an estimate of 995 colonies of <em>Acropora globiceps</em> would be likely to be directly affected by training activities. At Unai Babui, an estimate of 381 colonies of <em>Acropora globiceps</em> would be likely to be directly affected by amphibious landings; at Unai Lam Lam, an estimate of 550 colonies of <em>Acropora globiceps</em> would likely be directly affected by amphibious landings; and at Unai Masalok, an estimate of 22 colonies of <em>Acropora globiceps</em> would likely be directly affected by amphibious landings.</td>
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<tr>
<td><strong>Special-status Species - Coral</strong></td>
<td>SI</td>
<td>• DoD may consider transplantation of coral species. • DoD may consider debris removal and disposal as a one-time effort to collect large quantities of debris from an area such as Gold Beach. • DoD may consider recreational mooring Buoy and/or Fish Aggregation Devices to avoid impacts to coral by dropping anchors and to reduce the potential effects on access to fishing areas. • Implementation of Marine Species Awareness Training for all lookouts and other key personnel. • Additional measures may be recommended during agency consultations.</td>
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<tr>
<td>Amphibious training activities would cause a loss of 1 <em>Acropora globiceps</em> coral colony at Green Beach and an estimated 10,609 colonies at South Beach.</td>
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<td>Cultural Resources</td>
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| All Tinian alternatives would have a significant direct impact on historic properties in the Military Lease Area, immediately north of Tinian International Airport runways, and at the Port of Tinian.  
  - Tinian Alternative 1 would have a significant direct impact to 172 historic properties from construction and to 15 historic properties from operations, as well as significant indirect impacts to 4 historic properties. These historic properties include the North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; World War II-era Japanese and American military sites; and potential traditional cultural properties.  
  - Tinian Alternative 2 would have a significant direct impact to 182 historic properties from construction and to 15 historic properties from operations, as well as significant indirect impacts to 4 historic properties. These historic properties include. North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; World War II-era Japanese and American military sites; and potential traditional cultural properties.  
  - Tinian Alternative 3 would have a significant direct impact to 179 historic properties from construction and to 15 historic properties from operation, as well as significant indirect impacts to 4 historic properties. These historic properties include the North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; World War II-era |  | |

Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.
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<td>Japanese and American military sites; and potential traditional cultural properties.</td>
<td></td>
<td>Measures to mitigate significant impacts to historic properties will be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>All Pagan alternatives would have a significant direct impact to historic properties.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pagan Alternative 1 would have a significant direct impact to 27 historic properties and resources of cultural importance in the range complexes and expeditionary area due to vegetation clearance, as well as 54 historic properties due to operations. These historic properties include Pre-Contact latte complexes, pre-World War II Japanese Administration sites, and World War II-era Japanese defensive sites.</td>
<td>SI mitigated to LSI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pagan Alternative 2 would have a significant direct impact to 25 historic properties and resources of cultural importance in the range complexes and expeditionary area due to construction, as well as 50 historic properties due to operations. These historic properties include Pre-Contact latte complexes, pre-World War II Japanese Administration sites, and World War II-era Japanese defensive sites.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend:** LSI = less than significant impact; SI = significant impact. Shading is used to highlight the significant impacts.

**Note:** Mitigation measures only change the significance of impacts where noted.
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CHAPTER 5
CUMULATIVE IMPACTS

TABLE OF CONTENTS
CHAPTER 5 CUMULATIVE IMPACTS .............................................................................................. I
ACRONYMS AND ABBREVIATIONS.................................................................................................. II
5.1 METHODOLOGY ................................................................................................................5-1
5.2 PRESENT AND REASONABLY FORESEEABLE ACTIONS ....................................................... 5-3
5.3 CUMULATIVE IMPACTS ANALYSIS .................................................................................... 5-13
5.4 NEED FOR MITIGATION........................................................................................................ 5-86

List of Figures
5.2-1 Tinian and Pagan Present and Reasonably Foreseeable Actions........................................ 5-12

List of Tables
5.2-1 Mariana Islands Training and Testing EIS/OEIS Proposed Training Activities that Could Occur on Tinian ........................................................................................................ 5-5
5.2-2 Warning Area 13 Proposed Use and Characteristics.............................................................. 5-6
5.2-3 CNMI: Present and Reasonably Foreseeable Actions ............................................................ 5-7
5.2-4 Tinian: Present and Reasonably Foreseeable Actions........................................................... 5-8
5.2-5 Pagan: Present and Reasonably Foreseeable Actions ............................................................ 5-11
5.3-1 Tinian: Potential for Cumulative Impact .............................................................................. 5-15
5.3-2 Pagan: Potential for Cumulative Impact .............................................................................. 5-16
5.3-3 Existing CNMI Airspace Available for U.S. Military Training................................................ 5-31
### Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>percent</td>
<td>EA</td>
<td>Environmental Assessment</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>CIP</td>
<td>Capital Improvements Projects Program Office</td>
<td>MSL</td>
<td>mean sea level</td>
</tr>
<tr>
<td>CJMT</td>
<td>Commonwealth of the Northern Mariana Islands Joint Military Training</td>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>CNMI</td>
<td>Commonwealth of the Northern Mariana Islands</td>
<td>OEA</td>
<td>Overseas Environmental Assessment</td>
</tr>
<tr>
<td>Divert</td>
<td>Divert Activities and Exercises</td>
<td>OEIS</td>
<td>Overseas Environmental Impact Statement</td>
</tr>
<tr>
<td>DoN</td>
<td>Department of the Navy</td>
<td>R</td>
<td>Restricted Area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTA</td>
<td>Range and Training Area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U.S.</td>
<td>United States</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W</td>
<td>Warning Area</td>
</tr>
</tbody>
</table>
CHAPTER 5 CUMULATIVE IMPACTS

Chapter 5 identifies present and reasonably foreseeable projects, programs, actions, and activities ("present and reasonably foreseeable actions") and provides an analysis of the cumulative impacts of these actions combined with the proposed action. This chapter presents the following: (1) the methodology used to conduct the cumulative impact analysis; (2) study area and current health of resources; (3) present and reasonably foreseeable actions; (4) potential long-term impact of present and reasonably foreseeable actions; (5) direct and indirect impacts of the proposed action and cumulative impact analysis; and (6) assessment of the need for mitigation.

5.1 METHODOLOGY

The Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] § 1508.7) define cumulative effects as follows: “the impact [to] the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions...Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”

This Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) uses methodology as suggested in Guidance for Preparers of Cumulative Impact Analysis (California Department of Transportation 2005). Using methodology from this document as the approach to cumulative impact analysis was recommended by the United States (U.S.) Environmental Protection Agency in their scoping comments on the proposed Commonwealth of the Northern Mariana Islands (CNMI) Joint Military Training (CJMT) Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS). The following is a list of eight steps from this methodology used to perform the cumulative effects analysis:

1. Identify resources to consider in the cumulative effect analysis (see Section 5.1.1, Resources Considered in the Cumulative Impact Analysis).
2. Define the study area for each resource (Section 5.3, Cumulative Impacts Analysis).
3. Describe the current health and historical context for each resource (see Section 5.1.2, Study Area and Health of Resources Considered, and Section 5.3, Cumulative Impacts Analysis).
4. Describe direct and indirect impacts of the proposed project that might contribute to a cumulative effect (see Section 5.3, Cumulative Impacts Analysis).
5. Identify other reasonably foreseeable future actions that affect each resource (see Section 5.2, Present and Reasonably Foreseeable Actions).
6. Assess potential cumulative effects (see Section 5.3, Cumulative Impacts Analysis).
7. Report the results (see Section 5.3, Cumulative Impacts Analysis).
8. Assess the need for mitigation (see Section 5.4, Need for Mitigation).
5.1.1 Resources Considered in the Cumulative Impact Analysis

All resources analyzed in Chapter 4, Environmental Consequences, of this EIS/OEIS were considered in the cumulative impact analysis for the proposed action on Tinian and Pagan. These resources are as follows: geology and soils, water resources, air quality, noise, airspace, land and submerged land use, recreation, terrestrial biology, marine biology, cultural resources, visual resources, transportation, utilities, socioeconomics and environmental justice, hazardous materials and waste, and public health and safety.

5.1.2 Study Area and Health of Resources Considered

The study area and health of resources considered is described in the respective subsections of Section 5.3, Cumulative Impacts Analysis. The study area for each resource-specific cumulative impact analysis is typically Tinian, Pagan, and surrounding areas. “Resource health” refers to the overall condition, stability, or vitality of a resource and is influenced by both human activities and natural historical events, as described in the Guidance for Preparers of Cumulative Impact Analysis. “Resource health” is a broad picture of the vulnerability of the resource to new stressors and, as such, helps provide a basis for assessing cumulative impacts. For instance, a vulnerable resource that is declining in health could be greatly impacted by a new stressor while a healthy, stable, resource may not be impacted at all.

Resources that are on the threshold of being depleted are more vulnerable; however, if there are new policies or regulations that guard against future degradation, then the future trend of that resource’s health could be described as stable or potentially improving in the future. Ideally, there would be a quantitative analysis of each resource to demonstrate its vulnerability; however, most resources do not have regulatory thresholds or sufficient quantitative historical data and, as such, this analysis of resource health is qualitative.

5.1.3 Conceptual Approach to Assessing Cumulative Impacts Related to Present and Reasonably Foreseeable Actions

The long-term impacts of past actions are captured in the current baseline described for each resource in Chapter 3, Affected Environment. The historical context and current baselines are used as the basis for assessing cumulative impacts.

Potential cumulative impacts could occur when a) both the proposed action and present and reasonably foreseeable actions are anticipated to have a long-term impact to various resources, and b) the impact of the proposed action could be additive to the impacts of the present and reasonably foreseeable actions. The potential for cumulative impacts also takes into account present and historical context and health of the resource, the severity of the proposed action and present and reasonably foreseeable actions, and the geographic range of the impact.

Cumulative impacts can be adverse even when individual impacts – related to the proposed action and present and reasonably foreseeable actions – are minor. This is because the sum of all impacts, collectively, may be significant over a period of time (40 CFR § 1508.7). There would be no cumulative impact to a resource if there is no impact associated with the proposed action, or if there were no present and reasonably foreseeable action impacts, or neither.
5.2 **Present and Reasonably foreseeable Actions**

This section describes the methods for identifying present and reasonably foreseeable actions, and concludes with the lists of present and reasonably foreseeable actions.

5.2.1 **Non-federal Actions**

A list of actions was identified through media searches, land use plans, capital improvement plans, National Environmental Policy Act (NEPA) documents, and interviews with public and private organizations, including government agencies.

There are numerous future development proposals, expansion proposals, and notional activities that have been discussed in the media or have been presented to government officials. The status of these proposals ranges from being conceptual to having all requisite government approvals. Best available information was used to determine which future actions would reasonably be expected to be constructed or implemented.

The following are proposed actions on Tinian and Pagan that were identified but are not considered reasonably foreseeable, in part, for the reasons noted:

- Neo Gold Wings Paradise Resort and Matua Bay Resort and Golf Course – land leases were terminated and casino licenses revoked
- New Hotel (Suicide Cliffs area) – conceptual plans only
- Puntan Kastiyu Resort – conceptual plans only
- Kachona Beach improvements – conceptual plans only
- American Memorial Park, Tinian Historical Interpretative Center at North Field – conceptual plans only
- Pozzolan mining on Pagan – project has a permit but no evidence that it is economically viable (Appendix Q, Section 4.2.10)

There are numerous actions identified in capital improvement program documents and some actions have been built. The following were identified as funding priorities, but are not considered reasonably foreseeable at this time because of their development status or lack of funding. These include the following:

- Tinian International Airport Improvements – Proposed airport improvements include high speed Taxiway B, security access system, perimeter security fence replacement, instrument landing system improvements, and a jet fuel farm.
- Tinian Seaport Rehabilitation, U.S. Army Corps of Engineers funded Breakwater and Dredging – The engineering feasibility and environmental studies are underway to develop a project design.
- Wastewater Treatment Plant – The future wastewater treatment plant was originally to be co-located with the proposed landfill; however, the location of the landfill and the wastewater treatment plant are being revisited.
- New Tinian Solid Waste Facility – Location has not been determined. Funding commitment and design are pending.
During the 3 years that this EIS/OEIS is being processed, the status of reasonably foreseeable actions is likely to change, and the present and reasonably foreseeable list and cumulative impact analysis will be updated for the Final EIS/OEIS.

5.2.2  Federal Actions

5.2.2.1  Divert Activities and Exercises (Divert)

Air Force/Headquarters, Pacific Air Forces proposes to improve an existing airport or airports in the Mariana Islands to support strategic requirements of U.S. forces around the globe, including humanitarian airlifts during natural disasters. The Divert Draft EIS was published June 2012; however, the Final EIS and Record of Decision have not yet been issued. As a cooperating agency on the CJMT EIS/OEIS, the Air Force informed the Marine Corps in January 2015 that engagement with the Commonwealth Ports Authority, the controlling authority for all of the CNMI airports, has resulted in the Air Force conducting additional environmental impact analyses for a variation of the alternatives associated with establishing Divert capabilities at the Tinian International Airport. This variation consists of siting necessary airport facilities on property located north of the runway on Tinian airport adjacent to the Military Lease Area. To that end, it is possible that should the Air Force select Tinian for all or some of its Divert mission, its supporting infrastructure may be located on the north side of Tinian airport along with the CJMT project. If that occurs, additional Department of Defense development could include runway improvements, parking apron, a temporary munitions area, aircraft hangar, and maintenance facility, and jet fuel receiving, storage and delivery infrastructure. Therefore, the CJMT EIS/OEIS cumulative impact analysis takes into account this variation of the Divert requirement on Tinian because there is greater potential for cumulative impacts under this scenario when considered in conjunction with the proposed CJMT action.

5.2.2.2  Mariana Islands Training and Testing

The Mariana Islands Training and Testing EIS/OEIS is being prepared by the U.S Pacific Fleet to assess the impacts of U.S. military readiness training and research, development, testing, and evaluation activities conducted in the Mariana Islands Training and Testing study area. The Draft EIS/OEIS was published in September 2013 (Department of the Navy [DoN] 2013a). The Final EIS/OEIS is anticipated in the Spring of 2015.

The Mariana Islands Training and Testing region of influence encompasses that of the CJMT EIS/OEIS and includes Guam and the CNMI submerged lands and airspace.

The Mariana Islands Training and Testing EIS/OEIS preferred alternative does not introduce training capabilities on Pagan. The proposed action relevant to the Tinian Military Lease Area are shown in Table 5.2-1, by alternative (DoN 2013a). Seven training activities would occur more frequently within the study area than the baseline tempo established under the Mariana Islands Range Complex EIS/OEIS (DoN 2010). Tinian is not the only island where these events could occur. The actual annual tempo on Tinian would vary, but would not exceed the number of events proposed under Alternative 1 and 2, as listed in Table 5.2-1.
Table 5.2-1. Mariana Islands Training and Testing EIS/OEIS Proposed Training Activities that Could Occur on Tinian

<table>
<thead>
<tr>
<th>Range Activity</th>
<th>Baseline (activities per year)*</th>
<th>Alternative 1 (activities per year)*</th>
<th>Alternative 2 (activities per year)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed changes to training tempo:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphibious Assault</td>
<td>4</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Amphibious Raid</td>
<td>2</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Non-combatant Evacuation</td>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Humanitarian Assistance/Disaster Relief Operations</td>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Urban Warfare Training (Blanks/Simulations)</td>
<td>8</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Personnel Insertion/Extraction</td>
<td>150</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Parachute Insertion</td>
<td>12</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Training tempo unchanged:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Embassy Reinforcement</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Marine Air Ground Task Force Exercise (Amphibious) Battalion</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Special Purpose Marine Air Ground Task Force Exercise</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Urban Warfare Exercise</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Intelligence, Surveillance, Reconnaissance</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Maneuver (Convoy, Land Navigation)</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Field Training Exercise</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Force Protection</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Anti-Terrorism</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Seize Airfield</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Airfield Expeditionary</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

Legend: * = Number of activities per year is not limited to Tinian, but the maximum number of annual events that could potentially occur on Tinian is listed.

Most of the training activities proposed in the Mariana Islands Training and Testing EIS/OEIS occur in the open ocean and most of the impacts identified are to marine resources. The EIS/OEIS categorizes resources differently from the CJMT EIS/OEIS. For example, the socioeconomics analysis includes marine transportation, recreation, and land use. Noise impacts are addressed under the numerous marine resources sections.

5.2.2.3 Mariana Islands Range Complex Airspace

The Mariana Islands Range Complex Airspace Final Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) was published in June 2013 (DoN 2013b). The document was prepared specifically to address proposed modifications to airspace and sea space within the Mariana Islands Range Complex, as described in the Mariana Islands Range Complex EIS/OEIS (DoN 2010a). The EA/OEA tiers from the Mariana Islands Range Complex EIS/OEIS. The action alternatives propose expansion of the danger zone and restricted airspace around Farallon de Medinilla, and the establishment of new warning areas south of Guam and northeast of Saipan. The change in airspace northeast of Saipan includes the removal of existing Air Traffic Control Assigned Airspaces 3A, 3B, and 3C (see Figure 3.6-7) and the establishment of Warning Areas 13A high and low, 13B high and low, and 13C high and low, respectively.
Warning Area 13 would be within 40 nautical miles (74 kilometers) of Tinian and would be used 4 to 5 days each week, for 3 to 6 hours per day. Detailed information regarding the proposed use of Warning Area 13 is in the *Mariana Islands Range Complex Airspace Environmental Assessment /Overseas Environmental Assessment*. Table 5.2-2 presents the proposed use, area and altitudes of Warning Area 13. Similar to Air Traffic Control Assigned Airspace 3A, Warning Area 13A would overlay land, Farallon de Medinilla, Anatahan, and Sarigan Islands.

### Table 5.2-2. Warning Area 13 Proposed Use and Characteristics

<table>
<thead>
<tr>
<th>Warning Area 13</th>
<th>Days Used Per Year</th>
<th>Area (square nautical miles)</th>
<th>Altitude</th>
<th>Lower Limit (Floor)</th>
<th>Upper Limit (Ceiling)</th>
<th>Changes from Air Traffic Control Assigned Airspace 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>160</td>
<td>5,942</td>
<td>Low</td>
<td>Surface</td>
<td>FL300</td>
<td>• Upper Limit changes from FL300 to FL600</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>FL300</td>
<td>FL600</td>
<td>• Increase of 1,183 square nautical miles airspace</td>
</tr>
<tr>
<td>B</td>
<td>157</td>
<td>7,727</td>
<td>Low</td>
<td>Surface</td>
<td>FL300</td>
<td>• Upper Limit changes from FL300 to FL600</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>FL300</td>
<td>FL600</td>
<td>• Decrease of 95 square nautical miles airspace</td>
</tr>
<tr>
<td>C</td>
<td>111</td>
<td>5,069</td>
<td>Low</td>
<td>Surface</td>
<td>FL300</td>
<td>• Upper Limit changes from FL300 to FL600</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>High</td>
<td>FL300</td>
<td>FL600</td>
<td>• Decrease of 2,209 square nautical miles airspace</td>
</tr>
</tbody>
</table>

Source: DoN 2013b.

When Warning Area 13 is in use, civilian aircraft would be routed either east or west of the airspace. A Notice to Airmen is issued by the Federal Aviation Administration at least 72 hours prior to the U.S. military activity. The frequency of use of Warning Area 13 (see *Table 5.2-2*) would remain as described in Chapter 3, *Affected Environment*, for Air Traffic Control Assigned Airspace 3 (Table 3.6-1). Additionally, Restricted Area 7201 was proposed to be extended from 3 nautical miles (5 kilometers) to 12 nautical miles (22 kilometers), and would lie within Warning Area 3A.

No changes in operations were proposed. If approved by the Federal Aviation Administration, the amount of charted controlled airspace would increase by 18,738 square nautical miles (64,269 square kilometers).

The alternatives would not have a direct impact to Tinian, Saipan, or Pagan or submerged lands. A Finding of No Significant Impact was published June 15, 2013. The Federal Aviation Administration is completing their NEPA and aeronautical processes for approving the change.

### 5.2.3 Summary

The present and reasonably foreseeable actions for the CNMI, Tinian, and Pagan are listed in Tables 5.2-3, 5.2-4, and 5.2-5, respectively. *Figure 5.2-1* shows the approximate locations of present and reasonably foreseeable actions on Tinian and Pagan.
### Table 5.2-3. CNMI: Present and Reasonably Foreseeable Actions

<table>
<thead>
<tr>
<th>Lead Agency or Proponent</th>
<th>Name</th>
<th>Location</th>
<th>Implementation Year(s)</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Defense</td>
<td>Divert</td>
<td>Tinian or Saipan International Airport (not Pagan)</td>
<td>unknown</td>
<td>Record of Decision - pending</td>
<td>See Section 5.2.2.1</td>
</tr>
<tr>
<td>Department of Defense</td>
<td>Mariana Islands Training and Testing</td>
<td>Guam, the CNMI surrounding airspace/land/ocean areas</td>
<td>2015 (pending Record of Decision)</td>
<td>Draft EIS/OEIS published September 2013</td>
<td>See Section 5.2.2.2</td>
</tr>
<tr>
<td>Department of Defense</td>
<td>Mariana Islands Range Complex Airspace</td>
<td>Airspace in vicinity of Farallon de Medinilla, north of Saipan (not on Figure 5.2-1)</td>
<td>2015 (pending airspace modifications)</td>
<td>Finding of No Significant Impact issued, Federal Aviation Administration - decision pending</td>
<td>See Section 5.2.2.3</td>
</tr>
</tbody>
</table>
### Table 5.2-4. Tinian: Present and Reasonably Foreseeable Actions

<table>
<thead>
<tr>
<th><strong>Proponent</strong></th>
<th><strong>Name</strong></th>
<th><strong>Location</strong></th>
<th><strong>Construction Year(s)</strong></th>
<th><strong>Status</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Commonwealth Ports Authority</td>
<td>Tinian Airport Improvements</td>
<td>Airport</td>
<td>2014-2015</td>
<td>Funded</td>
<td>The project includes: (1) Relocation of the Aircraft Rescue and Fire Fighting Facility building; (2) Terminal improvements; (3) Acquisition of a 1,500-gallon Aircraft Rescue and Fire Fighting Facility vehicle; (4) New water line; (5) Tinian Airport West Terminal: ADA compliant upgrades.</td>
</tr>
<tr>
<td>Commonwealth Ports Authority</td>
<td>Tinian Airport Terminal Renovations</td>
<td>Airport</td>
<td>2015</td>
<td>Funded, contractor selected</td>
<td>Office of Internal Affairs funded a $2.9 million project that combines three Capital Improvement Projects for the Tinian Airport: (1) renovations of existing terminal, (2) renovations to departure terminal and (3) structural retrofitting. Improvements will include renovations to doors and windows, painting, roof repairs, and installation of a baggage handling system. Funded separately, is the construction of a 40 foot by 40 foot brown treesnake containment facility.</td>
</tr>
<tr>
<td>Department of Public Lands</td>
<td>West San Jose Village Homesteads</td>
<td>San Jose Village</td>
<td>2013-2016</td>
<td>Infrastructure and roadways begun</td>
<td>San Jose Village is a residential subdivision. This phase includes lots for 189 homes. Includes ponding basin and approximately 12,000 linear feet of roadways. Recipients have 3 years to build their homes.</td>
</tr>
<tr>
<td>CNMI</td>
<td>Tinian Slaughterhouse: Phase 1</td>
<td>Outside Military Lease Area. Public Land, possibly mobile unit (not mapped)</td>
<td>2015-2016</td>
<td>Request for proposal by the end of 2014.</td>
<td>Create U.S. Department of Agriculture sanctioned slaughterhouse &quot;kill unit&quot;. Facility includes corral, kill unit, and septic system. Animal would be brought to unit for slaughter and returned to owner for personal consumption or package for resale.</td>
</tr>
<tr>
<td>Capital Improvements Projects Program Office (CIP)</td>
<td>Solid Waste Transfer Station</td>
<td>Outside Military Lease Area. Across from the Commonwealth Utilities Corporation power plant.</td>
<td>2015</td>
<td>Engineering design: 2014</td>
<td>Solid Waste Transfer Station (3 acres) provides a more convenient method for people to take their solid waste for processing prior to disposal because it is closer to their homes and provides dumpsters for collection of trash, sorting bins for separation of recyclables, and collection areas for green waste and appliances.</td>
</tr>
</tbody>
</table>
### Table 5.2-4. Tinian: Present and Reasonably Foreseeable Actions

<table>
<thead>
<tr>
<th>Proponent</th>
<th>Name</th>
<th>Location</th>
<th>Construction Year(s)</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNMI</td>
<td>Brownfields Grants</td>
<td>Various</td>
<td>2013-2016</td>
<td>Grants received</td>
<td>Grant 1: site specific hazardous substance assessment for Pina, Tinian, and totaling $350,000. Grant 2: worth $200,000, is for community-wide hazardous substance assessment. Grant 3: $200,000 was awarded for community-wide petroleum assessment. These grants will assist Department of Public Lands in performing the necessary environmental assessments on public properties that are suspected to be contaminated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(not on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Figure 5.2-1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joeten Tinian Ace Hardware</td>
<td>Joeten Tinian Ace Hardware</td>
<td>San Jose Village</td>
<td>2013</td>
<td>Completed</td>
<td>New hardware store with lumber yard, appliances and a small grocery section. Approximately 4,800 square feet of retail.</td>
</tr>
<tr>
<td>CIP</td>
<td>Health Center Improvement</td>
<td>San Jose Village</td>
<td>2014</td>
<td>Construction</td>
<td>Upgrades to Health Center to address Americans with Disabilities Act compliance and maintenance.</td>
</tr>
<tr>
<td>CIP</td>
<td>Tinian Solid Waste Facility</td>
<td>South of Tinian International Airport</td>
<td>2014</td>
<td>Funded</td>
<td>Upgrades planned for the existing solid waste facility. Includes fence delineating extent, proper equipment, operator training, and some other minor upgrades.</td>
</tr>
<tr>
<td>Mega Stars Overseas Limited</td>
<td>Tinian Dynasty Hotel, San Jose Village</td>
<td></td>
<td>2014</td>
<td>Renovation</td>
<td>Renovation of hotel guest rooms. ($15 Million waterpark is not reasonably foreseeable).</td>
</tr>
<tr>
<td>Dynasty Hotel</td>
<td>Dynasty Hotel Ferry Service</td>
<td>Tinian Harbor</td>
<td>2015</td>
<td>Planning</td>
<td>Dynasty Hotel is proposing ferry service between Tinian and Saipan. This would be smaller than that proposed by the CNMI and would not include a terminal building.</td>
</tr>
<tr>
<td>DoN</td>
<td>Chiget Mortar Range Cleanup</td>
<td>Chiget Mortar Range, within Military Lease Area</td>
<td>2014-2015</td>
<td>Work plan, public outreach</td>
<td>The Chiget Mortar Range was used from World War II to 1994. It has been designated a restricted area, pending cleanup of explosives. A remedial investigation/feasibility study is ongoing. The Final Work Plan for the current phase of work was prepared in 2014 for work that would be completed in 2015.</td>
</tr>
<tr>
<td>CNMI</td>
<td>0.5-Million Gallon Reservoir</td>
<td>Carolinas Heights</td>
<td>2015</td>
<td>Construction request for proposal issued 2014</td>
<td>Office of Insular Affairs approved funding and NEPA categorical exclusion for the construction of the 0.5-Million Gallon Reservoir in Carolina Heights.</td>
</tr>
</tbody>
</table>
### Table 5.2-4. Tinian: Present and Reasonably Foreseeable Actions

<table>
<thead>
<tr>
<th>Proponent</th>
<th>Name</th>
<th>Location</th>
<th>Construction Year(s)</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNMI/U.S. Environmental Protection Agency</td>
<td>Masalog Depot Cleanup</td>
<td>Pina</td>
<td>2015-2016</td>
<td>Request for proposal for site investigation</td>
<td>Environmental site assessments are proposed at the Masalog Ammunition Depot. The site is approximately 237 acres. The munitions stored at the depot supported the World War II B-59 airfields. Subsequent clean-up actions are anticipated. The Unexploded ordnance cleanup is being funded by U.S. Environmental Protection Agency-Brownfields program.</td>
</tr>
<tr>
<td>CIP, Federal Highway Administration</td>
<td>Tinian Hazard Elimination Action</td>
<td>San Jose Village (Route 21, Route 24, and Route 27)</td>
<td>2017</td>
<td>Design</td>
<td>Road safety improvements, including; installing pavement and shoulder delineation, traffic signage, and safety barriers at locations that have steep slopes or may pose hazards to motorists.</td>
</tr>
<tr>
<td>CIP</td>
<td>Health Center Expansion</td>
<td>Health Center, San Jose Village</td>
<td>2017</td>
<td>Planning</td>
<td>New addition planned with CIP funds for a second building to house administrative and public health services. There will be a covered walkway connecting the two buildings.</td>
</tr>
<tr>
<td>Bridge Investment Group, LLC</td>
<td>Tinian Ocean View Resort</td>
<td>Tinian Harbor</td>
<td>2015 - 2020</td>
<td>Conditional Use Lease issued June 2014</td>
<td>A hotel replica of the Titanic would be built at Tinian Harbor. It would be part of a larger resort complex with 300 guest rooms, restaurants, shopping arcades and a wedding chapel. The project would be constructed in increments and the initial construction includes two stevedore warehouses to replace the existing dilapidated structures, a new Customs, Immigration and Quarantine building, and a new Brown Treessnake Containment Area.</td>
</tr>
<tr>
<td>CNMI Department of Public Works</td>
<td>Tinian Solid Waste Facility Closure</td>
<td>Existing Tinian Solid Waste Facility, South of Tinian Airport</td>
<td>Beyond 2016</td>
<td>Closure Plan</td>
<td>The existing Tinian Solid Waste Facility will be closed, in accordance with federal regulations, after a new landfill is developed. The new landfill site has not been determined. There is insufficient site information available to include it on the reasonably foreseeable actions list.</td>
</tr>
</tbody>
</table>
### Table 5.2-5. Pagan: Present and Reasonably Foreseeable Actions

<table>
<thead>
<tr>
<th>Proponent</th>
<th>Name</th>
<th>Area of Interest</th>
<th>Construction Year</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Geological Survey</td>
<td>Volcanic Activity Monitoring</td>
<td>Various (not on Figure 5.2-1)</td>
<td>2015</td>
<td>Installed, service suspended</td>
<td>Ground-based digital instrumentation and telemetry. Equipment installed in 2013 to provide monitoring of volcanic activities and a live camera feed of the volcanic activity on Pagan. Equipment is no longer streaming real time data due to lack of funding for satellite uplinks. The CNMI and agencies are pursuing funding to restart uplink.</td>
</tr>
<tr>
<td>Konferensian Chamorro Steering Committee</td>
<td>Chamorro Conference</td>
<td>Harbor area</td>
<td>2015</td>
<td>Planned</td>
<td>Chamorro conference on Pagan in 2014. Approximately, 100 delegates anticipated. “... their goal is to promote, preserve and apply cultural knowledge, innovations, expressions and practices of Chamoru culture as well as inspire, motivate and empower the Chamoru community.”</td>
</tr>
<tr>
<td>Various private entities</td>
<td>Ecotourism</td>
<td>various (not on Figure 5.2-1)</td>
<td>N/A</td>
<td>Temporary use authorization</td>
<td>Temporary permits could be obtained from the CNMI Homeland Security and Emergency Management Office for various ecotourism activities. It is anticipated these activities would occur in the future.</td>
</tr>
</tbody>
</table>
Figure 5.2-1
Present and Reasonably Foreseeable Projects
5.3 CUMULATIVE IMPACTS ANALYSIS

This section contains the results of the various steps of the cumulative effect analysis summarized in Section 5.1, Methodology. Section 5.3.1 presents impact summary tables that are used as the basis for this analysis. These include tables summarizing impacts of present and reasonably foreseeable actions and tables summarizing each resource’s potential for cumulative impact.

An analysis for each resource is presented in the same order they appear in Chapters 3 and 4 of this EIS/OEIS. Each resource contains the following subsections for Tinian and for Pagan:

1. Study Area and Health of Resources Considered
2. Impacts of Present and Reasonably Foreseeable Actions
3. Impacts of the Proposed Action That May Contribute to a Cumulative Impact
4. Potential Cumulative Impacts

5.3.1 Impact Summaries

5.3.1.1 Impacts of Present and Reasonably Foreseeable Actions

Each of the present and reasonably foreseeable actions (see Tables 5.2-3, 5.2-4, and 5.2-5) were assessed to determine whether they would have a long-term adverse or beneficial impact to each resource.

If a NEPA document was available for an action, then the results of the NEPA document were reviewed to help analyze cumulative effects, although the NEPA documents for other actions did not necessarily look at the same resources as this CJMT EIS/OEIS. In addition, the definition of the resources varies among NEPA documents. For example, the impacts of impervious surface is considered a water resources impact in Divert, and a geology and soils impact in this CJMT EIS/OEIS. To the extent practical, the other NEPA document significance levels were matched to the CJMT EIS/OEIS resource definitions. Where there is no NEPA document, assumptions on impacts for those actions were made based on the best available information.

Similar to the methodology applied in Chapter 4, for direct and indirect impacts, it is assumed that present and future actions would also incorporate resource management measures, which would minimize significant impacts. In other words, resource management measures are part of the present and reasonably foreseeable actions. This does not mean that analysis assumed that potential impacts would necessarily be reduced to less than significant.

5.3.1.2 Impacts of the Proposed Action (Chapter 4)

The direct and indirect impact analyses of the CJMT proposed action alternatives are in Chapter 4, Environmental Consequences, of this EIS/OEIS. This section summarizes the key findings from Chapter 4 and discusses the potential for cumulative impacts when considered in conjunction with present and reasonably foreseeable actions.
Summary tables (Tables 5.3-1 [Tinian] and 5.3-2 [Pagan]) provide a summary of the cumulative impact analysis. The first row is the highest level of significance identified for the proposed action alternatives for any criteria under each resource and sub-resource as described in Chapter 4. The highest level of significance for each resource was determined to be the same for all three Tinian action alternatives and both Pagan action alternatives. The second row summarizes the impact conclusions for present and reasonably foreseeable actions. The third row indicates whether there is potential for a cumulative impact, based on the impacts of Present and Reasonably Foreseeable Actions described in Section 5.2. For a cumulative impact to occur, there must be a resource impact identified for both the present and reasonably foreseeable actions and the CJMT proposed action alternatives.

The last rows summarize the cumulative impact analysis. The assessment of cumulative impacts includes consideration of both adverse and beneficial impacts.
Table 5.3-1. Tinian: Potential for Cumulative Impact

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Action Alternatives 1, 2, and 3 highest level of significant impact (Chapter 4)</td>
<td>SI (^3)</td>
<td>LSI</td>
<td>LSI</td>
<td>SI (^3)</td>
<td>SI (^M)</td>
<td>SI (^4)</td>
<td>SI</td>
<td>SI</td>
<td>SI</td>
<td>SI (^M)</td>
<td>SI (^5)</td>
<td>LSI</td>
<td>LSI</td>
<td>SI (^2)</td>
<td>LSI</td>
<td>LSI</td>
</tr>
<tr>
<td>Present and reasonably foreseeable action impacts identified? yes[Y]/no[N]</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Is there a proposed action impact (Chapter 4) and a present and reasonably foreseeable impact? i.e., is there potential for a cumulative impact? yes[Y]/no[N]</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Is there a potential cumulative impact? yes[Y]/no[N]</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y (^7)</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

Legend:  
LSI = less than significant impact; N = no; SI = significant impact; SI \(^M\) = less than significant impact with proposed mitigation; Y= yes.

Notes:  
1. SI due to airfield and airspace-based operations.
2. Impacts are both beneficial and adverse. LSI/SI due to community character and cohesion. SI related to a portion of community.
3. SI due to impacts to prime farmland soils.
4. SI due to new public access restrictions.
5. SI due to impact to Ushi Cross Point B (Key Observation Point #6) and Mount Lasso Lookout A (Key Observation Point #8).
6. There would be an overall beneficial cumulative impact to socioeconomics.
7. Impact identified for air transportation only.
<table>
<thead>
<tr>
<th>Proposed Action Alternative 1 and 2 highest level of significant impact (Chapter 4)</th>
<th>Geology and Soils</th>
<th>Water Resources</th>
<th>Air Quality</th>
<th>Noise</th>
<th>Airspace</th>
<th>Land and Submerged Lands Use</th>
<th>Recreational Resources</th>
<th>Terrestrial Biology</th>
<th>Marine Biology</th>
<th>Cultural Resources</th>
<th>Visual Resources</th>
<th>Transportation (Air, Ground, Marine)</th>
<th>Utilities</th>
<th>Socioeconomic and Environmental Justice</th>
<th>Hazardous Materials and Waste</th>
<th>Public Health &amp; Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present and Reasonably Forseeable Action impacts identified? yes[Y]/no[N]/beneficial impact only [B]</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Is there a proposed action impact (Chapter 4) and a present and reasonably foreseeable impact? i.e., Is there a potential cumulative impact? yes[Y]/no[N]</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Is there a potential cumulative impact? yes[Y]/no[N]</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

Legend: B = beneficial impact; LSI = less than significant impact; N= no; NC = no cumulative impact because (1) no present and reasonably foreseeable action impacts were identified or (2) no proposed action impacts were identified; SI = significant impact; SI<sup>M</sup> = less than significant impact with proposed mitigation; Y= yes.

Note: 1 LSI/SI due to community character and cohesion. The decreased opportunity to engage in cultural and recreational activities on Pagan affects the Northern Islands community residing elsewhere in the CNMI. There would be an adverse impact to community cohesion.

2 SI due to change in jurisdictional control.

3 SI due to change in jurisdictional control.

4 LSI to stormwater and solid waste management. Other utilities would be NI.
5.3.2 Geology and Soils

5.3.2.1 Tinian

5.3.2.1.1 Study Area and Health of Resources Considered

The study area for the geology and soils cumulative impact analysis is Tinian. The resiliency of geology and soils on Tinian, to future stress, is expected to improve over time. The anticipated improvement is due to building codes, construction permit conditions, and associated best management practices that are stricter, and work to better control erosion, than they have been historically. There are geologic hazards and unpredicted natural events that could interrupt the positive trend in erosion control; however, the overall positive trend in erosion control is expected to continue.

Section 3.2.5, Tinian, provides a detailed discussion of the current health of geology and soils on Tinian. World War II and sugarcane production resulted in widespread disturbance of surface soils, excavation, filling, and paving. Limestone and coral were removed from numerous quarries and “borrow pits” across the island, as well. Overall, the impacts to geology and soils have tended to be associated with commercial, industrial, and residential development that have involved earthmoving, paving, and large-scale removal of earth materials associated with mining and quarrying. Industrial sugarcane production has also led to substantial soil loss.

After World War II, the rapid growth of tangantangan cover reduced the soil erosion. Small-scale and subsistence agriculture on Tinian has been a mix of grazing and small, multi-crop fields that do not leave large areas of bare soil vulnerable to erosion. Impacts to geology and soils are largely related to human activities, but natural events such as typhoons and earthquakes have resulted in severe erosion and landslides.

The most notable construction within the Military Lease Area since World War II was the building of the International Broadcasting Bureau. Recent more stringent construction permit conditions and best management practices minimized the impacts to the geology and soils associated with that construction. Continued greater awareness of erosion control principles in construction has led to the trend in erosion potential declining. The CNMI Earthmoving and Erosion Control Regulations established in the 1980s to 2000s, reduce erosion associated with construction earthmoving activities.

The potential geologic hazards have not been altered for Tinian in recent history and are not expected to change in the near-future. However, modern building codes and engineering practices include requirements for seismic safety. Recent large-scale actions (e.g., the Tinian Dynasty Casino) were constructed in accordance with these regulations and building codes. Future actions, including the proposed action, would also be required to comply with these regulations and building codes.

Soils classified as prime farmland soils by the U.S. Department of Agriculture are present within and outside of the Military Lease Area. The amount of acreage considered prime farmland is not expected to change over time but other land uses would preclude agricultural use of prime farmlands, such as those located within the Exclusive Military Use Area that would not be available for agricultural use until the end of the U.S. military lease terms. Overall, the land use on Tinian has not changed substantially in recent years.
5.3.2.1.2 Impacts of Present and Reasonably Foreseeable Actions

Impacts of eight present and reasonably foreseeable actions (Tinian Airport Improvements, Divert, West San Jose Village Homesteads, Joeten Tinian Ace Hardware, New 0.5 Million Gallon Reservoir, Health Center Expansion, Alter City Resort, and Tinian Ocean View Resort) were identified on Tinian that would potentially have an impact to geology and soils due to soil disturbance during construction. The impacts are likely to be less than significant for most of the actions with implementation of resource management measures and because of the relatively flat topography and small areas of disturbance. All new construction would likely result in an increase in impervious surface area, unless they are replacement facilities. The larger projects such as the resorts and homestead developments require more ground disturbance with potential for impacts to geology and soils. The resorts (Alter City Resort, and Tinian Ocean View Resort) would increase the area of impervious surface on Tinian and may require grading and fill activities that could substantially alter the landscape, reduce slope stability, or alter surface drainage patterns. There would be impacts to topography and slope stability.

The present and reasonably foreseeable actions are geographically distinct and most would occur outside of the Military Lease Area, except Divert. The CNMI government reviews and approves building permits, inclusive of grading plans, for actions outside of the Military Lease Area. Permit conditions include mitigation measures for controlling erosion and protecting soils; however, impacts may not be avoided entirely. The CNMI permit approval process ensures that land development is consistent with the CNMI long-range master planning, including agricultural use of prime farmland soils.

Five present and reasonably foreseeable actions (Tinian Solid Waste Facility Improvements, Brownfields Grants, Chiget Mortar Range Cleanup, Masalog Ammunition Depot Cleanup, and Tinian Solid Waste Facility Closure) would likely have beneficial long-term impacts because they would improve or remediate soil conditions. The remainder of the cumulative actions would not have long-term impacts to this resource.

There is potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to geology and soils on Tinian.

5.3.2.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.2.3, Tinian. All three Tinian alternatives would result in similar significant direct impacts to prime farmland soils, but less than significant impacts related to topography, geology (geologic units and geologic hazards), and soils (see Table 5.3-1).

There would be significant impacts to prime farmland soils within the Military Lease Area. All of the Tinian proposed action alternatives would preclude the agricultural use of between 220 acres (89 hectares) to 230 acres (93 hectares) during operations, representing approximately 16% of the Tinian prime farmland soils. No mitigation is proposed for the impacts to prime farmland soils. There are other prime farmland soils available on Tinian, but 72% are within the Military Lease Area.

The impacts to topography and soils would be due to excavation, filling, and soil disturbance. The impacts would be less than significant with implementation of best management practices and standard operating procedures to minimize the potential for soil erosion and slope instability associated with
earthmoving. The facilities would be constructed in accordance with Unified Facilities Criteria that specifically reduce the potential hazards associated with seismic activity. Although there are some differences in the amount of ground disturbance, all Tinian action alternatives would have similar impacts to geology and soils.

5.3.2.1.4 Potential Cumulative Impacts

There would be permanent loss of prime farmland soils within the Military Lease Area under the proposed action. Most of the present and reasonably foreseeable actions do not affect prime farmland soils, would not be constructed at the same time, and are geographically distinct from the proposed action. Thus, there would be no additive effects to prime farmland soils. In addition, the resource is resilient to stress with continued implementation of best management practices and compliance with permit conditions. Existing environmental laws and regulations require that earthmoving and construction activities minimize the potential for soil erosion and slope instability. Building codes would be followed to minimize the potential for impacts from seismic hazards. Therefore, there would be no cumulative impact to geology and soils.

5.3.2.2 Pagan

5.3.2.2.1 Study Area and Health of Resources Considered

The study area for the geology and soils cumulative impact analysis is Pagan. The health trend of Pagan soil and geological resources can be described as being gradually declining due to the ongoing seismic hazards, recent typhoons, and recent erosion related to overgrazing of feral animals. The trend is expected to continue as the potential for these factors to continue over time is high.

Section 3.2.5, Tinian, provides a detailed discussion of the current health of geology and soils on Pagan. The historical influences of World War II and agricultural production on Pagan have resulted in soil disturbance and erosion. Erosion has been observed originating at the western upper flank of Mount Pagan and extending southwest to the former Somushon Village location. The soil cover tends to be thin; however the best-developed soils are in the inner basin south of Lake Sanhalom and the area north the central plateau, as described in Chapter 3.

Pagan continues to be volcanically active. The 1981 eruption of Mount Pagan spread lava rock and ash deposits over the north and south slopes of Mount Pagan, covered part of the grass airfield, and created pozzolan deposits that have been investigated for their economic potential. The most recent Mount Pagan lava flow was in 1981, but there have been numerous eruptions of ash, gas, and steam since then.

The 1981 lava flow led to the evacuation of the remaining on-island population and there has been no agricultural, commercial, or industrial activity on Pagan since. Therefore, human behavior has not directly contributed to the gradually declining trend in resource health. Feral ungulate populations resulted in island vegetation being severely overgrazed, particularly in the north, creating areas of soil erosion. Other soil disturbing activities have included establishment of trails and exploratory drilling into the pozzolan deposits.
5.3.2.2 Impacts of Present and Reasonably Foreseeable Actions

No present and reasonably foreseeable actions would have a potential impact to geology and soils on Pagan. Therefore, there is no potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to geology and soils.

5.3.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.2.4, Pagan. The Pagan alternatives would result in less than significant impacts to topography, geology (geologic units and geologic hazards), and soils. There are no prime farmland soils on Pagan. The impacts to topography, geologic units, and soils would be due to excavation, filling, and other soil disturbance. There would be approximately 355 acres (144 hectares) of impervious surface created under the proposed action, which would be 45% of the proposed action disturbed area (764 acres [310 hectares]). The impacts would be less than significant with implementation of resource management measures to minimize the potential for soil erosion and slope instability associated with earthmoving. Pagan is an active seismic and volcanic zone, where geologic hazards include earthquakes, fault ruptures, volcanic eruptions, slope instability (i.e., landslides), and tsunami inundation. The facilities would be constructed in accordance with Unified Facilities Criteria that specifically reduce the potential hazards associated with seismic activity. Construction and operation activities would not increase the risk of volcanic activity.

Although there are some differences in the amount of ground disturbance, both Pagan action alternatives would have similar impacts to geology and soils.

5.3.2.4 Potential Cumulative Impacts

No present and reasonably foreseeable actions would have a potential impact to geology and soils on Pagan. These actions are infrequent, transient, and geographically distinct. Therefore, there would be no cumulative impact to geology and soils on Pagan.

5.3.3 Water Resources

5.3.3.1 Tinian

5.3.3.1.1 Study Area and Health of Resources Considered

The study area for the water resources cumulative impact analysis is Tinian and nearshore waters. In general, the water resources are recovering from historical land use influences. While there is an increasing potential for saltwater intrusion into the groundwater supply, with the implementation of resource management measures and regulatory controls on land uses, the positive trend in resource health is likely to continue to improve. Water resources are expected to be resilient to future stresses, with the possible exception of surface waters at Makpo Swamp that are sensitive to rainfall or water withdrawal from the sub-watershed.

Section 3.3.4, Tinian, provides a detailed discussion of the current health of water resources on Tinian. Historically, World War II and intensive sugarcane production were the primary events impacting water resources on Tinian. Both involved vegetation removal that likely increased the potential for erosion and
stormwater runoff entering into nearshore waters. After World War II, vegetation has grown over most of the exposed soil areas, reducing runoff into nearshore waters. Nearshore waters and surface waters have been impacted by sewage outfalls, agricultural land uses, stormwater runoff, and possibly the unlined Tinian Solid Waste Facility. There are also areas of overgrazing, with evidence of stormwater runoff into nearshore waters during heavy rains. Surface activities (e.g., unlined Tinian Solid Waste Facility, agricultural chemicals, fuel storage, and munitions) also have potential to impact groundwater resources, but to date the groundwater supply does not appear to be affected. Saltwater intrusion due to excessive water pumping has potential to affect drinking water quality, but the water quality to date has met the secondary drinking water standards.

Water resources are subject to a higher level of regulatory protection than they historically were. In recent history, water resource health has benefited from these controls. Nearshore waters around Tinian are designated Class AA by the CNMI Bureau of Environmental and Coastal Quality, except for the nearshore waters of Tinian Harbor that are designated Class A. Class AA designation means these waters should remain in their natural pristine state with an absolute minimum of pollution or alteration of water quality from human related sources or actions. However, periodic water quality assessments between 2004 and 2012 have indicated that nearshore waters are impaired at Unai Chulu, which does not support its designated Class AA classification due to exceedances in enterococci bacteria from an unknown source. This beach is classified as being only partially supportive of its designated uses. Appropriate regulatory action has and would continue to be taken to improve nearshore water quality.

Because the entire shoreline is composed of limestone cliffs, rocky outcrops, or sand beach, there are no mangroves or coastal wetlands; however, there are three inland water features within the Military Lease Area: (1) Lake Hagoi; (2) Mahalang Complex; and (3) Bateha Isolated Wetlands. Lake Hagoi is a permanent partially-open-water complex that is dependent on rainfall and subject to sediment infill. Mahalang Complex is comprised of a cluster of craters and depressions, and it contains several ephemeral surface waters and an isolated wetland (see Appendix L, Wetland Survey Report). The Bateha Isolated Wetlands consist of two shallow depressional areas that contain water during wet periods.

Information on the acreage of historical wetland loss is not readily available. Currently, the health of the surface waters is dependent on rainfall. They are also subject to overgrowth of non-native vegetation. The health of these surface waters is likely to remain on a gradual decline. Makpo Swamp is located outside the Military Lease Area and the associated sub-watershed has been the primary potable water supply for Tinian. Over time the drawdown has reduced the open water and the area is more swamp-like. The drawdown of water is influenced by population growth (increased demand). The health of Makpo Swamp is likely in gradual decline with increased potable water demand.

5.3.3.1.2 Impacts of Present and Reasonably Foreseeable Actions

There are two reasonably foreseeable actions (Alter City Resort and Tinian Ocean View Resort) and one present action (New 0.5 Million Gallon Reservoir) that would affect water resources.

The present and reasonably foreseeable actions have potential to affect groundwater resources due to increased water withdrawal and an increased risk of saltwater intrusion.
The Tinian Ocean View Resort has a planned location at the harbor. Impacts to nearshore surface waters would be mitigated by the U.S. Army Corps of Engineers permitting process under the Clean Water Act; thereby reducing those impacts to less than significant.

Five present actions and one reasonably foreseeable action may have a beneficial impact to water resources: Solid Waste Transfer Station, Brownfield Grants, Tinian Solid Waste Facility Improvements, Chiget Mortar Range Cleanup, Masalog Ammunition Depot Clean-up, and Tinian Solid Waste Facility Closure. The benefit to water resources is indirectly related to the remediation or protection of soils proposed in these actions. Only the Chiget Mortar Range Cleanup is within the Military Lease Area.

There is potential for the present and reasonably foreseeable actions to generate both beneficial and adverse cumulative impacts on Tinian’s water resources.

**5.3.3.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact**

Direct and indirect impacts of the proposed action are detailed in Section 4.3.3, Tinian. The proposed action alternatives would similarly result in no impacts to Lake Hagoi and Bateha Isolated Wetlands and less than significant impacts to groundwater resources and nearshore waters (see Table 5.3-1). Although Tinian Alternative 1 construction activities would result in direct impacts to 0.5 acre (0.2 hectare) of the Mahalang Complex, the remainder of the Mahalang Complex would not be impacted by construction; therefore, construction would result in less than significant direct impacts to the Mahalang Complex. Training operations in the High Hazard Impact Area, including controlled burning of vegetation and use of high explosives and other munitions, may result in indirect impacts to the remaining surface water features of the Mahalang Complex because half of the potential stormwater runoff from the High Hazard Impact Area would flow in a northwesterly direction toward the Mahalang Complex. Stormwater runoff can erode and transport contaminated soil and leachable munition constituents.

The pumping of groundwater from the proposed new military wells to support military operations could potentially cause saltwater intrusion. However, this impact is not expected to be significant because the pumping would be limited to periods when training exercises occur and because of the size and recharge characteristics of the freshwater basal lens (i.e., availability of groundwater). Proper range management and implementation of the Range Environmental Vulnerability Assessment program would reduce operation impacts of Tinian Range Training Area and result in less than significant indirect impacts to water resources. Re-evaluations would occur at a minimum every 5 years.

**5.3.3.1.4 Potential Cumulative Impacts**

There are potential impacts to water resources associated with the proposed action, the two resort projects (Alter City Resort and Tinian Ocean View Resort) and the new 0.5 Million Gallon Reservoir which would all draw down the island groundwater resources and could increase the potential for saltwater intrusion. This increase in demand would be limited to the duration of construction of the proposed action because once new potable extraction wells are established, they would be utilized by the proposed action and prevent overextending the existing Makpo Valley well (i.e., Maui Well #2).

None of the actions would affect the Lake Hagoi and Bateha Isolated Wetlands. The present and reasonably foreseeable projects would not affect the Mahalang Complex. Therefore, there would be no additive effects to these surface water resources.
The civilian projects would not affect the same groundwater resources affected by the proposed action because of geographic separation (new potable extraction wells utilized in the Military Lease Area would not impact the same freshwater aquifers, as they are located in different sub watersheds). Use of new potable well sites would be in the Military Lease Area to prevent overextending the existing Makpo Valley Well (Maui Well #2). This separation would result in no impacts to the municipal water supply. In addition, the pumping of water for the proposed action would occur during periods when training exercises occur, and the size and recharge characteristics of the freshwater basal lens (i.e., availability of groundwater) are sufficient. Some of the present and reasonably foreseeable projects would have a beneficial impact to water resources. Water resources are subject to a higher level of regulatory protection than they historically were because they are vulnerable to stress. The projects would comply with regulatory requirements including the implementation of resource management measures. Therefore, there would be no cumulative impacts to water resources.

5.3.3.2 Pagan

5.3.3.2.1 Study Area and Health of Resources Considered

The study area for the water resources cumulative impact analysis is Pagan and nearshore waters. The health and resiliency of Pagan’s surface waters and nearshore waters is generally good; however, groundwater resources have been affected by natural events. The trend of water resources being occasionally affected by natural events is expected to continue.

Section 3.3.5, *Pagan*, provides a detailed discussion of the current health of water resources on Pagan. The historical influences of World War II and agricultural production are likely to have resulted in soil disturbance and erosion on Pagan. Feral ungulate populations resulted in island vegetation being severely overgrazed, particularly in the north, creating areas of soil erosion. There is minimal contribution of stormwater runoff to surface waters. Additionally, there have not been direct impacts associated with human influences in recent history, since the residents were evacuated in 1981.

There are two lakes on Pagan and neither meets the requirements for potable water due to high chloride content. The mixing of saltwater with the freshwater lakes may occur through vents, faults, and the bedrock substrate.

It is believed that only a small part of water infiltration is recoverable due to geologic and terrain conditions, and mixing of freshwater and saltwater. The groundwater wells that supported historical land uses are subject to saltwater intrusion. Although a fresh groundwater lens was likely to have developed, the 1981 eruption and subsequent temperature convection currents have likely mixed saltwater with portions of the fresh groundwater lens to an extent that the presence of a fresh groundwater lens is questionable.

Pagan has approximately 39 miles (63 kilometers) of undeveloped coastline that features diverse intertidal systems with tide pools formed in basalt and limestone headlands exposed along the coast (Polhemus 2010). During coral surveys, it was noted that visibility and apparent water quality was lower along Green Beach relative to the other leeward beaches. The degraded condition along Green Beach is potentially from anthropogenic sources – kitchen scraps were found in shallow areas of the bay during coral surveys (Polhemus 2010) suggesting that use of the area by visitors has influenced nearshore water quality (DoN 2014a).
5.3.3.2 Impacts of Present and Reasonably Foreseeable Actions

It is assumed that the potential ecotourism activities would be temporary in nature. Ecotourism is listed as a present action, but it would not require potable water infrastructure. Ecotourism would not be expected to result in impacts to water resources.

There is no potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to Pagan’s water resources.

5.3.3.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.3.4, Pagan. Both Pagan proposed action alternatives would result in similar impacts. Permanent erosion/sedimentation control practices would be utilized to minimize impacts to surface waters resulting from operation activities. Monitoring and adaptive management plans would identify if conditions change and concerns arise, allowing early intervention to reduce potential impacts to the surface water resources. The lakes would be designated “no training areas” to avoid impacts. As a result of the target placement up gradient of the surface waters and U.S. military trail adjacent to Laguna Sanhiyon, impacts to surface waters from leachable compounds from munitions constituents would be less than significant with implementation of resource management measures, including the Range Environmental Vulnerability Assessment program. Resource management measures for stormwater management would be utilized to minimize impacts to surface waters resulting from operation activities. There would be less than significant impacts related to groundwater and to nearshore waters. Munitions constituents would not have significant impacts to nearshore water quality due to corrosion of materials in water, slow release of constituents, and dilution through mixing and diffusion. As described in Section 4.3.4, Pagan, the alternatives would result in no impacts from flooding hazards.

5.3.3.2.4 Potential Cumulative Impacts

No present and reasonably foreseeable actions would have a potential impact to water resources on Pagan. Potential ecotourism activities would be infrequent, transient, geographically distinct, would not require potable water infrastructure, and would not adversely affect water quality. There would be sufficient water for all potential uses. Therefore, there would be no cumulative impact to water resources on Pagan.

5.3.4 Air Quality

Appendix G, Air Quality Technical Memo, provides background information on criteria pollutants for which the National Ambient Air Quality Standards have been established to protect public health and reduce greenhouse emissions that contribute to climate change.

Greenhouse gases trap heat within the surface and the lowest portion of the earth’s atmosphere, causing heating at the surface of the earth. Scientific evidence indicates a trend of increasing global temperature over the past century due to increasing greenhouse gas emissions from human activities. The heating effect from these gases is considered the probable cause of the rising temperatures observed over the last 50 years. The climate change associated with this increase in global temperatures
is predicted to produce negative economic and social consequences across the globe. Although greenhouse gas emissions occur locally, the potential effects of greenhouse gas emissions are by nature global in scale, and accumulate geographically and over time. Coral bleaching, ocean acidification, changes in weather patterns, and rising sea level and associated potential for coastal inundation are attributed to greenhouse gas emissions.

The region’s sea levels have risen at a rate of over 0.4 inch (10 millimeters) per year between 1993 and 2010. There have been increasing trends in surface air temperature since the 1950s and the projection is for an increase of 1.1 degrees Fahrenheit (0.6 degree Celsius) by 2030.

There is potential for the present and reasonably foreseeable actions to incrementally contribute to an impact to regional and global air quality conditions from criteria pollutant emissions and climate change on a regional and global scale due to greenhouse gas emissions.

5.3.4.1  Tinian

5.3.4.1.1  Study Area and Health of Resources Considered

The study area for the air quality cumulative impact analysis is the airshed of Tinian with consideration to the influence that the Tinian airshed has on air quality on a regional and global scale. The Tinian airshed air quality is based on compliance with the Clean Air Act, which is based on the location of the emission sources and their proximity to sensitive receptors (e.g., residences, schools). Because human activities involving fossil fuel combustion in the Tinian airshed have been limited, the resultant air emissions appear to have caused negligible air quality effects within the regional airshed (which consists of Guam, Saipan, Tinian, and other CNMI islands). For the same reason, these combustion activities have had minimal global air quality effects including greenhouse gas emissions effects that could contribute to global climate change with rising global temperatures. It is expected that this trend would continue and the Tinian airshed air quality would continue to have a negligible effect on a regional and global scale.

Historically, the road and air traffic during World War II had a temporary impact to air quality. As described in Section 3.4.4, Tinian, Tinian is in an unclassified/attainment area for all criteria pollutants and the current air quality is considered good and resilient to additional stress. The existing ambient air quality conditions in sensitive land areas (e.g., residences, schools, hospitals, hotels) on Tinian are affected primarily by proximity to mobile or stationary sources, including roadway, marine and aircraft traffic, and the power generating facility. Declines in air quality would be related to increases in population or new industry that would result in increased use of fossil fuels for energy generation or transportation. Although the CNMI government has goals to increase the tourism traffic that would increase the demand on fossil fuels, the CNMI government is also considering opportunities to reduce its dependence on fossil fuels for energy production.

5.3.4.1.2  Impacts of Present and Reasonably foreseeable Actions

Four present or reasonably foreseeable actions (Divert, Dynasty Ferry service, Alter City Resort and Tinian Ocean View Resort) would marginally contribute to impacts on the quality of air in the Tinian airshed due to potential increases in aircraft and marine vessel traffic and related air emissions.
The Dynasty Hotel Ferry and the two new resorts (Alter City Resort and Tinian Ocean View Resort) would increase civilian air and ferry traffic. There would be intermittent and short-term air emissions associated with the traffic.

The Department of Defense action, Divert, would contribute to impacts to air quality. There would be an increase in aircraft operations at the Tinian International Airport during the periodic Divert emergency response training. The training would be short-term, and would be scheduled to avoid the Tinian proposed training schedule.

There is potential for the present and reasonably foreseeable actions to result in a cumulative impact to Tinian airshed air quality.

5.3.4.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.4.3, Tinian. The three Tinian proposed action alternatives would result in similar less than significant impacts to Tinian’s air quality (see Table 5.3-1). No air quality impacts due to stationary sources (i.e., new or modified fixed or immobile facilities) would occur. Annual U.S. military training activities in Tinian would increase under the proposed action. Therefore, annual emissions for criteria pollutants would increase relative to the existing conditions. These emissions would originate from mobile sources during both the construction period and training exercises and contribute to the air quality impact. The majority of total carbon monoxide and nitrogen oxide emissions that exceed the comparative impact threshold of 250 tons (227 metric tons) would be generated by aircraft and seafaring vessels and would not result in impacts to air quality at ground level on land where human exposure would occur. Furthermore, the dominant trade winds in the region blowing from the east and northeast would quickly disperse emissions towards the ocean. Consequently, the emissions generated on Tinian would have less than significant impacts to air quality.

5.3.4.1.4 Potential Cumulative Impacts

There is a potential for impacts to air quality in the Tinian airshed for the proposed action and the present and reasonably foreseeable actions (Alter City Resort, Tinian Ocean View Resort, and the new 0.5 Million Gallon Reservoir). The actions would increase emissions mostly related to air and marine transportation. However, the cumulative impact at the island, regional, and global study areas would not appreciably impact the quality of the ambient air condition. Average annual emissions of most criteria pollutants would remain below the 250 tons (227 metric tons) per year threshold established in the Clean Air Act’s Prevention of Significant Deterioration program. In addition, the total ground level carbon monoxide and nitrogen oxide emissions would be well below the 250 tons (227 metric tons) per year comparative impact threshold. Furthermore, the dominant trade winds in the region blowing from the east and northeast would quickly disperse emissions towards the ocean. Also, the resource is resilient to future stresses on a regional and global scale. Impacts to greenhouse gas emissions from the proposed construction and training activities measured on a global scale would be negligible based on the predicted fraction of the U.S. emission inventory as discussed in Appendix G, Air Quality Technical Memo. Therefore, there would be no cumulative impact to the air quality of the Tinian airshed on a regional and global scale.
5.3.4.2 Pagan

5.3.4.2.1 Study Area and Health of Resources Considered

The study area for the air quality cumulative impact analysis is the airshed of Pagan. The analysis considered that actions within the Pagan airshed could influence air quality on a regional and global scale.

During World War II and historical agricultural production there were air emissions associated with the use of fossil fuels. The impacts on air quality were temporary. As described in Section 3.4.5, Pagan, Pagan is in an unclassified/attainment area for all criteria pollutants and the current air quality condition can be identified as good on a regional and global scale due to limited human activities on the island. However, periodic eruptions of existing volcanoes on Pagan have caused elevated sulfur dioxide emission levels with potentially high short-term ambient sulfur dioxide conditions resulting in short-term impacts to health and environment. The trend of good quality air with occasional heavy emissions related to periodic volcano eruptions is expected to continue.

5.3.4.2.2 Impacts of Present and Reasonably Foreseeable Actions

No present and reasonably foreseeable actions would have a potential impact to air quality. Therefore, there is no potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to Pagan airshed air quality.

5.3.4.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.4.4, Pagan. The Pagan proposed action alternatives would result in similar less than significant impacts to Pagan’s air quality, as summarized in Table 5.3-2. Air pollutant emissions would originate from mobile sources during both the construction period and training exercises. These emissions would originate from mobile sources during both the construction period and training exercises but would be well below the comparative impact threshold of 250 tons (227 metric tons) per year for all criteria pollutants, except for nitrogen oxide. However, because no sensitive land uses are located close to the proposed Range and Training Area (RTA) and the dominant trade winds in the region would quickly disperse all emissions (including nitrogen oxide or particulates from rock detonations) towards the ocean, operations would result in less than significant direct or indirect impacts to air quality.

5.3.4.2.4 Potential Cumulative Impacts

Present and reasonably foreseeable actions are not anticipated to impact air quality of the Pagan airshed. These actions are infrequent, transient, and geographically distinct. Furthermore, the dominant trade winds in the region blowing from the east and northeast would quickly disperse emissions towards the ocean. Impacts to greenhouse gas emissions from the proposed construction and training activities measured on a global scale would be negligible based on the predicted fraction of the U.S. emission inventory as discussed in Appendix G, Air Quality Technical Memo. Also, the resource is resilient to future stresses on a regional and global scale. Therefore, there would be no cumulative impact to air quality of the Pagan airshed on a regional or global scale.
5.3.5 Noise

5.3.5.1 Tinian

5.3.5.1.1 Study Area and Health of Resources Considered

The study area for the noise cumulative impact analysis is the land, submerged land, and airspace around Tinian and the southwestern half of Saipan. Section 3.5.4, Tinian, provides a detailed discussion of the current health of the Tinian noise environment. Ambient noise is unique in the discussion of historical trends in resource health, in that past events that have been discontinued (such as World War II) no longer have an impact to ambient noise. In this case, discussion of ambient noise at a point in time is also an assessment of resource health. The resource health of ambient noise is currently stable and mimics a rural or suburban town with minimal sleep or speech interfering events caused by noise. Because Tinian sensitive receptors are not burdened with high levels of ambient noise there is a potential for minor increases in ambient noise to continue to meet thresholds for land use compatibility and health effects. For this reason, the ambient noise levels are anticipated to remain relatively stable and very resilient to increases in future noise stressors.

The Tinian International Airport traffic and the infrequent U.S. military exercises in the Military Lease Area are the stressors that affect ambient noise levels; however, these stressors have not resulted in land use compatibility issues on Tinian or the southwestern half of Saipan.

5.3.5.1.2 Impacts of Present and Reasonably Foreseeable Actions

Reasonably foreseeable projects include Divert and two resorts (Tinian Ocean View Resort and Alter City), each of which could induce air traffic that would impact noise levels. The Divert training exercises would include increased air traffic at the Tinian International Airport and would potentially impact nearby residential populations. The exercises would occur at a maximum of 8 weeks per year and be of short duration. The impacts would not extend to Saipan.

There is potential for the present action to contribute to a cumulative impact to noise receptors.

5.3.5.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.5.3, Tinian. Construction noise impacts would be compatible with residential areas, and would not affect schools, places of worship, or hospitals (i.e., sensitive receptors). Aviation activities under all three proposed action alternatives would expose approximately 40 residents to noise levels greater than 65 decibels in the Marpo Heights area. Noise levels would be just over 66 decibels, but the increase over existing conditions would be about 19 decibels creating a significant impact from noise associated with aviation activities. Less than significant impacts would be associated with ground-based operations and traffic. No impact was identified for water operations or occupational noise. Refer to Section 5.3-9, Terrestrial Biology, for the potential impact to terrestrial biological resources from increased noise.
5.3.5.1.4 Potential Cumulative Impacts

The two resort projects would result in increased traffic and related noise at the Tinian International Airport. The Mariana Island Training and Testing and Divert training activities would increase the noise associated with aviation and may be concurrent with the proposed action aviation training. The Divert training would only be a maximum of 8 weeks per year and of short duration, and the impacts would not extend to Saipan. The impacts are limited to periods when Mariana Island Training and Testing and Divert training activities are occurring. However, if activities for the proposed action, Mariana Island Training and Testing and/or Divert occur at the same time, these impacts would be additive to the impacts identified for the proposed action as the same sensitive receptors would be affected by both actions. In addition, the proposed action would create noise audible to the same receptors during live-fire training. Therefore, there would be cumulative impacts to noise levels related to Tinian International Airport operations.

5.3.5.2 Pagan

5.3.5.2.1 Study Area and Health of Resources Considered

The study area for noise cumulative impact analysis is Pagan land, submerged land, and local airspace. Section 3.5.5, Pagan, provides a detailed discussion of the current health of Pagan noise. Therefore, the trend in ambient noise is anticipated to remain stable and very resilient to increases in future noise stressors.

Currently, and since 1981, the noise environment on Pagan would be considered rural or wilderness with the occasional aircraft or marine vessel visits. The ambient noise levels are compatible with the minimal land use and visiting population. There are visitors to the island but they do not impact the noise levels. There are no human activities on Pagan that generate noise at nuisance levels.

5.3.5.2.2 Impacts of Present and Reasonably Foreseeable Actions

No present and reasonably foreseeable actions would have a potential impact to the ambient noise environment on Pagan. There is no permanent residential population or sensitive land use, such as schools or medical facilities on Pagan that could be affected by any present or reasonably foreseeable action. Therefore, there is no potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to noise receptors.

5.3.5.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.5.4, Pagan. No long term noise impacts were identified for the proposed action on Pagan. Refer to Section 5.3.9, Terrestrial Biology, for the potential impact to terrestrial biological resources from increased noise. Supersonic activities would be infrequent, occurring about 30 times per year, for approximately 1 minute each time, and above 10,000 feet (3,048 meters) mean sea level (MSL). During training periods, the public would be restricted from accessing the Pagan RTA encumbered by surface danger zones for safety reasons. Depending on the type of training and training scenario, other portions of the island and surrounding waterways may be used for training and public access would be restricted in those areas. While there
may be visitors on Pagan, the number of visitors is unknown, they would be present for short periods of
time, and they are not present outside of southern Pagan during training events. No sensitive receptors
would be exposed to elevated noise levels.

5.3.5.2.4 Potential Cumulative Impacts

No present and reasonably foreseeable actions would have a potential impact to the ambient noise
environment on Pagan. These actions are infrequent, transient, and short-term in duration. Furthermore, while there may be visitors on Pagan, the number of visitors is unknown, they would be
present for short periods of time, and they are not present outside of southern Pagan during training
events. Therefore, there would be no cumulative impact to the ambient noise environment on Pagan.

5.3.6 Airspace

5.3.6.1 Tinian

5.3.6.1.1 Study Area and Health of Resources Considered

The study area for airspace cumulative impact analysis associated with the airspace supporting arrivals
and departures to Tinian International Airport and Saipan International Airport is the 12-nautical mile
(22-kilometer) radius of Tinian (i.e., the Military Operations Area) from the surface up to 18,000 feet
(5,486 meters) MSL. Additionally, the airspace outside of the 12-nautical mile (22 kilometer) radius,
where other airspace used by the U.S. military exists forms the study area for the cumulative impact
analysis for commercial air traffic transiting the area on published aviation routes.

The airspace within the study area is somewhat constrained from current uses; however, there is
opportunity for increased use of and changes in airspace use. The trend is likely to be an increase in
airspace constraints; however, airspace is anticipated to be resilient to increases in constraints because
it will be managed and regulated by Federal Aviation Administration to ensure safe and efficient use of
the airspace by all users.

Section 3.6.4, Tinian, provides a detailed discussion of the current condition of Tinian airspace. The
airspace surrounding Tinian and Saipan includes Class E and Class G. Tinian International Airport lies with
Class G airspace with Class E airspace beginning at 700 feet (210 meters) above ground level. Saipan
International Airport lies within Class D airspace with Class E transition airspace needed to support
instrument flight rule arrivals and departures by commercial airlines, charter aircraft, and U.S. military
transport. The current fleet of single engine airplanes operating between Tinian and Saipan are required
to use the shortest distance between land masses and remain within glide distance to shore. The
current primary flight route between Tinian and Saipan International Airports is directly over the
Military Lease Area; however, this is not a published route.

The existing airspace available for U.S. military training in the Mariana Islands consists of one military
training route (IR-983), one warning area (W-517), one restricted area (R-7201), and seven Air Traffic
Control Assigned Airspaces (see Appendix I, Airspace Technical Memo, Figure 4). Civilian aircraft
transiting the area on federal airways are either routed around the active airspace or allowed to transit
the airspace by the controlling agency. As can be seen in Table 5.3-3, there are currently 82,375 square
nautical miles (282,541 square kilometers) of airspace available for U.S. military training purposes in the CNMI.

Table 5.3-3. Existing CNMI Airspace Available for U.S. Military Training

<table>
<thead>
<tr>
<th>Airspace</th>
<th>Square Nautical Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>W-517</td>
<td>8,704</td>
</tr>
<tr>
<td><strong>Total Warning Area</strong></td>
<td><strong>8,704</strong></td>
</tr>
<tr>
<td>R-7201</td>
<td>29</td>
</tr>
<tr>
<td><strong>Total Restricted Airspace</strong></td>
<td><strong>29</strong></td>
</tr>
<tr>
<td>Air Traffic Control Assigned Airspace 1</td>
<td>10,601</td>
</tr>
<tr>
<td>Air Traffic Control Assigned Airspace 2</td>
<td>13,524</td>
</tr>
<tr>
<td>Air Traffic Control Assigned Airspace 3A</td>
<td>5,000</td>
</tr>
<tr>
<td>Air Traffic Control Assigned Airspace 3B</td>
<td>7,750</td>
</tr>
<tr>
<td>Air Traffic Control Assigned Airspace 3C</td>
<td>8,000</td>
</tr>
<tr>
<td>Air Traffic Control Assigned Airspace 5</td>
<td>10,216</td>
</tr>
<tr>
<td>Air Traffic Control Assigned Airspace 6</td>
<td>18,551</td>
</tr>
<tr>
<td><strong>Total Air Traffic Control Assigned Airspace</strong></td>
<td><strong>73,642</strong></td>
</tr>
<tr>
<td><strong>Total Airspace Available for U.S. Military Use</strong></td>
<td><strong>82,375</strong></td>
</tr>
</tbody>
</table>

Air Traffic Control Assigned Airspace 6 lies directly over the islands of Tinian and Saipan. It has a floor of 40,000 feet (12,200 meters) and a ceiling of 60,000 feet (18,300 meters) and covers approximately 18,551 square nautical miles (63,628 square kilometers). The airspace between 30,000 feet (9,100 meters) and 40,000 feet (12,200 meters) MSL lies between the proposed Tinian Air Traffic Control Assigned Airspace and Air Traffic Control Assigned Airspace 6. This 10,000 feet (3,000 meters) of airspace would remain available for commercial airliners transiting the area at higher altitudes. Special Use Airspace lies to the east of Tinian and Saipan. Restricted Area 7201 surrounds the Island of Farallon de Medinilla. Three Air Traffic Control Assigned Airspace areas (3A, 3B, and 3C) are requested when needed in support of aircraft and ship-to-shore training operations. When in use, commercial air traffic is routed around the airspace or allowed to transit the area by the controlling agency. Air Traffic Control Assigned Airspace 1, 2, and 5 and W-517 are located to the south and west of Guam and would not be expected to result in cumulative impacts with the proposed action.

Tinian North Field is a U.S. military operated World War II-era airfield that is currently used by the U.S. military to support fixed wing and helicopter training activities such as airlift of personnel, cargo drops, firefighting, and search-and-rescue. Tinian North Field lies beneath Saipan International Airport’s approach corridor and is within Saipan International Airport’s Class E airspace. Procedures are in place to ensure aircraft operating at Tinian North Field do not impact civilian aircraft operations or the arrivals to Saipan International Airport.

Airspace designated for U.S. military use is coordinated by Joint Region Marianas with the Federal Aviation Administration. Military Training Route Instrument Route 983 is aligned 8 nautical miles (15 kilometers) west of Tinian and historically only used 4-6 times per year. Air Traffic Control Assigned Airspace 6 lies directly over Tinian and Saipan and Air Traffic Control Assigned Airspace 3A, 3B, and 3C lies within 30 nautical miles (56 kilometers) of Tinian. Restricted Area 7201 is located within 50 nautical miles (93 kilometers) of Tinian. All U.S. military airspace is activated by a Notice to Airmen.
5.3.6.1.2 Impacts of Present and Reasonably Foreseeable Actions

Four present and reasonably foreseeable projects would affect air traffic leading to an impact to airspace. For an action to contribute to a cumulative impact to airspace, the action must directly affect the airspace by causing a change to air navigation routes or creating new or altering existing airspace restrictions that impact civilian air traffic. An increase in the use of a specific class of airspace or creation of new Special Use Airspace would not necessarily have an impact to airspace as a whole. New Special Use Airspace requests are subject to Federal Aviation Administration analysis and approval and are only granted if the proposed new airspace will not interfere with the safe and efficient use of airspace by all users. Air traffic and airport facility impacts are addressed under air transportation sections throughout this EIS/OEIS.

There are two proposed Department of Defense projects: Divert (see Section 5.2.2.1, Divert Activities and Exercises (Divert)) and Mariana Islands Range Complex Airspace (see Section 5.2.2.3, Mariana Islands Range Complex Airspace). The Divert EIS analyzes proposed improvements to an existing airport or airports and associated infrastructure by constructing facilities to support a combination of cargo, fighter, and tanker aircraft and associated support personnel for Divert landings, periodic training exercises, and humanitarian assistance and disaster relief. The Divert action would have short-term, periodic, moderate, direct, impacts to the immediate airspace and airfield operations due to implementation of joint U.S. military exercises. No new airspace restrictions would be required. The Divert training exercises are within the training levels proposed in the Mariana Islands Range Complex EIS/OEIS that was completed in 2010 (DoN 2010a). The action would not contribute to a cumulative impact because there would be no change to air navigation routes or new airspace restrictions imposed.

The proposed Alter City Resort and Tinian Ocean View Resort would require an increase in civilian air traffic, but they would not require a change to air navigation routes and would not contribute to an impact to airspace.

The Dynasty Hotel’s proposed ferry service between Tinian and Saipan would reduce the need for charter flights to and from Saipan. If implemented, there is a potential for reduced requirement for commuter air traffic needing to use the Commuter Flight Route and a beneficial impact to airspace. This present action could have a beneficial impact to airspace.

There is potential for the present and reasonably foreseeable actions to contribute to both beneficial and adverse cumulative impacts to Tinian airspace.

5.3.6.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.6.3, Tinian. The airspace impacts would be the same among all three Tinian alternatives. Activation of the proposed restricted airspace and a Tinian Military Operations Area to support U.S. military training on Tinian would directly impact arriving and departing flights at both Tinian and Saipan International Airports, as well as flights communting between the islands within the CNMI. No direct impacts would be expected for international flights transiting commercial airways. There would be direct impacts to aircraft arriving and departing Saipan and Tinian International airports. Commuter flights between islands would be rerouted when restricted areas are activated for training. If rerouted to the west around the Restricted Area, there
would be indirect impacts, such as longer flights and increased fuel consumption. However, this would only occur up to two hours per day for up to 135 days per year.

Activation of the Tinian Military Operations Area independent of the restricted airspace would not be expected to impact commuter flight routes as commuter air traffic would be expected to remain below 3,000 feet (914 meters) MSL.

The proposed action would not include operations at Saipan International Airport; however, it would involve use of the same airspace. U.S. military personnel would engage in air and ground activities that could have an effect on aircraft operations, published approaches, and current airspace procedures up to 140 days per year that the Restricted Area 7203A/B/C/W and the Tinian Military Operations Area are scheduled and activated for use. Published times of use, Notices to Airmen, proper range scheduling and aircraft notification procedures (i.e., real-time voice advisories) would be in place to ensure no significant disruption of large commercial jet operations at Saipan International Airport.

The existing airspace available for U.S. military training in the Mariana Islands consists of one military training route (IR-983), one Warning Area, one Restricted Area, and eight Air Traffic Control Assigned Airspaces (see Figure 4 in Appendix I, Airspace Technical Memo). The proposed action would have no impact to the military training route. Civilian aircraft transiting the area on federal airways are either routed around the active airspace or allowed to transit the airspace by the controlling agency.

Determination of the extent of the impact, as well as any additional mitigation required, is pending completion of the U.S. military’s coordination with the Federal Aviation Administration. When coordination is complete, less than significant impacts to airspace management and airport operations would be expected. Additional mitigations developed during the coordination process would ensure safe and timely access to Saipan International Airport.

5.3.6.1.4 Potential Cumulative Impacts

There would be potential for the proposed action and present and reasonably foreseeable actions to result in impacts to airspace for aircraft operating to and from the Tinian and Saipan International Airports. All actions increase the use of airspace proposed for U.S. military training purposes. The resort projects would increase the use of airspace for commercial aircraft operations. The Divert action would result in an increase of U.S. military operations. It would have short-term, periodic, moderate, direct impacts to the immediate airspace and airfield operations due to implementation of joint U.S. military exercises. No new airspace restrictions would be required. These training exercises are within the training levels proposed in the Mariana Islands Range Complex EIS that was completed in 2010 (DoN 2010a). If Divert exercises were conducted at the same time as the proposed CJMT activities, additional effects on airspace use could occur.

The Federal Aviation Administration manages the cumulative impact of air traffic and Special Use Airspace to ensure there are no significant impacts to users of the airspace. The Federal Aviation Administration consultation and decision is considered mitigation for the impacts to airspace. Completion of coordination with the Federal Aviation Administration and Commonwealth Ports Authority is pending. Assuming acceptable mitigation measures are developed in coordination with Federal Aviation Administration and Commonwealth Ports Authority, there would not be a cumulative impact to Tinian airspace.
5.3.6.2 Pagan

5.3.6.2.1 Study Area and Health of Resources Considered

The study area for the airspace cumulative impact analysis is the 60 by 80 nautical mile (110 by 150 kilometer) quadrilateral area from the center of Pagan (i.e., dimensions of proposed Warning Area 14) from the surface up to 60,000 feet (18,300 kilometers) MSL and the airspace associated with commercial airliners. There are two commercial airways within 60 nautical miles (110 kilometers) of Pagan (see Figure 3.6-8). A337 lies about 23 nautical miles (43 kilometers) to the east and G205 is located approximately 40 nautical miles (70 kilometers) to the west. Aircraft utilizing these airways would be expected to be at altitudes at or above 30,000 feet (9,200 kilometers) or at altitudes directed by Air Traffic Control. Air traffic and airport facility impacts are addressed under Air Transportation sections throughout this EIS/OEIS.

The airspace within the Pagan study area is unconstrained due to limited current use and there is opportunity for future restrictions on airspace and increased use of existing airspace. However, airspace is anticipated to be resilient to increases in constraints because it will be managed and regulated by the Federal Aviation Administration to ensure safe and efficient use of the airspace by all users.

Section 3.6.5, Pagan provides a detailed discussion of the current condition of Pagan airspace. The Pagan airfield is located within Class G airspace and pilots use visual flight rules. Pagan supports one unimproved (turf and gravel) public airfield (designated Runway 11/29) that was closed in 1981. There were 240 annual operations reported at Pagan Airport from September 1979 to September 1980. In contrast, 10 to 24 annual operations were reported between 2004 and 2007. The 1981 lava flows truncated the runway and the population was evacuated. Only rotary-wing aircraft (helicopters), tilt-rotor aircraft (i.e., MV-22 Osprey), and small planes can use the truncated airfield. Injured persons from the Northern Islands may travel by boat to Pagan and fly to Saipan. Similarly, cargo is flown to Pagan and is shipped to the Northern Islands and vice versa.

The airspace surrounding Pagan is uncontrolled Class E airspace with no radar coverage. Aircraft transiting airways near Pagan are tracked/monitored using procedural control methods by Oakland Center Air Route Traffic Control Center. Currently, there is no Special Use Airspace associated with Pagan.

5.3.6.2.2 Impacts of Present and Reasonably Foreseeable Actions

For an action to contribute to a cumulative impact to Pagan’s airspace and airfield, an action must directly affect the airspace or airfield by creating new or altering existing airspace that would impact civilian air traffic. Of the present and reasonably foreseeable actions, only the Mariana Islands Range Complex Airspace EA/OEA (see Section 5.2.2.3, Mariana Islands Range Complex Airspace) would contribute to an airspace impact. No reasonably foreseeable actions would impact airspace. The creation of new airspace would result in a potential impact to commercial air traffic due to an increase in the distance and time en route for air traffic traversing airway A337 and G205 as they both transect the proposed W-14. This action would contribute to an impact to airspace.

Mariana Islands Range Complex Airspace action’s potential impacts to airspace are summarized in Section 5.2.2.3, Mariana Islands Range Complex Airspace. Mariana Islands Range Complex Airspace
EA/OEA proposed changes to airspace would result in a 2,012 square nautical miles (6,900 square kilometers) reduction in the amount of airspace available for U.S. military training. The proposed Warning Area 13A would form the lower boundary of proposed Warning Area 14. Both warning areas activated at the same time would contribute to an impact to airspace. Activation of each area simultaneously could cause civilian aircraft transiting on commercial aviation route A337 to points northwest to travel additional distances, increasing fuel consumption and travel time. A Federal Aviation Administration-completed air traffic analysis found 10 civilian/commercial tracks on or parallel to aviation route A337 during a 7-day period (DoN 2013b).

There is potential for one present action to contribute to cumulative impacts to Pagan airspace.

### 5.3.6.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action for the 16 weeks of annual training on Pagan are detailed in Section 4.6.4, *Pagan*. Both Pagan proposed action alternatives would have similar impacts to airspace. The establishment of new Special Use Airspace to support U.S. military training on Pagan would impact air traffic traversing airway A337 and G205 as they both transect the proposed Warning Area 14 (see Figure 4.6-1). When Warning Area 14 is active aircraft using these airways would have to be re-routed. Pagan Airfield lies within Restricted Area 7204A, and access to the airfield is through Warning Area 14 and Restricted Area 7204D. During the days when aviation training activities occur, access to the Pagan airfield by non-participating aircraft would be allowed through coordination with the Marine Corps Range controllers. Determination of the extent of the impact, as well as any additional mitigation required, is pending completion of the U.S. military’s coordination with the Federal Aviation Administration. When coordination is complete, less than significant impacts to airspace management would be expected.

### 5.3.6.2.4 Potential Cumulative Impacts

There would be potential for airspace impacts due to the proposed action and the Mariana Islands Range Complex Airspace modifications. However, the airspace has capacity for increased use. The Federal Aviation Administration manages the cumulative impact of air traffic and Special Use Airspace to ensure there are no significant impacts to users of the airspace. The Federal Aviation Administration consultation and decision is considered mitigation for the impacts to airspace. None of the other present and reasonably foreseeable actions would have a potential impact to Pagan airspace. Therefore, there would be no cumulative impact to Pagan airspace.

### 5.3.7 Land and Submerged Land Use

#### 5.3.7.1 Tinian

##### 5.3.7.1.1 Study Area and Health of Resources Considered

The study area for the land and submerged land use cumulative impact analysis includes the entire land area of Tinian and submerged land within 3 miles (5 kilometers) of the Tinian shoreline. The land and submerged land use is resilient to increases in future land and submerged land use changes due to the CNMI government control over changes in land use. This trend is likely to continue.
As described in Section 3.7.4, Tinian, land use on Tinian has seen drastic changes over the past century. In the 1920s when the Japanese controlled Tinian, approximately 95% of Tinian’s native limestone forests were converted to sugarcane fields. During World War II, the fortified island was a battleground, and when the U.S. gained control, Tinian was developed as a major U.S. military airbase. In the post-World War II-era, Tinian has been characterized as being rural with subsistence land uses. In the 1990s, Tinian’s economy was tourism-based and the land and submerged land were viewed as a resource to support tourism. There was a decline in the tourism industry in the late 2000s, and the planned construction of multiple resorts did not materialize.

Currently, major land uses include U.S. military use of the northern two-thirds of the island, grazing and agricultural use in the middle portion of the island (excluding the airport area), homestead development and urban use in San Jose, a resort in south San Jose, and homestead and agricultural use in the southern portion of the island. The CNMI government manages land use compatibilities outside the Military Lease Area; therefore, future land uses in this area would likely be compatible with existing land uses.

As summarized in Appendix K, Summary of Historical Land Use Agreements Between the U.S. and the CNMI, the U.S. leased 17,798 acres (7,203 hectares) on Tinian in the 1965 agreement and currently leases 15,148 acres (6,130 hectares) on Tinian. The U.S. has a significant influence on land uses, especially in the Military Lease Area. Since the 1990s, the trend has been for the U.S. to identify surplus land and return control to the CNMI government. This trend to return control to the CNMI has been perceived as a positive trend in land ownership. Under the current 50-year lease, the ownership is considered to be in a plateau.

The submerged land adjacent to U.S. leased lands is federal submerged land. The federal submerged land has not changed appreciably since the original lease. The submerged lands are used for fishing and anchoring the occasional visiting ship.

Training exercises on Tinian have resulted in periodic restrictions on public access to the Military Lease Area land and submerged lands. The type, frequency, and duration of these exercises have been consistent with those described under the 2010 Mariana Islands Range Complex EIS/OEIS Record of Decision. Changes to the type, frequency, and duration of U.S. military training would require NEPA compliance.

Land use and management control is subject to the CNMI government approval. The CNMI government is responsible for analyzing the potential benefits and impacts of proposed land uses on behalf of the community. This requires a balance of various land uses and economic considerations that are consistent with prevailing community values. The CNMI issued a land lease to the U.S. military for most of Tinian (see Appendix K, Summary of Historical Land Use Agreements between the U.S. and the CNMI), which is likely to remain consistent through the terms of the lease. Outside of the Military Lease Area, the CNMI government approves leases and issues building permits. There is capacity on Tinian outside the Military Lease Area for land use development.

### 5.3.7.1.2 Impacts of Present and Reasonably Foreseeable Actions

There are eight present and reasonably foreseeable actions that would have adverse or beneficial impacts to land and submerged land use. Four of the actions would have a potential beneficial impact
because they would support the CNMI land use planning (West San Jose Village Homesteads) or improve/remediate lands for future use (Brownfields Grants, Masalog Ammunition Depot Cleanup, and Chiget Mortar Range Cleanup).

The two resort projects (Alter City Resort and Tinian Ocean View Resort) represent major development projects that alter existing land use with a potential for impact; however, the land uses are subject to CNMI government approval. The assumption is that, given government approval, the resorts would be compatible with surrounding land uses and long range master planning.

One present action (Mariana Island Training and Testing) would have an impact to land use because of an increase in the frequency of U.S. military training on Tinian. The training affects the land use at the Tinian International Airport, increases the public access restrictions to the Military Lease Area, and affects the ambient noise levels.

There is potential for the present and reasonably foreseeable actions to contribute to both beneficial and adverse cumulative impacts to land and submerged land use.

5.3.7.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.7.3, Tinian. All three Tinian proposed action alternatives would result in a minor increase the acreage under federal jurisdictional control. This is considered a less than significant impact. Tinian Alternative 2 would result in the elimination of an existing land use (International Broadcasting Bureau), which is considered a significant impact.

There would be significant impacts associated with public access restrictions to Military Lease Area and associated submerged lands during training events. The public and visitors to Tinian use the Military Lease Area for recreation, tourism, fishing, agriculture, cattle grazing, and cultural activities. Areas within the Military Lease Area that would be restricted, including North Field, historic and cultural sites, and beaches, are areas that are valued by the community. The impacts to these specific activities are addressed under other resource areas (e.g., recreation, socioeconomics and environmental justice).

Under all three Tinian proposed action alternatives, there would be significant land use incompatibilities associated with the Tinian Military Retention Land for Wildlife Conservation and the agricultural and cattle grazing activities in the Lease Back Area. There are competing uses for land and agriculture/grazing land is one use that requires a lot of land area. The reduction in land available for agriculture/grazing contributes to the impact of limited land availability for those uses as well as other uses, such as conservation, recreation, homestead development, etc. Table 4.20-3, Summary of Potential Mitigation Measures lists potential mitigation for the impacts to the Tinian Military Retention Land for Wildlife Conservation and grazing areas.

Training noise generated by the proposed action would have a less than significant impact to nearby land uses outside the Military Lease Area on Tinian and the southwestern portion of Saipan. The impact would be compatible with the existing land uses, but the noise would be detectable.
5.3.7.1.4 Potential Cumulative Impacts

The two resort projects would be geographically distinct the U.S. military actions. These actions would be sited outside of the Military Lease Area. This would add visitors that would potentially visit accessible areas within the Military Lease Area. This would add to the public access restriction impacts associated with proposed military training. There would be a potential impact to land use due to the present and reasonably foreseeable actions and the proposed action, primarily due to other U.S. military actions (the Mariana Island Training and Testing, and Divert) as they would impact some of the same geographic areas. All U.S. military training activities would be coordinated by range management, and the assumption is that there would be some overlap in military training in order to maximize the number of days per year that the public would have access to land and submerged land. Training schedule management would minimize but not eliminate the additive effect. Therefore, there would be cumulative impacts to land and submerged land use, primarily due to public access restrictions to land and submerged land.

5.3.7.2 Pagan

5.3.7.2.1 Study Area and Health of Resources Considered

The study area for the land and submerged land use cumulative impact analysis includes the entire land area of Pagan and submerged land within 3 miles (5 kilometers) of the Pagan shoreline. The land use resource is considered resilient to future land use changes due to the development approval processes. This trend is likely to continue.

As described in Section 3.7.5, Pagan, land and submerged land use on Pagan has largely been affected by the volcanic eruption and associated constraints that have prevented resettlement and development of Pagan. The few visitors to the island use the land for camping, fishing, hunting, and other recreational activities as well as cultural activities. The submerged lands are used for fishing and anchoring the occasional visiting ship.

Land use and management control is subject to the CNMI government approval (see Appendix K, Summary of Historical Land Use Agreements between the U.S. and the CNMI). The lack of infrastructure and health and safety support would need to be addressed prior to authorizing residential land use. It is anticipated that land use changes and future development would continue to be consistent with approved land use plans.

5.3.7.2.2 Impacts of Present and Reasonably Foreseeable Actions

There are three present and reasonably foreseeable actions that could have a beneficial impact to land use (Chamorro Conference, Silver Explorer Cruise Ship Visit, and Ecotourism) if they are realized. There would be no permanent infrastructure, and the uses would be temporary. The uses are approved by CNMI and determined to be compatible land uses. There are no changes to jurisdictional control of Pagan or submerged lands under the present and reasonably foreseeable action.

There is potential for the present and reasonably foreseeable actions to contribute to cumulative impacts to land and submerged land use.
5.3.7.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.7.4, *Pagan*. The proposed action would change the jurisdictional control of Pagan to the federal government, likely through a long-term real estate agreement. This change would be a significant impact. The submerged lands would remain under CNMI jurisdictional control; however, the federal government would be able to restrict public access to submerged lands during training for safety reasons.

There is no CNMI land use designation for Pagan, so it is therefore assumed to be conservation. Training activities are not compatible with this designation. The impact would be significant.

The CNMI government issues temporary use permits for visitors to Pagan, but there is no permanent resident population due, in part, to the CNMI government’s evacuation of the island, ongoing volcanic risks, travel distance, and lack of infrastructure. However, access to the island is valued by the Northern Islands community. During training periods, the public would be restricted from accessing the Pagan RTA encumbered by surface danger zones for safety reasons. Depending on the type of training and training scenario, other portions of the island and surrounding waterways may be used for training and public access would be restricted in those areas during training events. The intent is to provide public access to Pagan to the extent practical. The real estate agreement would restrict public access to specific areas of Pagan for safety reasons. This proposed limited public access is considered a less than significant impact, based, in part, on the lack of a permanent population.

Members of the Northern Islands community have cultural ties to the island and an interest to create homesteads, as described in Section 4.15, *Socioeconomics and Environmental Justice*. Resettlement would be precluded by the proposed action; therefore, this would contribute to a cumulative impact.

5.3.7.2.4 Potential Cumulative Impacts

These actions are infrequent, transient, and geographically distinct. Under the proposed action, the isthmus and northern portion of Pagan would be placed off limits to the public during live-fire training events 16 weeks per year. The remainder of the year all areas of the island, except the High Hazard Impact Areas, would be accessible to the public. Prior scheduling would allow the reasonably foreseeable actions to occur when proposed military training is not occurring. In addition, resettlement would be precluded by the proposed action. Therefore, there would be cumulative impacts to land and submerged land use, and some impacts would be beneficial.

5.3.8 Recreation

5.3.8.1 Tinian

5.3.8.1.1 Study Area and Health of Resources Considered

The study area for the recreation cumulative impact analysis is the island of Tinian and submerged land. While the capacity of existing resources to meet current demand is stable, the trend for recreational opportunity is in a gradual decline due to the limited ability to maintain existing resources.
As described in Section 3.8.4, Tinian, tourism and its associated recreational components are relatively new pursuits on Tinian. While there have been recreational activities, events, and cultural destinations on Tinian for generations, the economic and cultural role and value of recreational opportunities have become a focus of attention with the advent of commercial tourism on the island. With approval of casino gambling and the construction of the Tinian Dynasty Hotel and Casino in 1998, tourism, access to the island, and the designation and maintenance of recreational, cultural, and historical sites for visitor enjoyment have become more important.

The most popular activities for visitors include historical island tours, snorkeling, and water sports on the beach. However, there is a concern that the growth of Tinian’s tourism industry is hindered by the lack of attractions, nightlife, and children’s activities. There are currently limited options for recreation and few planned new recreation experiences. Current options include packaged tours provided by the Tinian Dynasty and Star Marianas to see the historic and cultural sites and beaches; private charter boats for sight-seeing, diving, and recreational fishing; and beach rentals of snorkel equipment, personal watercraft, and banana boats at Tachogna Beach. These limitations influence the visitors’ average length of stay on the island, the number of repeat visitors, and the overall value that visitors provide in spreading economic benefit through the community (Mariana Visitors Authority 2012).

The Mariana Visitors Authority and the Tinian Dynasty Hotel and Casino actively market visitor experiences, services, and specific events on Tinian. However, there is no formal agency or agencies (aside from the limited role of the CNMI Divisions of Parks and Recreation and Sports and Recreation) tasked to maintain, enhance or develop recreational, historical, or cultural resources on the island. As a result, many of the recreational resources on Tinian suffer from disrepair, vegetation overgrowth, and lack of adequate signage.

The recreational opportunities have great potential for expansion with favorable economic trends. Recreational opportunities are a primary driver for tourism on Tinian. Increased economic growth would likely result in improved management of recreational resources, but there are some critical infrastructure requirements that need to be addressed before the tourism industry can grow.

5.3.8.1.2 Impacts of Present and Reasonably Foreseeable Actions

There are four present and reasonably foreseeable actions that contribute to cumulative impacts on Tinian recreational resources (Divert, Mariana Islands Training and Testing, Alter City Resort, and Tinian Ocean View Resort).

Recreational impacts were addressed under the socioeconomics section of the Mariana Islands Training and Testing EIS/OEIS. Most of the training activities would occur in the open ocean and most of the impacts identified are to marine resources. No impacts to tourism or recreational activities were identified. Divert would have minor impacts on recreation due to limits on public access to recreational activities.

The two resort projects, Alter City Resort and Tinian Ocean View Resort, would provide new recreational opportunities for their guests, but may increase the demand on existing public recreational resources outside of the resorts.

There is potential for the present and reasonably foreseeable actions to contribute to both beneficial and adverse cumulative impacts to recreational opportunities on Tinian.
5.3.8.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Similar significant impacts to recreational resources were identified for all three Tinian proposed action alternatives that are described in Section 4.8.3, Tinian. The impacts would be a result of the new public access restrictions to the Military Lease Area during training events. The proposed action includes an access plan that would address many of the impacts related to limited access, but the access plan would not necessarily reduce impacts to less than significant.

Limited access to cultural sites is considered a significant impact because 10 out of 12 historic sites are within the Military Lease Area. Similarly, the limited visitor access to the Blow Hole would be a significant impact.

There are annual festivals that would be significantly impacted by the training events. Proposed mitigation would be, to the extent possible, schedule training events to avoid predictable peak visitor periods such as annual festivals.

The proposed action would result in significant impacts to ocean-based recreational resources, including four of the five most popular snorkeling/dive sites and popular fishing sites due to limited access. There would be less than significant noise impacts to ocean-based recreational use.

Roadways within the Military Lease Area would be improved and result in a beneficial impact to public access to recreational resources. Part of Broadway Avenue would be closed, but an improved 8th Avenue would provide an alternative route to recreational sites.

Although there would be some beneficial impacts, the overall impact would be significant to recreational resources.

5.3.8.1.4 Potential Cumulative Impacts

There would be potential impacts to recreational resources resulting from the increase in baseline training activities under Mariana Islands Training and Testing EIS/OEIS and the proposed action. All U.S. military training activities would be coordinated by range management, and the assumption is there would be some overlap in order to maximize the number of days per year that the public would have access to recreational resources in the Military Lease Area. The impacts would be as described for the proposed action.

In conjunction with the two reasonably foreseeable resort projects, there would be increased demand on the recreational resources outside of the Military Lease Area because of restricted access to the recreational resources within the Military Lease Area. The condition of the existing recreational resources island-wide is generally declining due to lack of maintenance. The potential increased demand on recreational resources outside the Military Lease Area during U.S. military training would contribute to the poor condition.

The Mariana Island Training and Testing plus the proposed action would impact the same geographic area, but training schedule management would minimize the cumulative effect. For these reasons, there would be cumulative impacts to the availability of recreational opportunities, the condition of recreational resources, and user experience.
5.3.8.2 Pagan

5.3.8.2.1 Study Area and Health of Resources Considered

The study area for the recreation cumulative impact analysis is Pagan land and submerged land. The recreational opportunities would be resilient to future recreational pressure due to the great potential for expansion and low demand. This trend is likely to continue.

Section 3.8.5, Pagan, provides a discussion of the current health of recreation on Pagan. Currently, the only anticipated recreational resource development on Pagan is associated with ecotourism. However, there have been discussions about developing Pagan as an ecotourism destination and a staging area for visitors to the Marianas Trench Marine National Monument, and the CNMI Mayor’s Office has a plan for the socioeconomic development of Pagan. This development includes ecotourism, heritage tourism, geo-tourism, the construction of replicas of ancient Chamorro structures, aquaculture, agriculture, fishing, fishery, cultivation of black pearls and black coral, diving, a scientific research laboratory, and geothermal energy production (Todiño 2014). However, these discussions have not resulted in the establishment of Pagan as a destination for official tourism or recreational activities.

One obvious drawback to recreational use of Pagan is the volcanic volatility of Mount Pagan and the possibility of future eruptions. Other constraints to recreational opportunity development include the long distance from Pagan to Saipan (173 nautical miles [320 kilometers]), the lack of seaport or airport facilities (other than the truncated, grass airfield), the lack of developed freshwater sources and infrastructure, and the possible presence of unexploded ordnance dating from World War II battles. There are occasional ecotourism visits to the island that have had negligible impacts on the recreational resources.

5.3.8.2.2 Impacts of Present and Reasonably Foreseeable Actions

There are two present and reasonably foreseeable actions that would have beneficial impacts to recreational resources on Pagan (Ecotourism and the Silver Explorer Cruise Ship Visit). The Silver Explorer Cruise Ship Visit occurred in 2014 with no long term impact to recreational resources. But it does set a precedent for future cruise ship visits. The excursion did not involve overnight stays on Pagan. Similarly, the potential for reasonably foreseeable temporary permits authorizing ecotourism or cultural activities would have a beneficial impact to recreational opportunities on Pagan.

There is potential for the present and reasonably foreseeable actions to contribute to beneficial cumulative impacts to recreational resources on Pagan.

5.3.8.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.8.4, Pagan. There are similar less than significant impacts to recreational resources anticipated with either of the two Pagan proposed action alternatives. Both alternatives propose permanent closure of the High Hazard Impact Area, restricted access and intermittent closure of the northern portion of the island, and establishment of a perimeter danger zone offshore of the island during 16 weeks of training per year. During training periods, the public would be restricted from accessing those areas of Pagan encumbered by surface danger zones for safety reasons. Depending on the type of training and training scenario, areas of the...
island and surrounding waterways may be available for public access while training is occurring. The intent would be to provide public access to Pagan to the greatest extent practical. The public restriction on Pagan access during training events may preclude some recreational opportunities. Although there are no established and authorized long-term recreational uses on the island or in the submerged lands that would be impacted by this action, there have been visits to Pagan for ecotourism and cultural practices, and the natural resources provide recreational opportunities.

The impacts are considered less than significant impacts to recreational resources.

5.3.8.2.4 Potential Cumulative Impacts

The present and reasonably foreseeable actions (Chamorro Conference, Silver Explorer Cruise Ship Visit, and Ecotourism) would impact access to recreational opportunities. However, there would be a balance of beneficial and adverse impacts. There are no formally identified recreational facilities on Pagan, and Pagan hosts occasional recreational visitors. Under the proposed action, the isthmus and northern portion of Pagan would be placed off limits to the public during live-fire training events 16 weeks per year. The remainder of the year all areas of the island, except the High Hazard Impact Area, would be accessible to the public. Prior scheduling would allow the reasonably foreseeable actions to occur when proposed military training is not occurring. The proposed action would not substantially limit or prohibit access to recreational resources, nor would it substantially reduce the number of recreational opportunities. In addition, advance coordination would allow scheduling of visits to Pagan to happen at times when training is not scheduled to occur. There would be no cumulative impact to recreational resources due to the limited population affected and lack of established recreational resources on island.

5.3.9 Terrestrial Biology

5.3.9.1 Tinian

5.3.9.1.1 Study Area and Health of Resources Considered

The study area for the terrestrial biology cumulative impact analysis is the island of Tinian. The health of the terrestrial biology on Tinian has been compromised due to the impacts of historical crop production, World War II, and post-war activities. In recent history, recovery plans for individual species that are at critically low population levels have been developed and local regulations were drafted to protect species from hunting. Some stresses have had a lasting impact but some impacts appear to be of short duration. In general the resource is slowly recovering from historical impacts; however, it is not resilient to future stress. Overall, the trend in terrestrial biological resources is likely to continue.

As described in Section 3.9.4, Tinian, the vegetation communities on Tinian were altered by historical agricultural use prior to World War II and activities during and after World War II. The native limestone forest that once dominated the island currently represents about 5% of the vegetation community. The non-native tangantangan dominates the vegetation cover. The loss of this limestone forest has contributed to the decline of native bird species, including those protected under the Migratory Bird Treaty Act.
Non-native species on Tinian currently include at least 5 birds, 10 mammals, 6 reptiles, 1 amphibian, and 3 invertebrates. Rat densities on Tinian are higher than on many other tropical Pacific islands and are likely detrimental to native flora and fauna, including Tinian’s bird species. Rodents and shrews are predators of native birds, lizards, insects, and snails. The marine toad is the only known amphibian on Tinian and is possibly a threat to native reptiles on Tinian. The predatory manokar flatworm was introduced to Tinian to help control the introduced giant African snail. The flatworm poses a serious threat to native tree snails, including the humped tree snail that is proposed for listing under the federal Endangered Species Act (discussed below).

The Tinian monarch is a native bird species found only on Tinian that was delisted under the Endangered Species Act in 2004 and by the CNMI government in 2009. The overall trend for Tinian monarch abundance and density since 1982 is considered stable despite the fluctuations that have occurred over time. Due to a survey in 2008 that indicated a significant decrease in the population, a petition to relist the Tinian monarch as a threatened or endangered species under the federal Endangered Species Act was submitted in 2013. To date, the species has not been relisted.

Nine federally listed threatened, endangered, or proposed species are found on Tinian and all have been observed in the Military Lease Area. Depredation by rats and mangrove monitor lizards may impact the federally endangered Mariana common moorhen. Its preferred habitat includes freshwater lakes, marshes, and swamps. Lake Hagoi in the Military Lease Area was identified as a primary habitat. The populations have varied since 1998 and declines are related to years of low rainfall.

The federally endangered Micronesian megapode is a ground-dwelling bird. In 1902, the Micronesian megapode was noted as common on Tinian but by 1949 they were difficult to locate. The numbers have been low (0 to 3) in surveys from 1985 through 2014. There is no resident breeding population on Tinian at this time and individuals detected on Tinian are thought to be transient visitors from Saipan.

The federally threatened Mariana fruit bat was prevalent on Tinian prior to World War II. The species has not been observed during recent surveys but there have been some anecdotal sightings. The population decline is attributed to the loss of native forest and illegal hunting.

The federally threatened green turtle and the endangered hawksbill turtle are known to nest on Tinian beaches especially Unai Dankulo and Unai Babui, both of which are in the Military Lease Area. The populations of both species are in decline in the CNMI. On Tinian, the sea turtles are threatened by increased human presence, coastal construction, habitat degradation, and illegal hunting.

The humped tree snail is a species proposed for listing under the federal Endangered Species Act. It was historically present on Tinian but was thought to no longer occur on the island because of the presence of a predatory manokar flatworm and the predatory rosy wolf snail; the severe loss of native limestone forest habitat; and because it had not been observed on Tinian since 1970. It was observed during 2013 surveys of the Military Lease Area within native limestone forest along the west coast above Laminobot Bay.

### 5.3.9.1.2 Impacts of Present and Reasonably Foreseeable Actions

There is potential for seven reasonably foreseeable actions (Divert, Mariana Islands Training and Testing, Chiget Mortar Range Cleanup, Masalog Ammunition Depot Cleanup, New 0.5 Million Gallon Reservoir,
Tinian Ocean View Resort, and Alter City Resort) to have impacts on terrestrial biological resources. The actions would cause ground disturbance and possible loss of terrestrial biology or habitats. Although terrestrial biological surveys are not available for all of these actions, the impact is assumed because of the large areas of ground disturbance required. No limestone forest would be affected by these actions. The Divert EIS identifies long-term, direct minor impacts to wildlife due to noise generated by proposed project operations.

The Mariana Islands Training and Testing EIS/OEIS study area covers a much larger area than this EIS/OEIS, but the conclusions are relevant to Tinian. Although potential impacts to certain terrestrial species from the training activities that occur on land within the study area may include injury or mortality, impacts are not expected to decrease the overall fitness of any given population (DoN 2013a).

There is potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to terrestrial biological resources.

5.3.9.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.9.3, Tinian. Impacts were identified and Endangered Species Act determinations are pending. The CJMT Final EIS/OEIS will be updated with consultation effects determinations. During construction, the maximum impact to vegetation would occur under Alternative 2 (for details on Alternative 1 and Alternative 3 refer to Section 4.9.3.1, Tinian Alternative 1, and Section 4.9.3.3, Tinian Alternative 3, respectively). The habitat removed under Alternative 2 would be spread across the Military Lease Area and would affect a maximum of 0.5% of the island’s native limestone forest, 10.1% of the island’s mixed introduced forest, 9.7% of the island’s tangantangan, and 9.8% of the island’s Casuarina forest. The permanent loss of habitat represents a maximum of approximately 8.7% of the island’s vegetation. The loss of habitat would result in significant impacts to vegetation communities, native wildlife, and species protected under the Migratory Bird Treaty Act. Forest enhancement measures are proposed as mitigation for impacts to limestone forest, mixed introduced forest, tangantangan, and herbaceous scrub habitats. There would be temporary significant impacts to nesting sea turtles from proposed construction activities at Unai Chulu.

Impacts to vegetation from operations include increased risk of fire. Fire breaks are incorporated into the Tinian proposed action site plan, and a range control plan would include protocols for preventing and responding to fires. There would be impacts due to weapons training noise. The noise generated by small arms and large caliber training would result in significant impacts to Mariana common moorhens at the Mahalang sites and to nesting sea turtles at Unai Dankulo.

5.3.9.1.4 Potential Cumulative Impacts

There would be potential cumulative impacts to terrestrial biological resources associated with the proposed action. The present and reasonably foreseeable actions could impact special-status species that would be additive to the proposed action. Although terrestrial biological surveys are not available for all of the present and reasonably foreseeable actions, the impact is assumed because of the large areas of ground disturbance required. The health of the terrestrial biological resources is generally stable in the study area; however, there are some species that are listed under the Endangered Species
Act or protected by other regulation that are more susceptible to stress and would be impacted by the proposed action and present and reasonably foreseeable actions. Therefore, there would be cumulative impacts to terrestrial biological resources.

**5.3.9.2 Pagan**

**5.3.9.2.1 Study Area and Health of Resources Considered**

The study area for the terrestrial biology cumulative impact analysis is the island of Pagan. The health of the terrestrial biology on Pagan is compromised due to the impacts of historical crop production, World War II, lava flows, and overgrazing by feral ungulates. In recent history, recovery plans for individual species that are at critically low population levels have been developed and local regulations were drafted to protect species from stressors. Some stresses have had a lasting impact and some impacts appear to be of short duration. Feral ungulates continue to stress the resource and the resource is not resilient to future stress. Overall, the trend in terrestrial biological resources is likely to continue.

As summarized in Section 3.9.5, *Pagan*, the terrestrial biological health on Pagan is declining. It is assumed that the pigs and goats were first introduced in the 1600s with the Spanish and during later attempts to colonize Pagan in the 1800s. Cattle were brought to the island during German and Japanese administration when the island was developed for copra production. All livestock were abandoned in 1981 following the volcanic eruption. As a result of the feral ungulate populations, the island vegetation has a long history of being severely overgrazed, particularly in the north.

The presence of other non-native species on the island has posed a threat to native species on Pagan. Non-native reptiles (e.g., mutilating gecko, oceanic gecko) pose a threat to native geckos. Evidence of three non-native snail species that would potentially pose a threat to native snails was found during the 2010 surveys. The highly non-native crazy ant is abundant on Pagan. When they occur in high densities they can devastate plant and invertebrate organisms.

The Micronesia megapode was reported common on Pagan in the 1950s and 1960s; however, populations have been reported low since the 1981 volcanic eruption of Mount Pagan which buried at least one nesting area. During surveys in 2010, megapodes were observed only within the southern portion of Pagan within *Casuarina*, coconut, and mixed native-introduced forests. The main threats affecting this species are habitat loss and degradation mainly due to forest clearing and browsing by feral goats, pigs, and cattle, and predation by introduced species, including monitor lizards, pigs, dogs, and cats (all of which occur on Pagan). Heavy grazing by feral livestock is believed to limit megapode distribution on the northern half of the island.

It is thought that the Mariana fruit bat population continues to be impacted by habitat degradation or loss from feral animals, as well as from illegal hunting. During surveys in 2010, three fruit bat colonies were observed on Pagan.

The native humped tree snail is currently found on southern Pagan only in forests of mixed native vegetation with relatively dense understory and ground cover. The humped tree snail was not found during the 2010 surveys in forests around Mount Pagan where the snail had been collected in 1949. Their absence in the north is most likely due to the impacts from the 1981 eruption and the intense grazing from feral cattle.
The nightingale reed-warbler and the Mariana common moorhen were present on Pagan in the past in association with the two lakes on the island (Upper Lake and Lower Lake); however, they are currently believed to have been extirpated by the 1970s. The potential wetland habitat was drastically altered and reduced in the last century due to development by the Japanese prior to and during World War II, as well as the presence of feral goats, pigs, and cows, and volcanic eruptions. The vegetation around Upper Lake was virtually eliminated during the 1981 and later eruptions.

Sea turtles are not known to nest on Pagan beaches.

5.3.9.2.2 Impacts of Present and Reasonably Foreseeable Actions

No present and reasonably foreseeable actions would have a potential impact to terrestrial biological resources on Pagan. Therefore, there is no potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to terrestrial biological resources.

5.3.9.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.9.4, Pagan. Impacts were identified and Endangered Species Act determinations are pending. The CJMT Final EIS/OEIS will be updated with effects determinations from Endangered Species Act section 7 consultation with the U.S. Fish and Wildlife Service.

During construction, the maximum impact to vegetation would occur under Alternative 1 (for details on Alternative 2 refer to Section 4.9.4.2, Pagan Alternative 2). The habitat removed under Alternative 1 would affect a maximum 4% of the island’s native forest, 7% of the island’s herbaceous scrub, and 5% of the island’s *Casuarina* forest. The permanent loss of habitat represents a maximum of approximately 7% of the island vegetation. This loss of vegetation would result in mitigable impacts to the vegetation community.

There would be less than significant impacts from construction to the following special-status species: Micronesian megapode, nesting sea turtles, humped tree snail, Slevin’s skink, *Cycas micronesica*, *Bulbophyllum guamense*, Mariana fruit bats, and species protected under the Migratory Bird Treaty Act.

Impacts from operations to vegetation would be less than significant and would be due to ground maneuvers compacting, crushing, removing the vegetation, and increased risk of fire. The range control plan would include protocols for preventing and responding to fires. Fire breaks are incorporated into the site plan.

Training on Pagan would not be continuous, and some wildlife species have been shown to habituate to noise associated with training activities. However, due to the noise levels, time of day, and large geographic extent of noise that would be generated by live-fire training, there would be impacts to native wildlife species due to noise associated with Pagan Alternative 1.

Overall, impacts to the Mariana fruit bat population resulting from large-caliber munitions noise would be unavoidable and unmitigable under Pagan Alternative 1. Because the majority of the training would occur in the northern part of the island, the impacts to Micronesian megapodes would not be significant. In addition, as aircraft overflights would avoid the known fruit bat colonies, the impacts to fruit bats from aircraft overflights would not be significant. U.S. military training activities would not
significantly impact nesting green or hawksbill sea turtles. Training activities would not significantly impact humped tree snail, Slevin’s skink, *Cycas micronesica*, and *Bulbophyllum guamense*.

### 5.3.9.2.4 Potential Cumulative Impacts

No present and reasonably foreseeable actions would have a potential impact to terrestrial biological resources on Pagan. These actions are infrequent, transient, and geographically distinct. Therefore, there would be no cumulative impact to terrestrial biological resources on Pagan.

### 5.3.10 Marine Biology

#### 5.3.10.1 Tinian

##### 5.3.10.1.1 Study Area and Health of Resources Considered

The study area for the marine biology cumulative impact analysis includes the nearshore waters surrounding Tinian to 3.0 nautical miles (5.6 kilometers) offshore. While the analysis of cumulative effects is confined to the study area, the vulnerability of individuals and populations of wide-ranging marine species to stresses originating within the study area will be influenced by actions occurring elsewhere.

The health and vulnerability of marine biological resources in Tinian’s nearshore waters is a function of natural and man-induced circumstances, with short- and long-term consequences that can be positive or negative. In the absence of the proposed action, trends in the health and vulnerability of protected and/or managed species are presumed to continue along their recent trajectories for the foreseeable future; this is the baseline condition described in Section 3.10.4, *Tinian*. Those species that are protected by local and federal regulations are considered to be in declining health or recovering from population reduction, and are thereby vulnerable to additional stress. The key stressors to marine biological resources have included sedimentation of nearshore waters due to poor erosion control and vegetation removal on land (e.g., World War II), harbor dredging, commercial fishing and bycatch, marine transportation, and natural disasters. In addition, climate change and U.S. military training have the potential to impact marine resources. This section summarizes information on the resources that, based on recent declines or incomplete recovery from previous population reduction, are most vulnerable to cumulative impacts in the study area.

##### 5.3.10.1.1.1 Invertebrates

As described in Section 3.10.4.5.1, *Marine Invertebrates*, there are 17 marine invertebrates that have been designated by the CNMI Division of Fish and Wildlife as Species of Special Conservation Need and the following 5 have been reported in Tinian waters:

- Spiny lobster
- Surf redfish (sea cucumber)
- Black teatfish (sea cucumber)
- Giant clam
- Triton’s trumpet shell
Four coral species that were recently listed under the federal Endangered Species Act have the potential to occur in the study area: *Acropora globiceps*, *Acropora retusa*, *Pavona diffuens*, and *Seriatopora aculeata*. *Acropora globiceps* was the only coral species listed under the federal Endangered Species Act that was confirmed in Tinian nearshore waters during the 2013 survey.

*Acropora globiceps* shows a decreasing population trend and has experienced estimated habitat losses of 35% over 30 years (Brown and Wolf 2009). Like other members of the genus *Acropora*, *Acropora globiceps* is highly susceptible to bleaching, disease, crown-of-thorns starfish predation, harvest and trade, and habitat degradation. These threats apply throughout the species’ range and contribute to its overall vulnerability. It is slow to recover from disturbance events. Although the occurrence of *Acropora globiceps* is characterized as “uncommon,” the absolute abundance of this species is likely at least tens of millions of colonies (National Marine Fisheries Service 2014a).

Globally, coral health has been in decline due to human-caused stressors, and these same stressors are active in the Mariana Islands. The major existing threats to coral species include ocean warming, disease, and ocean acidification (reduced pH and reduced availability of carbonate ions caused by an increase of carbon dioxide in the atmosphere). Corals can also be impacted by natural disasters, such as typhoons.

5.3.10.1.1.2 Fish

Fish species that potentially occur in the CNMI and are listed under the Endangered Species Act, or are listed as Species of Concern by the National Marine Fisheries Service include the scalloped hammerhead shark, humphead wrasse, and gray reef shark. Humphead wrasse and the gray reef shark are designated as Species of Special Conservation Need by the CNMI Division of Fish and Wildlife (Berger et al. 2005), and the Indo-West Pacific The Indo-West Pacific Distinct Population Segment of the scalloped hammerhead shark is listed as threatened under the Endangered Species Act.

The scalloped hammerhead shark is highly sought within the fishing industry, due to its size and high fin ray count. Across their range, scalloped hammerhead sharks are fished recreationally and commercially using a variety of techniques, including trawls, purse-seines, gillnets, fixed bottom longlines, pelagic longlines, and inshore artisanal methods. Adult scalloped hammerhead sharks are primarily taken in gillnets and longlines along the shelf and offshore in oceanic waters (Baum et al. 2007). There are no targeted commercial shark fisheries or longline fisheries in the CNMI, but recreational fishing and incidental capture in gillnets are serious threats to scalloped hammerhead sharks in the CNMI (National Marine Fisheries Service 2014b).

The most serious threats to the humphead wrasse are from commercial and subsistence fishing, including directed live capture for food, spearfishing with scuba gear, and fishing techniques that employ destructive methods such as the use of dynamite or cyanide. This species is particularly vulnerable to overfishing due to slow growth, long lifespan, late age of sexual maturity, and a preference for immature fish by consumers. General habitat loss and degradation are also major threats to this species (National Oceanic and Atmospheric Administration 2007).

No official population size estimates are available for the humphead wrasse; however, it is known that this species is uncommon to rare throughout most of its range. In the CNMI, humphead wrasses appear to be more prevalent in the southern populated islands, as compared to the mostly uninhabited or lightly populated islands north of Saipan. The conservation efforts of the CNMI Division of Fish and
Wildlife as described above have helped conserve the species. In addition, there have been increased public awareness efforts through communication and education on the long-term effects of over exploitation of sensitive reef fish stocks (Berger et al. 2005).

Gray reef sharks are impacted by fishing and are vulnerable due to small litter size, restricted habitat (coral reefs) which is also threatened, late onset of maturity, inshore distribution, and prevalence for being fished. Bottom fishermen consider this species a nuisance as they will often attack catch. Gray reef sharks population level estimates are unknown; however, the Mariana Archipelago Reef Assessment and Monitoring Program 2003 survey reported that sharks occurred in relatively higher densities (biomass/numbers) around the northernmost islands (Berger et al. 2005). As of March 13, 2002, the Magnuson-Stevens Fishery Conservation and Management Act prohibits the consumptive practice of shark finning (removing shark fins for subsequent sale and consumption while discarding the rest of the animal) in the U.S. Exclusive Economic Zone and through U.S. ports. The CNMI Division of Fish and Wildlife have also implemented actions that function to conserve gray reef sharks, as well as other reef fishes. Spear-fishing while scuba diving has been banned, along with the use of poisons, dynamite, and gill/surround nets.

5.3.10.1.1.3 Sea Turtles

The green turtle is listed as threatened under the Endangered Species Act, while the hawksbill and leatherback turtles are listed as endangered. The green and hawksbill turtles are found in the Tinian study area. While the leatherback turtle was not observed during the July 2013 Sea Turtle Marine Resource Survey conducted in support of this EIS/OEIS (DoN 2014b), the species may occur in Tinian waters. The major threats to the green sea turtle include alteration or loss of nesting habitat, decreased quality of sensitive marine habitats such as seagrass, vessel strikes, hunting for commercial or subsistence use, take of eggs, incidental take in fisheries (bycatch), and diseases such as fibropapillomatosis, which results in internal and/or external tumors (National Oceanic and Atmospheric Administration and U.S. Fish and Wildlife Service 2007).

Similarly, the major threats to the green turtle are alteration or loss of nesting or marine habitat, overutilization for commercial or subsistence use, take of eggs, incidental take in fisheries (bycatch), and climate change (National Oceanic and Atmospheric Administration and U.S. Fish and Wildlife Service 2013).

5.3.10.1.1.4 Marine Mammals

All marine mammals are protected under the Marine Mammal Protection Act; however, the sperm whale and the humpback whale are the marine mammals listed as endangered under the Endangered Species Act that occur in Tinian waters. Other marine mammal species that have been observed in Tinian waters include the melon-headed, sei, fin, and blue whales, common bottlenose dolphin, pantropical spotted dolphin, and spinner dolphin. Threats to marine mammals include entanglement in fishing gear, ship strikes, habitat impacts and whaling.

Oleson (2013) reported that in 2010 and 2011 humpback whales were acoustically detected by autonomous recording devices off Saipan, but specific whales could not be identified and it is unknown how close they were to the recording devices. Estimates indicate that marine mammal density is 0.00089 animals/square kilometers in the Mariana Islands Training Complex (DoN 2013c). Based on the
relatively few sightings and acoustic detections, humpback whale presence in the vicinity of Tinian is likely transitory in nature.

Little is known about the stock structure of sperm whales around Tinian. Density estimates for the region include 0.00123 animals/square kilometers in the CNMI (DoN 2007), 0.00123 animals/square kilometers in the Mariana Islands Training Complex (DoN 2013c), and 0.0030333 animals/square kilometers (outer Exclusive Economic Zone only). The sperm whale was the most frequently cited cetacean during the Navy’s 2007 survey (DoN 2007), with acoustic detections three times higher than visual detections (Fulling et al. 2011). Sperm whales are probably regularly present in the waters around Tinian, although they are usually associated with deep waters.

### 5.3.10.1.2 Impacts of Present and Reasonably Foreseeable Actions

There is potential for three present and reasonably foreseeable projects to impact marine biological resources (Mariana Islands Training and Testing, Dynasty Hotel Ferry Service, and Tinian Ocean View Resort).

The Draft Mariana Islands Training and Testing EIS/OEIS impacts to marine biological resources are summarized below:

- **Marine habitats:** The combined impact area would not diminish the ability of soft shores, soft bottoms, hard shores, hard bottoms, or artificial substrates to function as habitat. As such the ability of these resources to provide critical habitat would not be impacted. The total area impacted by underwater explosions and U.S. military expended materials is less than 1% of the Mariana Islands Training and Testing study area.

- **Marine mammals:** Although potential impacts to certain marine mammal species from the Mariana Islands Training and Testing action may include injury or mortality, impacts are not expected to decrease the overall fitness of any given population. There is no Endangered Species Act-designated critical habitat in the study area.

- **Sea turtles:** Although potential impacts to certain sea turtle species from the Mariana Islands Training and Testing action may include injury or mortality, impacts are not expected to decrease the overall fitness of any given population or affect designated sea turtle critical habitat.

- **Marine birds:** Although potential impacts on certain bird species from the Mariana Islands Training and Testing proposed action could include injury or mortality, impacts are not expected to decrease the overall fitness or result in long-term population-level impacts of any given population. There are no critical habitat designations for Endangered Species Act-listed marine bird species within the Mariana Islands Training and Testing study area.

- **Marine vegetation:** Impacts would not be expected to affect marine vegetation populations and the aggregate effect on marine vegetation would not observably differ from existing conditions. As such the ability of marine vegetation to provide critical habitat would not be impacted.

- **Marine invertebrates:** The DoN is including 22 species of corals recently listed under the Endangered Species Act in the section 7 consultation with National Marine Fisheries Service. No other Endangered Species Act-listed invertebrate species or species in currently proposed for
Endangered Species Act listing occurs within the Mariana Islands Training and Testing study area.

- **Fish**: Although potential impacts to certain fish species from the Mariana Islands Training and Testing action may include injury or mortality, impacts are not expected to decrease the overall fitness of any given population. No critical habitat for fish was identified (DoN 2013a).

The Dynasty Hotel Ferry Service would require some harbor improvements that would impact the existing harbor area. There would likely be short-term construction-related impacts to the marine resources in the vicinity due to noise, direct physical impacts, and degraded water quality. In addition, there would be potential operational impacts to marine mammals and sea turtles associated with the increase in vessel traffic between Tinian and Saipan.

The Tinian Ocean View Resort is proposed at the Tinian Harbor and would require in-water construction. There would likely be short-term construction-related impacts to the marine biology in the vicinity due to noise, direct physical impacts, and degraded water quality. The operational impacts would be less because the facility would be stationary and operate in accordance with relevant environmental regulations to mitigate releases to the marine environment. There may be an increase in marine recreational vessels associated with the resort. The project would contribute to an impact to marine biological resources primarily because it would permanently cover and remove some benthic resources in the project area.

There is potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to marine biological resources.

### 5.3.10.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.10.3, *Tinian*. In-water construction at Unai Chulu and operations at Unai Babui, Unai Lam Lam, and Unai Masalok would result in significant impacts to Marine Habitat and Essential Fish Habitat and special-status coral species. The impacts to marine biology would be similar among the Tinian proposed action alternatives.

In-water construction for Amphibious Assault Vehicle landing areas at Unai Chulu would result in permanent direct loss of coral (including special-status coral species) and habitat loss for fish and sea turtles species resulting in impacts. Construction activities would also result in impacts to fish and Essential Fish Habitat as the seafloor within this area would be modified, which are all designated as Essential Fish Habitat Area for bottomfish, crustaceans, and coral reef ecosystems. Underwater noise during in-water construction would result in disturbance to sea turtles and marine mammals; however, some impacts to would be lessened with best management practices during construction.

Operational impacts to marine biology would be related to in-water training, increased vessel traffic, landings of amphibious and small craft vehicles, operation of vessels in nearshore waters, and land-based activities. Operational activities would also result in impacts to Essential Fish Habitat by disturbing or altering the seafloor, water quality, or physical environment (e.g., underwater noise) within the approach zone or indirect effect area at the proposed tactical amphibious landing beaches.
The actions that would potentially impact sea turtles during operations include in-water training, increased vessel traffic, increased noise levels, landings of amphibious and small craft vehicles, and operation of vessels in nearshore waters. There would be a risk of vessel strikes to sea turtles, which would be minimized although not completely eliminated through monitoring and the standing watch procedure as described in Appendix D, Best Management Practices.

Overall, the proposed action impacts to marine biological resources would be significant.

5.3.10.1.4 Potential Cumulative Impacts

The proposed action and present and reasonably foreseeable actions could impact marine biological resources. The Mariana Island Training and Testing EIS/OEIS covers a much broader area than the proposed action, but there is potential for a cumulative impact to marine mammals and sea turtles due to in-water training, noise, and vessel traffic because the same populations would be affected by both projects.

The construction of the Dynasty Hotel Ferry Service and the Ocean View Resort would have additive impacts to the in-water construction impacts to coral reef habitat and its associated species that were identified for the proposed action. In addition, there would be cumulative operational impacts associated with the increase in vessel traffic which would add to the risk of vessel strikes to sea turtles and marine mammals, although the latter is considered negligible for the proposed action.

The health of the marine biological resources is generally stable in the study area; however, there are some species that are listed under the Endangered Species Act or protected by other regulation that are more susceptible to stress and would be impacted by the proposed action and present and reasonably foreseeable actions. Therefore, there would be cumulative impacts to marine biological resources.

5.3.10.2 Pagan

5.3.10.2.1 Study Area and Health of Resources Considered

The study area for marine biological resources cumulative impact analysis includes the waters surrounding Pagan from the shoreline to 3.0 nautical miles (5.6 kilometers) offshore. However, as marine mammals, turtles, and some fish are highly migratory animals, individuals and entire populations could be affected by actions at multiple locations. Members of the populations that frequent Pagan may be exposed to stress from actions occurring elsewhere in the CNMI, which impacts the ability of the species to resist stresses originating within the study area.

The marine biological resources have been and continue to be stressed by natural and man-induced activities. Some stresses have lasting impact and some appear to be of short duration. Protected species are presumed to be vulnerable until they are no longer protected. The stresses on listed species are not eliminated through management plans and recovery plans, but the intent of these measures is for population health to improve or remain stable.

Section 3.10.5, Pagan, provides a detailed discussion of the current health of marine biological resources for Pagan. Those species that are protected by local and federal regulations are in declining health or recovering from population reduction and are vulnerable to additional stress.
5.3.10.2.1.1 Invertebrates

Of the 17 marine invertebrates that are Species of Special Conservation Need (Section 3.10.5.5.1, Marine Invertebrates), 10 have been observed in the waters surrounding Pagan:

- Ghost crab
- Surf redfish (sea cucumber)
- Black teatfish (sea cucumber)
- Giant clam
- Pectinate venus
- Horned helmet shell
- Tapestry turban shell
- Rough turban
- Silver-mouth turban
- Octopus

One coral species listed under the Endangered Species Act, *Acropora globiceps*, was observed in Pagan waters in the 2013 study. Special-status fish species for Pagan are the same as described for Tinian (see Section 5.3.9.1, Tinian).

5.3.10.2.1.2 Sea Turtles

Green and hawksbill sea turtles have been observed around Pagan. As described in the Terrestrial biology sections, sea turtles are not known to nest on Pagan beaches. While the leatherback sea turtle was not observed during the July 2013 Sea Turtle Marine Resource Survey conducted in support of this EIS/OEIS (DoN 2014b), the species may occur in Pagan waters. Refer to Section 5.3.9.1, Tinian, for a discussion of these species.

5.3.10.2.1.3 Marine Mammals

The sperm whale is the only marine mammal listed under the Endangered Species Act that is known to occur in Pagan waters. Four other marine mammal species have been observed in Pagan waters including the common bottlenose dolphin, spinner dolphin, Blainville’s beaked whale, and Cuvier’s beaked whale. Refer to Section 5.3.9.1, Tinian, for a discussion of these species.

5.3.10.2.2 Impacts of Present and Reasonably Foreseeable Actions

No present and reasonably foreseeable actions would have a potential impact to marine biology on Pagan. Therefore, there is no potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to marine biological resources.

5.3.10.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

The impacts to marine biology are similar for both Pagan proposed action alternatives. Operations would result in significant impacts to special-status coral species at Green Beach and South Beach. The CJMT Final EIS/OEIS will be updated with consultation effects determinations.

There is no in-water construction proposed.
Direct and indirect impacts of the proposed action are detailed in Section 4.10.4, Pagan. Operational impacts to marine biology would be related to in-water training, increased vessel traffic, landings of amphibious and small craft vehicles, sea-based live-fire training and munitions and explosives of concern, operation of vessels in nearshore waters, and land-based activities. There would impacts to marine flora, marine invertebrates, and fish during in-water training.

Operational activities would result in impacts to sea turtles particularly due to habitat disturbance and vessel strikes. Additional impacts would occur from disturbing or altering the seafloor, water quality, or physical environment (e.g., underwater noise) within the approach zone at the proposed tactical amphibious landing beaches. Impacts from vessel strikes could be minimized through regular surveys prior to the onset of training, as well as adherence to other resource management measures as described in Appendix D, Best Management Practices.

Operational activities that would potentially impact marine mammals during operations from in-water training, increased vessel traffic, increased noise levels, landings of amphibious and small craft vehicles, and operation of vessels in nearshore waters. Impacts would be lessened with best management practices during operations including regular surveys prior to the onset of training, as well as adherence to other resource management measures as described in Appendix D, Best Management Practices.

Overall, the proposed action would impact marine biological resources.

5.3.10.2.4 Potential Cumulative Impacts

No present and reasonably foreseeable actions would have a potential impact to marine biological resources on Pagan. These actions are infrequent, transient, and geographically distinct. Therefore, there would be no cumulative impact to marine biological resources on Pagan.

5.3.11 Cultural Resources

5.3.11.1 Tinian

5.3.11.1.1 Study Area and Health of Resources Considered

The study area for the cultural resources cumulative impact analysis is Tinian. The direct impacts to cultural resources are collective over time because the physical impacts on resources are generally not recoverable. There are regulatory protections for cultural resources, which emphasize avoiding and or minimizing impacts. However, with competing land uses, there could be cultural resources that may continue to be impacted. Therefore, trend in cultural resource health is expected to remain in a gradual decline.

Section 3.11.4, Tinian, provides a detailed discussion of the current health of cultural resources on Tinian. As discussed in Appendix N, Cultural Resources Technical Memo, cultural resources on Tinian are declining in numbers due to grazing, construction related to tourism, and residential and commercial development.

The main Mariana Islands were settled more than 3,500 years ago. The Pre-Latte period was from 3,500 to 1,000 years ago. Evidence of historical residency and community composition is difficult to identify. The Latte Period (1,000 to 700 years ago) is distinguished by the presence of latte stone structures. The
post-Contact period begins in 1521 with Magellan’s landing. Afterward, disease and war decimated the local population. By 1698, the remaining inhabitants on Tinian were moved to Guam.

Tinian was probably depopulated by 1700 and was not re-inhabited on a large scale by the Chamorro until after World War II, although limited settlement did occur intermittently. Settlement by Carolinian populations began in the 1800s. At the end of the Spanish period (Spain relinquished all its Pacific colonies at the end of the Spanish-American War in 1899), the population had dwindled to 95, of whom 59 were reported to be Carolinians (Bowers 1950).

Following the Spanish occupation, the Mariana Islands, with the exception of Guam, were sold to Germany. Germany’s primary interest was the development of a cash-based agricultural economy based on copra (dried coconut meat used for coconut oil) production. German authority over the islands ended in 1914, when a Japanese naval squadron seized control of Saipan along with other German possessions in Micronesia. The Japanese developed large-scale sugarcane production for trade. Large tracts of lands were leased and sublet to tenant farmers, most of whom were colonists from Japan, and Korea. The pattern of Japanese occupation was most developed on Tinian, with sugarcane fields occupying 80% of arable land. By 1944, the civilian population of Tinian was 17,900 with only 26 of those being Chamorro; most of the population was Japanese, or Korean (Bowers 1950). Construction by the Japanese of airfields and later construction by U.S. forces at North Field, West Field, and the creation of roads, housing, and other construction actions cleared and leveled much of the northern portion of the island. By the end of 1946, the Japanese, and Korean were returned to their homelands. Soon after approximately 500 Chamorro moved to Tinian from Yap. Since 1950, agriculture in the north, limited development around San Jose and the port area, and deterioration of resources through weathering and land clearing have resulted in declining numbers of archaeological sites and remnant historic structures.

Since 1966, most potential impacts to cultural resources from U.S. federal actions are addressed under National Historic Preservation Act and the Criteria of Adverse Effect set forth in 36 CFR § 800.5. Laws related to management and preservation of cultural resources in the CNMI include the following:

- Public Law 3-39; the Commonwealth Historic Preservation Act of 1982, promoting preservation of the historic and cultural heritage of the Northern Islands and prohibits the removal of historic properties and artifacts from the Island
- Public Law 3-33, establishing a permit and penalty process for the excavation and removal of human remains
- Public Law 10-71 amending the Commonwealth Historic Preservation Act of 1982 to increase the membership of the Review Board and increasing the monetary penalty for violations of the Act.
- An earthmoving permit is required for all actions involving ground disturbance. This permit is reviewed by the CNMI Historic Preservation Office and may require archaeological monitoring during excavations.

These laws have provided some protection or required mitigation for adverse effects to cultural resources on Tinian and Pagan.
5.3.11.1.2 Impacts of Present and Reasonably Foreseeable Actions

There is potential for five present actions (West San Jose Village Homesteads, Tinian Airport Improvements, New 0.5 Million Gallon Reservoir, Chiget Mortar Range Cleanup, and Masalog Ammunition Depot Cleanup) and four reasonably foreseeable actions (Divert, Health Center Expansion, Alter City Resort, and Tinian Ocean View Resort) to have impacts to cultural resources on Tinian.

These actions are likely to involve extensive ground disturbance that would increase the potential for disturbance and loss of cultural resources on Tinian. These impacts would have a long-term impact to Tinian’s cultural resources. Cultural impact surveys have not been conducted at most of the present and reasonably foreseeable action sites, but impacts to cultural resources are assumed for the actions identified in this section due, in part, to the large area of ground disturbance.

The Divert EIS identified long-term, direct and indirect, adverse, cumulative impacts to historic and archeological resources would occur due to vibrations from increased heavy vehicle traffic, depending on the proximity of the supply truck routes to historic structures. In addition, long-term, minor cumulative impacts to unrecorded archaeological sites and historic structures would occur due to U.S. military use of Tinian International Airport.

The Chiget Mortar Range Cleanup is also within the Military Lease Area and will involve ground disturbance that could impact cultural resources.

The remaining projects would be outside of the Military Lease Area and would likely require ground disturbance over large areas, such as the two resorts. The site planning is not complete for either development but the Alter City Resort alone could result in the disturbance of over 386 acres (152 hectares) of generally vacant land.

There is potential for present and reasonably foreseeable actions to contribute to a cumulative impact to cultural resources on Tinian.

5.3.11.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.11.3, Tinian. Significant mitigable to less than significant impacts to historic properties and resources of cultural importance were identified for all Tinian proposed action alternatives with respect to construction and operations impacts to historic properties within the Military Lease Area, immediately north of Tinian International Airport runways, and at the Port of Tinian. Significant impacts would primarily be related to the direct disturbance of historic properties resulting from construction activities or by operations relating to the use of the High Hazard Impact Area and tactical amphibious training.

The impacted historic properties include: North Field National Historic Landmark; Pre-Contact latte sites, pottery scatters, and rock shelters; pre-World War II Japanese farms and shrines; and World War II-era Japanese and American military sites. There would be less than significant impacts due to most visual intrusions and noise. Construction of a Surface Radar site at Unai Babui and near Unai Dankulo would have a significant visual impact to a latte site and a potential traditional cultural property by permanently changing the setting. Disturbance or destruction of these cultural resources would further diminish the regional historic record, thus decreasing the potential of its overall research contribution.
Reduced access to cultural sites, whether for cultural practices, recreation, tourism, or academic study would be temporary and intermittent for construction, but would be permanent for resources within Range Complex A, the base camp, and the munitions storage area.

The landing beach associated with North Field National Historic Landmark (Unai Chulu), which is also a potential traditional cultural property and a latte site, would be impacted by amphibious training operations and construction of an in-water ramp and access roads. Construction of the amphibious landing ramp could also impact submerged historic properties. With the exception of amphibious training at Unai Chulu, effects to historic properties from ground maneuver activities would be minimal because activities are done on foot and by vehicles driving on established roads. Public access to the Military Lease Area, and thus to historic properties and the Tinian Landing Beaches, Ushi Point Field, and North Field National Historic Landmark, would also be restricted, but the resulting impact would be less than significant as it would be intermittent and temporary. Audible and most visual setting effects to historic properties would be less than significant because they would be temporary and not occur when these areas are accessible by the public. A portion of Broadway Avenue, which is an entrance to North Field National Historic Landmark and a contributing feature to the cultural landscape, would be closed permanently by the use of the High Hazard Impact Area of Range Complex A. This closure would be a significant indirect impact to the landmark.

Measures to mitigate significant impacts to historic properties would be identified through consultation with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, National Park Service, and other interested parties representing the interests of the local government and the public. These measures, which may include data recovery excavations, archaeological monitoring, documentation, public education, and/or other appropriate measures, will be formalized in an agreement document.

5.3.11.1.4 Potential Cumulative Impacts

There would be impacts on Tinian cultural resources associated with the proposed action and some present and reasonably foreseeable actions.

All U.S. military training activities would be coordinated by range management, and it is assumed there would be some overlap in order to maximize the number of days per year that the public would have access to cultural resources.

The civilian projects located outside of the Military Lease Area are not considered a federal undertaking and are not subject to the same level of regulatory review under the National Historic Preservation Act. However, any ground disturbance could impact cultural resources. The two resort projects: Alter City Resort and Tinian Ocean View Resort would disturb large areas, and there would be potential for disturbance and loss of cultural resources. Potential impacts to historic properties would be long-term. Therefore, there would be cumulative impacts to cultural resources.


5.3.11.2 Pagan

5.3.11.2.1 Study Area and Health of Resources Considered

The study area for the cultural resources cumulative impact analysis is Pagan. Other than ground disturbance by erosion and feral animals, cultural resource health on Pagan is stable due to historical lack of land use development on Pagan. This trend would likely continue.

Section 3.11.5, Pagan, provides a detailed discussion of the current health of cultural resources on Pagan. Cultural resources include pre- and post-Contact archaeological resources, architectural resources, and traditional cultural properties. As discussed for Tinian, the main Mariana Islands were settled more than 3,500 years ago. However, Pagan was probably inhabited beginning approximately 700 years ago. Pre-Contact sites include large habitation sites with latte, pottery and artifact scatters, and rockshelters.

The post-Contact period began in 1521 with Magellan’s landing and continues through the twentieth century. After European contact, disease and war decimated the local populations. Between 1698 and 1721, the survivors of disease on Pagan were moved to Guam. During the 1860s, the Spanish imported laborers from the Caroline Islands to settle on Pagan and produce copra. The first German census of Pagan, taken in 1899, reported a Chamorro population of 23 and a Carolinian population of 52. During the Japanese administration (1914 to 1944), Pagan was placed under the Saipan Branch of the South Seas Bureau. In 1935, there were 121 Chamorro and 244 Carolinians recorded on Pagan. By the late 1930s, the Japanese population exceeded 200. Construction of an airfield by the Japanese was first initiated in early 1933 to support naval maneuvers. In 1939, a pier for loading and unloading ships was built, as was a barracks near the airfield. By August 1941, a hangar and several water systems, including a concrete water storage tank, pond, water supply pond, a filtration plant, the runway, oil tank, and bomb storage area were completed or under construction. In early 1944, Japanese defenses included anti-aircraft gun positions in the areas above the airfield.

American forces occupied Pagan from 1945 to the early 1950s, with U.S. Marines occupying a camp at the north end of lower Lake Laguna. However, very little construction took place during this period. Between 1951 and 1981, Pagan was inhabited by Chamorro and Carolinians from Saipan and Aguigan. Island residents continued to harvest copra and engage in a largely subsistence style of living until 1981 when they were evacuated after Mount Pagan’s eruption. Deposition of lava from the eruption covered much of north Pagan and certainly covered many historic properties and resources of cultural importance.

Since 1966, most potential impacts to cultural resources from U.S. federal projects are addressed under National Historic Preservation Act and the Criteria of Adverse Effect set forth at 36 CFR § 800.5. Other protective laws are listed in Section 5.3.11.1, Tinian.

These laws have provided some protection or required mitigation for effects to cultural resources on Pagan. Primarily, it is the lack of land use development on Pagan that has protected cultural resources.

5.3.11.2.2 Impacts of Present and Reasonably Foreseeable Actions

One present project (Volcanic Activity Monitoring) has the potential to contribute to a cumulative impact to cultural resources. The Volcanic Activity Monitoring project uncovered four archaeological
sites that were recommended to be made eligible for listing in the National Register of Historic Places. There is potential for present and reasonably foreseeable actions to contribute to a cumulative impact to cultural resources on Pagan.

5.3.11.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.11.4, Pagan. Significant mitigable to less than significant impacts were identified for both action alternatives with respect to Pagan cultural resources, including Pre-Contact latte complexes, pre-World War II Japanese Administration sites, World War II-era Japanese defensive sites, and potential traditional cultural properties. Significant impacts would primarily be related to the direct disturbance of historic properties resulting from construction activities or by operations relating to the use of the High Hazard Impact Area and off-trail maneuvers by wheeled and tracked vehicles.

Indirect impacts due to training operations occur by restricting access, changing the visual setting, and increasing the noise environment of potential traditional cultural properties. In general, these impacts would be less than significant. The mitigation would be as described in for the Tinian proposed action impacts. An agreement document will be developed through the Section 106 process with the CNMI Historic Preservation Officer, Advisory Council on Historic Preservation, and other consulting parties to mitigate significant impacts to historic properties and resources of cultural importance.

5.3.11.2.4 Potential Cumulative Impacts

There would be cultural resource impacts related to one reasonably foreseeable action, Volcanic Activity Monitoring. This project uncovered four archaeological sites that were recommended to be made eligible for listing in the National Register of Historic Places. These would be additive impacts to the proposed action because they are long-term, although potential mitigation measures can reduce the impact. Disturbance or destruction of cultural resources would further diminish the regional historic record, thus decreasing the potential of its overall contribution to research. Reduced access to cultural sites, whether for cultural practices, recreation, tourism, or academic study would also diminish the cultural resources of Pagan.

The federal actions are subject to the National Historic Preservation Act and NEPA compliance documents, which describe the potential mitigation measures to address impacts. Although individual project impacts may be mitigated, there is potential for cumulative impacts because there could be permanent loss of resources under each project. Therefore, there would be cumulative impacts to cultural resources on Pagan.

5.3.12 Visual Resources

5.3.12.1 Tinian

5.3.12.1.1 Study Area and Health of Resources Considered

The study area for the visual resources (natural and man-made) cumulative impact analysis is Tinian. The natural visual resources on Tinian have declined overall due historical land uses (e.g., large scale agricultural production and World War II) but are currently stable with respect to resiliency to future
stress. Man-made visual resources, especially historic sites are subject to vandalism, weathering, and other factors but are considered resilient to future stress and stable if they continue to be maintained. Health and resiliency of visual resources is expected to continue.

As described in Section 3.12.4, Tinian, scenic qualities of Tinian are appreciated by both residents and visitors. Community values regarding visual resources have changed over time, with an increasing interest in preserving and fostering visual resources for overall quality of life and as an important feature of the tourism industry.

Visual resources on Tinian can generally be categorized into natural and man-made features. Critical man-induced events on Tinian that affected the visual resources include the removal of much of the native limestone forest in the 1920s for sugarcane cultivation and World War II. These events changed the visual landscape of Tinian. There are World War II-era generated visual resources that are cultural in nature, such as the memorials at Ushi “Cross” Point. Aside from the resources located within North Field National Historic Landmark, man-made visual resources on Tinian have not been extensively inventoried or catalogued and suffer from poor maintenance.

Natural visual resources on Tinian tend to be associated with beaches and the shoreline, such as Unai Chulu and the Blow Hole. Large, expansive views are available at certain locations on the island due to substantial areas of relatively flat topography. The lack of development outside San Jose ensures that most of these natural visual resources and view corridors remain unspoiled. Frequently found together, visual resources compliment and provide a backdrop for recreational, historical, and cultural activities on Tinian.

5.3.12.1.2 Impacts of Present and Reasonably Foreseeable Actions

One present action (New 0.5 Million Gallon Reservoir) and two reasonably foreseeable projects (Alter City Resort and Tinian Ocean View Resort) could potentially impact visual resources. These actions are not likely to impact the visual resources in the Military Lease Area, but they would dominate the landscape and result in a loss of open space outside of the Military Lease Area. The site planning for the two resort projects is not complete and it is assumed they would have an impact to visual resources based on the magnitude of the development and location along the coasts.

The reservoir would be constructed near an existing reservoir and would be consistent with adjacent visual landscape and the impact would be considered less than significant.

There is potential for present and reasonably foreseeable actions to contribute to a cumulative impact to visual resources on Tinian.

5.3.12.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts to visual resources were identified in Section 4.12.3, Tinian. Impacts to key observation points from all of the alternatives were generally the same. Operation impacts would result from light pollution and landscape changes as visible from the key observation points. The impacts were assessed based on the degree of visual contrast from existing conditions and the overall visual impact. Most of the key observation points would be subject to less than significant or no impacts from the
proposed action alternatives. However, there would be significant impacts to visual contrast and overall visual impact from key observation points at Mount Lasso Lookout A and Ushi “Cross” Point B.

Mount Lasso Lookout (Key Observation Point #8) provides an expansive pristine view encompassing almost half of Tinian. There would be significant impacts to the north/northeast view from Mount Lasso Lookout due to the significant clearing of the High Hazard Impact Area, peripheral firebreak road, convoy course, range control Observation Posts, and mortar firing points.

Ushi “Cross” Point B (Key Observation Point #6) has a southern view orientation towards North Field. The Surface Radar site would be in the foreground of the key observation point and would cause a significant visual contrast and change from what is currently visible looking south from Ushi “Cross” Point.

No mitigation is proposed for the significant impacts to visual resources. Mitigation for impacts to visual resources associated with cultural resources would be established through the Section 106 consultation process.

5.3.12.1.4 Potential Cumulative Impacts

Alter City Resort and Tinian Ocean View Resort and the proposed action could potentially impact visual resources. The civilian actions would result in a loss of open space and change the visual landscape outside of the Military Lease Area. Visual impact analyses have not been prepared for the two large-scale projects, but it is unlikely that they would impact the same key observation points impacted under the proposed action. Therefore, there would be no cumulative impact to visual resources on Tinian.

5.3.12.2 Pagan

5.3.12.2.1 Study Area and Health of Resources Considered

The study area for the visual resources cumulative impact analysis is Pagan. There are no key observation points on Pagan. Visual resources are recovering from historical stresses such as World War II and lava flows. This trend is expected to continue.

Pagan offers dramatic, unspoiled views unique to this remote, undeveloped island. Man-made features on Pagan are associated with World War II and include an airstrip, abandoned Japanese military equipment, and remnants of former military structures. Natural features that dominate the visual landscape include Mount Pagan, South Pagan Volcano, shorelines, and two lakes. These views can be appreciated from view corridors on the island and from ocean vessels. Pagan has been officially uninhabited since its last major volcanic eruption in 1981 resulted in the evacuation of its residents. This volcanic eruption changed the landscape of northern Pagan from dense, green vegetation to large areas of barren lava surrounded by vegetation. While there are scenic views and scenery on Pagan, there are no resident populations to enjoy them since the evacuation associated with the volcano eruption in 1981. There are abandoned buildings associated with the former homesteads, as well as dirt/grass vehicle pathways between the north Pagan beach areas, inland lakes, and the former landing strip.

There is a desire among former Pagan residents to return to Pagan and the CNMI government has taken steps to facilitate this through legislation and homestead provisions. There have also been discussions about developing Pagan as an ecotourism destination and a staging area for visitors to the Marianas Trench Marine National Monument area. However, these homesteading and tourism discussions have
not resulted in the establishment of a resident or visitor population base on Pagan. Any new developments would be subject to government review.

5.3.12.2.2 Impacts of Present and Reasonably Foreseeable Actions

None of the present or reasonably foreseeable actions would diminish the scenic quality of the landscape. Therefore, there is no potential for present and reasonably foreseeable actions to contribute to cumulative impacts to visual resources on Pagan.

5.3.12.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts to visual resources are identified in Section 4.12.4, Pagan. Training on Pagan would be expeditionary and would include minimal construction of permanent facilities. The existing dark barren landscape of the lava fields would remain the same; however, craters caused by U.S. military training operations (i.e., impact craters from naval gunfire, aviation, artillery, mortar ordnance) would modify the topography of the barren lava fields over time. There would be minimal visual impacts to the southern portion of Pagan associated with vegetation removal.

In the absence of a permanent human population base to act as visual “receptors,” there would be less than significant impacts of the proposed action alternatives that might contribute to a cumulative visual impact.

5.3.12.2.4 Potential Cumulative Impacts

No present and reasonably foreseeable actions would have a potential impact to visual resources on Pagan. These actions are infrequent, transient, and geographically distinct. Therefore, there would be no cumulative impact to visual resources on Pagan.

5.3.13 Transportation

5.3.13.1 Air Transportation

5.3.13.1.1 Tinian

5.3.13.1.1.1 Study Area and Health of Resources Considered

The study area for air transportation cumulative impact analysis is Tinian. The air transportation infrastructure is operational and meets current capacity. There continue to be maintenance and infrastructure improvements that are required to maintain the facilities and meet new regulatory requirements. There are physical limits to the resiliency of the resource to meet additional demand. This trend is expected to continue.

Section 3.13.4, Tinian, provides a detailed discussion of the current health of transportation resources on Tinian. Island environments are particularly vulnerable to limited transportation for people and goods. Air transportation infrastructure that was critical during World War II, such as North Field, was developed to meet the U.S. military requirements. Currently, Tinian has one public airport, Tinian International Airport, and one expeditionary U.S. military airfield, North Field. In addition, there are three heliports that are for private or commercial use. Only North Field is within the Military Lease Area.
North Field is in poor condition and is used for U.S. military expeditionary exercises only. The Tinian International Airport is currently undergoing maintenance and compliance upgrades as well as other improvements that are planned, subject to funding. The traffic at the Tinian International Airport fluctuates with the tourism and U.S. military use. It presently operates within its current traffic capacity.

### 5.3.13.1.1.2 Impacts of Present and Reasonably Foreseeable Actions

Four present and reasonably foreseeable actions could impact air transportation (Divert, Mariana Islands Training and Testing, Alter City Resort, and Tinian Ocean View Resort).

The Divert action would require construction of new facilities at the Tinian International Airport to include a runway extension, new pavement markings, taxiway, billet, hangar, storage areas (fuel and munitions), maintenance facility, and fuel receiving and distribution infrastructure. The airport improvements would have a potential beneficial impact to non-U.S. military air traffic.

The Mariana Islands Training and Testing EIS/OEIS does not propose new or improved infrastructure but does propose three additional Humanitarian Assistance/Disaster Relief Operations per year (see Table 5.2-1). The training events would have a potential impact to air traffic, but the impacts would be temporary, limited to three operations per year.

The two reasonably foreseeable resort projects (Alter City Resort and Tinian Ocean View Resort) would increase the commercial air traffic and contribute to an impact to air transportation. Airport improvements would be required to accommodate the new demand in traffic and would mitigate the impacts.

There are two present projects that would have a beneficial impact to air transportation (Tinian Airport Improvements and Tinian Airport Renovations). The improvements would address some operational deficiencies, maintenance requirements, and improve the comfort, safety, and efficiency of the airport.

There is potential for present and reasonably foreseeable actions to contribute to beneficial and adverse cumulative impacts to Tinian air transportation.

### 5.3.13.1.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.13.3, Tinian. The impacts are the same for all Tinian proposed action alternatives.

Transportation of construction equipment, materials and personnel to the existing airport facilities for the construction of the Tinian alternatives would result in less than significant direct and indirect impacts to air transportation.

Periodic impacts to the existing airport facilities (mainly Runway 08/26) would be expected due to the implementation of the proposed action. Coordination with the Commonwealth Ports Authority and commercial aviation would minimize these impacts. The training event timing could be coordinated with the civil and commercial usage of the existing airport facilities. Intermittent delays would likely result periodically when the U.S. military training occupies the runway. Increase in maintenance requirements for Runway 08/26 are anticipated as a result of the increase in usage for the U.S. military training exercises. However, these impacts would be less than significant.
5.3.13.1.4 Potential Cumulative Impacts

Impacts to Tinian International Airport use were identified for the proposed action, as well as present and reasonably foreseeable projects. The level of additive impact is subject to a number of variables, including the economy. Coordination with the Commonwealth Ports Authority and commercial aviation would minimize these impacts. The same airport would be affected by all projects; however, infrastructure modifications could address capacity deficiencies. The increase in air traffic associated with the civilian projects would be indicative of a healthier economy that could support the requisite infrastructure improvements. There would be a cumulative impact to air transportation due to an increase in direct and induced air traffic.

5.3.13.1.2 Pagan

5.3.13.1.2.1 Study Area and Health of Resources Considered

The study area for air transportation cumulative impact analysis is Pagan. The condition and resiliency of the air transportation facilities is declining due to lava flows and lack of maintenance, but there is little demand except for emergency evacuations and supply for other Northern Islands. The trend in air transportation facilities is expected to continue.

Section 3.13.5, Pagan, provides a detailed discussion of the current health of Pagan transportation. Pagan has one public airport, Pagan airfield. The Pagan airfield runway was severely compromised by a lava flow, but is able to accommodate the limited visitor traffic. There are no CNMI government plans to improve the airfield. The facilities are poor but there is no regularly scheduled traffic.

5.3.13.1.2.2 Impacts of Present and Reasonably Foreseeable Actions

None of the present or reasonably foreseeable actions would impact the air transportation facilities of Pagan. There would be no new airfield construction or air traffic associated with any present or reasonably foreseeable projects. Therefore, there is no potential for present and reasonably foreseeable actions to contribute to cumulative impacts to Pagan air transportation.

5.3.13.1.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.13.4, Pagan. The impacts are the same for all Pagan proposed action alternatives. As part of the proposed action, the lava flow would be removed from the existing Runway 11/19 and the runway would be extended, re-graded, and strengthened. A new aircraft parking apron would be provided. These improvements would be beneficial long-term impacts to air transportation on Pagan.

5.3.13.1.2.4 Potential Cumulative Impacts

No present and reasonably foreseeable actions would have a potential impact to air transportation facilities on Pagan. These actions are infrequent, transient, and geographically distinct. Therefore, there would be no cumulative impact to air transportation on Pagan.
5.3.13.2 Ground Transportation

5.3.13.2.1 Tinian

5.3.13.2.1.1 Study Area and Health of Resources Considered

The study area for the ground transportation cumulative impact analysis is Tinian. The condition of Tinian ground transportation infrastructure has been in decline. Without future improvements and continued maintenance, it will not be resilient to additional stresses and the declining trend is likely to continue.

Tinian has approximately 68 total miles (110 kilometers) of existing roadways, most of which were designed, developed, and constructed in 1944 to accommodate constant volumes of heavy vehicle traffic when the island’s U.S. military population was approximately 150,000. Other roads were constructed prior to and during World War II when the island’s sugarcane industry was being developed by the Japanese.

The population of Tinian in 2010 was 3,136. All Tinian roadways currently operate under capacity at acceptable level of service (Level of Service A), as evidenced by free-flowing traffic and no traffic delays. However, many of the existing roads throughout Tinian are in poor condition due to lack of maintenance.

5.3.13.2.1.2 Impacts of Present and Reasonably Foreseeable Actions

Five present and reasonably foreseeable actions (Joeten Tinian Ace Hardware, Health Center Expansion, Divert, Alter City Resort, and Tinian Ocean View Resort) would have potential to contribute to an impact to ground transportation on Tinian.

Joeten Tinian Ace Hardware and the Health Center Expansion would generate an increase in traffic in the projects’ vicinity; however, the roadways in the two areas have adequate level of service and no significant impact has been identified for the existing hardware store and no significant impact is anticipated near the health center. Additionally, the proposed pedestrian walkway associated with the Health Center Expansion would benefit pedestrians.

Divert would potentially result in temporary, short-term increases in traffic, roadway closures, and altered circulation patterns.

The two resorts (Alter City and Tinian Ocean View Resort) would be outside of the Military Lease Area and would increase the amount of traffic on Tinian’s roadways. The impact of the resorts on traffic has not been assessed and it is assumed the increase in transient populations on Tinian would contribute to an impact to Tinian roadway traffic.

Two present actions (Solid Waste Transfer Station and West San Jose Village Homesteads) and one reasonably foreseeable action (Tinian Hazard Elimination Action) would be beneficial to ground transportation. The Solid Waste Transfer Station action would locate the station closer to homes and provide dumpsters to consolidate trash collection, effectively reducing the travel distance required to transport solid waste for processing and resulting in benefits to traffic circulation and roadway level of service. Additionally, construction of new roads (approximately 12,000 linear feet [3,700 linear meters]) would improve traffic circulation near the West San Jose Village Homesteads residential subdivision (170...
families). The Tinian Hazard Elimination Action, which includes installing pavement and shoulder delineation improvements, traffic signage improvements, as well as safety barriers, would benefit traffic circulation, pedestrians, and roadway safety.

There is potential for present and reasonably foreseeable actions to contribute to adverse and beneficial cumulative impacts to Tinian ground transportation.

### 5.3.13.2.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.13.3, Tinian. The impacts are the same for all Tinian proposed action alternatives. New road construction and existing roadway improvements are planned as part of the proposed action, to support tactical vehicles and U.S. military training activities on Tinian, as well as to improve access to areas within the Military Lease Area for civilians. Improvements may include, but would not be limited to, clearing, grading, resurfacing, and reinforcing/strengthening existing roads that are currently in poor condition. These improvements would result in beneficial impacts to ground transportation.

There would be less than significant impacts to ground transportation due to:

- Temporary and permanent road closures
- Increase in on-island permanent personnel (approximately 95)
- U.S. military personnel on leave
- Transportation of hazardous materials and other supplies
- Training arrivals and departures

The expected primary route for personnel traveling between Tinian International Airport and base camp is less than 0.5 mile (0.8 kilometer) in length and does not require travel on roadways outside the Military Lease Area.

Outside of the Military Lease Area there would be improvements to general use roadways. There would also be new roadways and improvements that would not benefit the public and would be for U.S. military use only. The U.S. military training activities would be coordinated by range management to maximize the number of days per year that the public would have access to roadways and minimize the potential impact of roadway closures and altered circulation patterns.

### 5.3.13.2.1.4 Potential Cumulative Impacts

There would be impacts to ground transportation associated with the two large resort projects that would increase traffic outside of the Military Lease Area and the proposed action. However, the traffic routes would not necessarily coincide with the tourist traffic. The expected primary route for personnel traveling between Tinian International Airport and base camp would not require travel on roadways outside the Military Lease Area. The improvements to general use roadways and improvements that would benefit the public. The U.S. military training activities would be coordinated by range management to maximize the number of days per year that the public would have access to roadways and minimize the potential impact of roadway closures and altered circulation patterns in the Military Lease Area. In addition, the health of the resource (i.e., existing traffic levels) are within the capacity of current level of service. Therefore, there would be no cumulative impact to ground transportation on Tinian.
5.3.13.2.2 Pagan

5.3.13.2.2.1 Study Area and Health of Resources Considered

The study area for cumulative impact analysis is Pagan. This trend of limited use is likely to continue as no infrastructure is planned.

5.3.13.2.2.2 Impacts of Present and Reasonably Foreseeable Actions

No present and reasonably foreseeable actions would have a potential impact to ground transportation on Pagan. Therefore, there is no potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to Pagan ground transportation.

5.3.13.2.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

The proposed action alternatives would not have an impact to ground transportation; therefore, there would be no cumulative impact.

5.3.13.2.2.4 Potential Cumulative Impacts

No present and reasonably foreseeable actions would have a potential impact to ground transportation on Pagan. These actions are infrequent, transient, and geographically distinct. There is no traffic or maintained roadways on the island. There are dirt tracks and trails that have supported limited historical and current use. Therefore, there would be no cumulative impact to ground transportation on Pagan.

5.3.13.3 Marine Transportation

5.3.13.3.1 Tinian

5.3.13.3.1.1 Study Area and Health of Resources Considered

The study area for the marine transportation cumulative impact analysis is the Port of Tinian, the Tinian Harbor, and the shipping routes to Tinian. Tinian marine transportation infrastructure has declined in health over the years. Without future improvements and continued maintenance, this trend would continue and marine transportation infrastructure would not be resilient to additional stresses and would continue to decline in health.

Tinian Port and Harbor was built in 1944 to accommodate up to eight Liberty Ship cargo vessels. The few harbor improvements made since 1944 include additional finger piers and a biosecurity facility. It is the principal point of entry for goods to the island. The main wharf, breakwater, and finger piers are severely deteriorated; therefore, the harbor operates at diminished capacity. The port has a single mobile crane with a capacity of 50 tons (45 metric tons), and facilities for biosecurity and bulk fuel storage. The harbor is currently used by commercial and supply barges, as well as U.S. Coast Guard vessels and U.S. military supply shipments on Joint High Speed Vessels.

Historically, there was a Saipan-Tinian ferry service that provided a convenient alternative to air travel, but it was discontinued in 2012. The CNMI government and the community continue to seek opportunities to resume ferry service.

Shipment of cargo to and from Saipan typically occurs to the west of Tinian. Vessels maintain a distance from 1 mile (2 kilometers) to 100 feet (30 meters) offshore of Tinian depending on the size of the vessel.
The current harbor infrastructure is in need of improvements and repairs. The CNMI government is assessing the use and priorities of the port and the harbor, examining options for rehabilitating the piers, and conducting fieldwork (topographic and hydrographic studies) to support a basis of design and dredging requirements.

5.3.13.3.1.2 Impacts of Present and Reasonably Foreseeable Actions

One present (Dynasty Ferry Service) action would impact marine transportation resources on Tinian. The Dynasty Ferry Service would have a beneficial impact to marine transportation through the proposed infrastructure improvements. There would be an increase in harbor traffic but it would not exceed the existing marine traffic capacity.

There is potential for the present and reasonably foreseeable action to contribute to beneficial cumulative impacts to Tinian marine transportation.

5.3.13.3.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

The proposed action would have less than significant impacts to commercial marine transportation during the training range use, because of restrictions to marine traffic within the danger zones for health and safety reasons.

There would be increased traffic at the harbor but there would be no impact to harbor capacity. There would be an improved boat ramp in the Tinian Harbor that would have a beneficial impact to harbor facilities.

5.3.13.3.1.4 Potential Cumulative Impacts

There would be impacts associated with the Tinian proposed action alternatives and the reasonably foreseeable actions. The present and reasonably foreseeable actions that provide ferry service infrastructure and induce an increase in visitor arrivals by sea are considered beneficial impacts to marine transportation. However, ferry service between Saipan and Tinian would be subject to the same marine access restrictions as other marine traffic during the proposed action training events. There would be minimal additive impact because the activities are intermittent and there is adequate capacity for more marine traffic. Therefore, would be no cumulative impact to marine transportation.

5.3.13.3.2 Pagan

5.3.13.3.2.1 Study Area and Health of Resources Considered

The study area for the marine transportation cumulative impact analysis is Pagan pier and shipping routes to Pagan.

The Pagan pier was built in the 1940s but is severely degraded and no longer in usable condition. When the island was permanently inhabited, cargo and passengers had to be transferred to smaller vessels that could come ashore. Current visitors to the island anchor in bays offshore and use smaller vessels to go ashore.

5.3.13.3.2.2 Impacts of Present and Reasonably Foreseeable Actions

No CNMI harbor infrastructure is proposed for the present and reasonably foreseeable actions. The impacts of ecotourism, future cruise visits, and maintenance of the volcanic activity monitoring station to marine traffic would be negligible.
There is potential for present and reasonably foreseeable actions to contribute to beneficial cumulative impacts to Pagan marine transportation.

### 5.3.13.3.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

No direct or indirect impacts to marine transportation were identified in Section 4.13.4, Pagan. Construction of range facilities and support structures, as well as transport of personnel, would require transfer of cargo and passengers from vessels to Pagan through amphibious vehicles or rubber raiding craft. During use of the training ranges, the proposed action would restrict marine traffic from the danger zones during training for health and safety reasons. No waterfront improvements are proposed for either of the Pagan proposed action alternatives.

### 5.3.13.3.2.4 Potential Cumulative Impacts

Neither the proposed action nor the present or reasonably foreseeable actions would have an impact to marine transportation. These actions are infrequent, transient, and geographically distinct. Therefore, there would be no cumulative impact to marine transportation on Pagan.

### 5.3.14 Utilities

#### 5.3.14.1 Tinian

##### 5.3.14.1.1 Study Area and Health of Resources Considered

The study area for the utilities cumulative impact analysis is Tinian for the following: electrical, potable water, wastewater, and information technology/communications. The solid waste management study area extends to the entire CNMI due to proposed shipping/disposal of solid waste off-island to a U.S. Environmental Protection Agency-compliant landfill.

As summarized in Section 3.14.4, Tinian, the trends in utility demand are tied to population growth and constructed facility growth, which has generally remained constant over the past several years. Electrical power demand is typically estimated based on the square footage of constructed facilities. Potable water and wastewater demand and loading are forecast using population and industrial uses. Solid waste quantities are estimated using population, commercial/industrial operations, and construction activity for construction and demolition debris and green waste.

##### 5.3.14.1.1.1 Electrical

Electrical would be resilient to increased demand because there is existing excess electrical energy production capacity. The trend of adequate electrical production capacity is projected to continue.

In the utility studies prepared for this EIS/OEIS, the forecast electrical power demand was based on planned U.S. military actions and their square footage/type of facility. The current health of this utility is very good for capacity and reliability. The generating capacity was expanded around the year 2000 when there was interest in resort development. Population and tourism declines and a reduction in peak power demand have caused the current generating capacity to have a substantial surplus.
5.3.14.1.1.2 Potable Water

The potable water infrastructure would not be resilient to additional stresses in its current state due to lack of funding for infrastructure and maintenance. The trend in declining capacity due to lack of funding for maintenance and upgrades is expected to continue.

As of November 2013, the Commonwealth Utilities Corporation provides the potable water for a total of 833 metered accounts, which includes residential, commercial, and government customers (Commonwealth Utilities Corporation 2013a). Unaccounted for water is the result of leaks, unmetered uses, and unplanned overflows within the system. The typical unaccounted for water from efficient systems should be less than 25% of the water produced. The Commonwealth Utilities Corporation has indicated that unaccounted for water (water pumped from the supply well but not billed to customers) is estimated to be approximately 75% to 80% of the water produced (Commonwealth Utilities Corporation 2013b).

5.3.14.1.1.3 Wastewater

Wastewater would be resilient to additional stresses due to the CNMI Bureau of Environmental and Coastal Quality regulations. The trend of meeting the requirements of these regulations is expected to continue.

Currently, there is no centralized wastewater collection, treatment, or disposal system. Requirements for wastewater treatment and disposal are provided by each entity for their own needs. The CNMI Bureau of Environmental and Coastal Quality administers a Wastewater Treatment and Disposal program that ensures proper design, construction and application of approved on-site wastewater disposal systems. The approved systems would minimize impacts to water resources. There are currently no plans for a centralized wastewater treatment system.

The existing U.S. military septic and leaching field system on Tinian is not currently being used due to poor condition of the leach field. The Dynasty Hotel operates a wastewater treatment plant and currently there is excess capacity.

5.3.14.1.1.4 Solid Waste

The only current solid waste facility on Tinian is non-U.S. Environmental Protection Agency-compliant and its ability to accommodate additional stresses has been in decline. There are plans to close the existing Tinian Solid Waste Facility and replace it, therefore, the health and resiliency of solid waste management on island is expected to improve in the future.

The CNMI Department of Public Works is required to maintain the Tinian Solid Waste Facility in accordance with a CNMI Bureau of Environmental and Coastal Quality, Division of Environmental Quality issued Administrative Order (DoN 2014c) stipulating operations and maintenance measures designed to protect public health and safety.

5.3.14.1.1.5 Information Technology/Communications

There is sufficient capacity on existing information technology/communications infrastructure. This trend is expected to continue as the health and resiliency of this resource is expected continue to have sufficient capacity and remain stable.
Tinian currently does not have U.S. military information technology infrastructure. Commercial information/technology services exist outside of the Military Lease Area and include phone, internet, cable television, and cellular phone services. The information technology/communications service is currently adequate and reliable.

5.3.14.1.2 Impacts of Present and Reasonably Foreseeable Actions

Eight present and reasonably foreseeable actions might increase demand on utility infrastructure (construction and demolition solid waste facilities, Divert, West San Jose Village Homesteads, Health Center Interior Improvements, Tinian Dynasty Renovation/Expansion, Health Center Expansion, Alter City Resort, and Tinian Ocean View Resort).

Divert would have long-term, direct and indirect, negligible to minor impacts to utilities assessed in the NEPA document (e.g., electrical, water supply, solid waste). No impact to wastewater was identified in the Divert NEPA document. A beneficial impact to communications systems was identified in the Divert NEPA document.

The homestead development and the two resort development actions have the greatest potential to impact utilities. The CNMI government would review all development plans and would ensure that there is adequate utility capacity to meet current and reasonably foreseeable demand. Infrastructure improvements would be required as necessary under each project to meet the new demand.

Five present and reasonably foreseeable projects are likely to have beneficial impact to utilities because they improve existing infrastructure. Tinian Solid Waste Facility Improvements and Solid Waste Transfer Station would benefit solid waste management. The closure of the unlined Tinian Solid Waste Facility would improve solid waste management and would be accompanied by the development of a new landfill. The Tinian Airport Improvement Projects include upgrades to utilities. The New 0.5 Million Gallon Reservoir would provide reserve water capacity.

There is potential for present and reasonably foreseeable actions to contribute to adverse and beneficial cumulative impacts to utilities on Tinian.

5.3.14.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.14.3, Tinian. All three Tinian proposed action alternatives would have similar less than significant impacts to utilities.

5.3.14.1.3.1 Electrical Power

Impacts during construction of the proposed facilities may include temporary power outages to facilitate connection of the new and rerouted power lines. These would be of short duration, scheduled to allow for advance notification to users, and timed to be least disruptive (e.g., late in the evening), thereby minimizing the effect of any potential outages. Therefore, construction of the Tinian alternatives would result in less than significant direct and indirect impacts to the existing electrical utility.

A study of the existing electrical utility was performed and documents that both Tinian’s generating system and distribution system are reliable and in good condition. The total power demand for the Tinian proposed action is less than the current excess capacity of the existing power plant. The existing
island-wide power generation facility is capable of meeting the increased power demand during operation.

Therefore, operation of the Tinian alternatives would result in less than significant direct and indirect impacts to the existing electric utility generation capability and electrical distribution system.

5.3.14.1.3.2 Potable Water

There is currently no existing potable water system within or leading to the Military Lease Area. The proposed water system would be constructed early in the site development process to support the remainder of the construction activities. The base camp, Munitions Storage Area, and proposed facility improvements at the Port of Tinian would require potable water and fire protection systems. Approximately three to six new supply wells, plus one backup, located to the north and east of the Tinian International Airport within the Military Lease Area would be installed to support the proposed action. The operation and maintenance of this new system, including supply, treatment, transmission, and distribution, would be independent of the Commonwealth Utilities Corporation’s water system. The proposed action would rely on Commonwealth Utilities Corporation’s potable water system to support activities outside of the Military Lease Area; however, there is potential to produce and deliver the required amount of water to support these actions.

5.3.14.1.3.3 Wastewater

Temporary toilet facilities would be used during construction and the wastewater generated during the construction period would be pumped and transported to the existing U.S. military septic tank and leaching field system for treatment and disposal. The existing system may require rehabilitation of the septic tank or leaching field depending on its condition at the time of the construction. The use of the existing system for the proposed action would also require inspection and permit compliance verification prior to use.

Due to the magnitude of estimated the flows associated with the proposed action, the existing U.S. military septic tank and leaching field system would not have adequate capacity. A new wastewater collection and treatment system is included in the proposed action and would be located at the base camp. The wastewater treatment system would require a minimum of secondary level of treatment, as defined by the CNMI regulations.

The individual wastewater disposal systems for the Munitions Storage Area would be designed, permitted, constructed, certified for use, operated, and maintained in accordance with the CNMI regulations. Wastewater generated on the ranges would be collected in temporary portable toilet facilities and emptied at the base camp wastewater treatment and disposal system periodically by a licensed contractor. The wastewater from the vehicle wash-down area at the Port of Tinian associated with the proposed action would be treated by a sedimentation basin followed by an intermittent sand filtration system prior to discharge to an adjacent stormwater retention pond. Impacts to wastewater management would be less than significant.

5.3.14.1.3.4 Stormwater Management

During construction, the contractor would be expected to follow the CNMI regulations for erosion control with the development and management of a Stormwater Pollution Prevention Plan. This plan would minimize silt and sediment from being transported either offsite or to receiving surface waters.
However, with implementation of the plan and other resource management measures, it is anticipated that construction of Tinian alternatives would result in less than significant direct and indirect impacts to stormwater management.

The primary stormwater improvements would consist of temporary surface conveyance and control via vegetated swales, pipe culverts, and retention ponds. Construction of permanent stormwater management facilities would occur at the base camp, training areas, Munitions Storage Area, the Port of Tinian, the Tinian International Airport, and at other areas with proposed site improvements. There would be new impervious surfaces at the port improvements, base camp, airport improvements, Munitions Storage Area, roadways, and some of the training facilities. A Low Impact Development approach to stormwater management would be utilized to maintain existing hydrology conditions to the maximum extent technically feasible. The impacts to stormwater management would be less than significant.

5.3.14.1.3.5 Solid Waste Management

Municipal solid waste generated by the construction contractors would be disposed of at a regulatory compliant facility. The existing solid waste facilities on Tinian are not in compliance with regulatory requirements; therefore, construction solid waste generated would be transferred off-island to an U.S. Environmental Protection Agency-compliant landfill.

During operation of the proposed action, processed (i.e., separated, shredded, compacted, baled) waste would be shipped to a facility in compliance with U.S. Environmental Protection Agency/Resource Conservation and Recovery Act requirements.

There would be less than significant impacts to solid waste management.

5.3.14.1.3.6 Information Technology/Communications

Impacts to existing commercial telephone, television, and internet services during construction would be limited to potential brief outages that would be necessary to facilitate new connections to the existing systems. With resource management measures, such as scheduling outages in low use periods, construction of the Tinian alternatives would result in less than significant direct and indirect impacts to the existing information technology/communications utilities.

The current commercial information technology/communications facilities have adequate capacity to serve the proposed new facilities. New service lines to the new facilities would be routed via a combination of aerial cables and underground cables in concrete encased duct banks.

Therefore, operation of the Tinian alternatives would result in less than significant direct and indirect impacts to the current information technology/communications utilities.

5.3.14.1.4 Potential Cumulative Impacts

There would be an additive increase in demand on utilities associated with the proposed action and the reasonably foreseeable actions. The West San Jose Village Homestead development and the two new resort developments would also increase the demand on utilities. Utility infrastructure improvements, such as the new water reservoir, would have a beneficial impact to utilities. There are pre-existing utility deficiencies (i.e., solid waste management, potable water, wastewater management) that can
contribute to the impacts; however, the U.S. military would operate those utilities independently of the CNMI government in a way that would not cumulatively impact those utilities.

The U.S. military projects incorporate infrastructure improvements into each project as needed. The CNMI building permit review process manages the approval of new developments to prevent system failures, and deficiencies in utility service could be corrected by infrastructure improvements. Therefore, there would be no cumulative impact to utilities on Tinian.

5.3.14.2 Pagan

5.3.14.2.1 Study Area and Health of Resources Considered

There is no current electrical power utility, potable water utility, wastewater infrastructure, or information technology/communications infrastructure on Pagan. This trend is expected to continue as no utilities infrastructure is expected to be constructed.

5.3.14.2.2 Impacts of Present and Reasonably Foreseeable Actions

No present and reasonably foreseeable actions would have a potential impact to utilities on Pagan. Therefore, there is no potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to utilities on Pagan.

5.3.14.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.14.4, Pagan. Both Pagan proposed action alternatives would have similar impacts to utilities.

There is no current electrical power utility, potable water utility, wastewater infrastructure, or information technology/communications infrastructure on Pagan. All requirements for these utilities during construction would be provided by bivouac style systems. Because there are currently no utilities on Pagan, there would be no impact to these existing utilities. Temporary portable devices would supply the power. No permanent potable water system is proposed and potable water would be brought in or provided by the use of portable de-salinization units. Information technology/communications systems would be portable. Wastewater would be managed with field sanitation devices and expeditionary procedures would be followed. Stormwater would be managed through vegetated systems. Solid waste would be shipped to an approved off-island facility.

Construction and operation of the Pagan alternatives would result in no impacts to the electrical power utility, potable water utility, wastewater infrastructure, or information technology/communications infrastructure; and less than significant impacts to stormwater management and existing solid waste infrastructure during construction.

5.3.14.2.4 Potential Cumulative Impacts

There is no current electrical power utility, potable water utility, wastewater infrastructure, or information technology/communications infrastructure on Pagan. No present and reasonably foreseeable actions would have a potential impact to utilities on Pagan. These actions are infrequent,
transient, and geographically distinct. Therefore, there would be no cumulative impact to utilities on Pagan.

### 5.3.15 Socioeconomics and Environmental Justice

#### 5.3.15.1 Tinian

#### 5.3.15.1.1 Study Area and Health of Resources Considered

The study area for the socioeconomic cumulative impact analysis is Tinian, but the CNMI provides regional context. The socioeconomic health of Tinian is considered stable. While population and economic data over the past decade have shown declines, these conditions have improved in recent years due to improved tourism activity (primarily related to an increased number of Chinese and Korean visitors). The health of Tinian public services would be considered resilient to future stresses, such as population growth, as capacity has shown to be great enough to support a larger population as was present on the island during the latter part of the 1990s and early part of the 2000s. The demographics of minority populations and children are likely to remain static with changes mainly due to fluctuations in the number of foreign workers from Asia.

Section 3.15.4, Socioeconomic Context, provides information on the socioeconomic historical context for the study area. In addition, a Socioeconomic Impact Assessment Study (Appendix Q) (DoN 2014d) was prepared to support this EIS/OEIS and contains baseline information.

The late 1980s and early 1990s were a boom period for the CNMI economy, in large part due to Japanese investments that were geared towards making the CNMI a tourist destination. Also contributing to the boom was growth in Chinese investments in the garment manufacturing industry. The Tinian Dynasty Hotel and Casino, which opened on April 25, 1998, currently draws visitors to Tinian, primarily from China. The boom was followed by a prolonged contraction of the economy between 2002 and 2007, due to changing international trade conditions that were unfavorable to the garment industry and the decline of the Japanese tourism market. There have been challenges to tourism growth, namely the decline in passenger air traffic and the loss of the Saipan-Tinian ferry service. Tinian International Airport improvements are required to accommodate international direct flights. In recent history (2011-2012), there has been some economic improvement due to an increase in Korean and Chinese tourists.

The CNMI population increased by 730% between 1958 and 2000 (from 8,290 to 69,221) but decreased from 2000 to 2010 by 22% (from 69,221 to 53,883). The projected population in the CNMI is a function of economic prosperity and the recent increases in tourism suggest the population could increase.

In 1983, the CNMI government leased the northern two-thirds of Tinian to the U.S. military. There have been subsequent modifications to the lease over the years and certain areas were leased back to the people of Tinian for agricultural use. There are subsistence agricultural (i.e., crops and cattle) and fishing activities on and around Tinian. Although Tinian is an agricultural community the trend appears to be toward consumption of processed store bought products rather than locally grown foods. There is adequate facility capacity for health care and education.

As of 2014, 29 lots in the Military Lease Area were permitted for noncommercial, subsistence agriculture and grazing; these lots constituted 2,390 acres (967 hectares). An estimated 1,010 acres (409 hectares) was actually being used for cattle grazing. Subsistence farming/farming is primarily for personal
consumption but excess is available for sale or barter. “Farming” is a term used to describe annual agricultural sales of greater than $1,000. Between 2002 and 2007, the farming acreage doubled on Tinian.

There is no commercial fleet stationed at Tinian but there is some commercial fishing in the waters around Tinian done by the fishing fleet on Saipan. On Tinian, the fish caught are primarily consumed for subsistence or given as gifts but are also bartered or sold to cover fishing vessel operation expenses.

As of the 2010 census the population of Tinian was comprised of 47% Asian and 39% Pacific Islander with a total minority population of 98.2%. The unemployment rate on Tinian in the 2010 census was reported at 6.7%. Since the 1990s, Tinian’s economy has been led by tourism and local government employment. Forty-six percent of the Tinian population is characterized as low income. With respect to environmental justice, the Tinian population is both a minority and low income population. Children comprise 29.9% of the population and 43% of the children are in low income households.

5.3.15.1.2 Impacts of Present and Reasonably Foreseeable Actions

There are 12 present and reasonably foreseeable actions that would impact socioeconomics. All actions would have a beneficial impact, as follows:

- Divert
- Tinian Airport Improvement Actions
- Tinian Airport Terminal Renovations
- West San Jose Village Homesteads
- Tinian Slaughterhouse
- Joeten Tinian Ace Hardware
- Health Center Improvements
- Health Center Expansion
- Tinian Dynasty Renovations
- Tinian Dynasty Ferry Service
- Tinian Ocean View Resort
- Alter City Resort

There is potential for present and reasonably foreseeable actions to result in beneficial cumulative impacts to the socioeconomics of Tinian.

5.3.15.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.15.3, Tinian and are the same for all alternatives.

With the proposed action on Tinian, population would increase and economic impacts would be beneficial overall; however, there would be less than significant impacts associated with tourism and housing. The population change would increase demands on Tinian public services, but not to a level that would exceed capacity of public services agencies. Access restrictions on Tinian would reduce the opportunities for Tinian residents to participate in recreational and cultural activities such as fishing, hunting, and gathering, potentially altering the way some perceive their relationships with the land and
affecting the interaction within social networks. While this impact would be less than significant for the overall population it could be significant for some; hence, the dual level of significance in Table 5.3-1.

There would be beneficial and adverse impacts on socioeconomics and environmental justice.

### 5.3.15.1.4 Potential Cumulative Impacts

The present and reasonably foreseeable actions would all have beneficial impacts such as the Tinian Dynasty Expansion, development of Ocean View Resort, Alter City Resort, the Tinian Dynasty Ferry Service, and the new housing provided in the homestead development. Socioeconomics is an island-wide resource, so civilian and U.S. military projects have an additive impact.

The impact identified for the proposed action in conjunction with present and reasonably foreseeable actions would be beneficial from an economic perspective, as resort development would lead to higher levels of economic activity on the island. The government and commercial actions tend to have a beneficial impact to socioeconomics.

No disproportionate impacts to environmental justice populations are anticipated with either the proposed action or present and reasonably foreseeable actions; therefore, there would be no cumulative impacts to environmental justice populations.

For these reasons, there would be no cumulative impact to socioeconomic resources or environmental justice populations on Tinian.

### 5.3.15.2 Pagan

#### 5.3.15.2.1 Study Area and Health of Resources Considered

The study area for the socioeconomic impact analysis is Pagan. The socioeconomic health of Pagan is basically non-existent. There is potential for the return of resident population and development of economic activities such as ecotourism and aquaculture; however, there are many obstacles. The trend in socioeconomic health is anticipated to remain unchanged in the near future.

Section 3.15.5, *Population Characteristics*, provides information on the socioeconomic historical context for the study area. In addition, a *Socioeconomic Impact Assessment Study* (Appendix Q) (DoN 2014d) was prepared to support this EIS/OEIS and contains baseline information.

After World War II, the Mariana Islands were part of the United Nations Trust Territory of the Pacific Islands administered by the U.S. Pagan residents were relocated to Saipan and a small U.S. military contingent remained on the island to maintain the airfield. Northern Islands Development Company brought people to Pagan to collect and market copra. In 1976, about 75 tons (83 metric tons) of copra was produced on Pagan, generating sales of about $13,000. Income in the 1970s was derived from farming and fishing, and the sale of fruit bat and coconut crab to Saipan. As of 1978, there were no stores on Pagan or evidence of cash exchanges among residents for goods or services. There was “limited potential for development” on Pagan due to lack of comparative advantage over other islands in the region, relative inaccessibility, and lack of modern infrastructure necessary to make potentially productive operations (e.g., basalt mining) feasible.

Inhabitants were forced to evacuate during the 1981 eruption of Mount Pagan, and again relocate to Saipan. The island is still considered a safety risk, but people do visit for fishing, hunting, and camping.
There is no modern infrastructure on Pagan and the structures remaining on the island are historic Japanese military installations from World War II.

There is no 2010 census data for Pagan. Pagan has no economy or resident environmental justice population; however, people periodically visit the island and some may stay for extended periods. Subsistence hunting and fishing activities could sustain the visitors. In 2010, the CNMI enacted Public Law 16-50, a homesteading law to establish the Northern Islands Village and Agricultural Homesteading program for current or former residents of the Northern Islands or any qualified person interested in residing on the Northern Islands. The law, however, requires extensive municipal planning and infrastructure development prior to homesteading deeds being issued. To date the CNMI has not deeded any land on Pagan nor has it lifted the emergency evacuation order for Pagan related to the hazards of volcanic eruptions.

Mineral resources have been identified on Pagan, including basalt and pozzolan (a substance used as an additive for producing cement). Economic use of pozzolan is to mix it with Portland cement to create blended cement. The price of pozzolan in 2012 was $35 per metric ton, which is lower than the cost it would be to extract and ship pozzolan to market. Although a permit to mine pozzolan was provided by the CNMI Department of Public Lands to a private mining company, a pozzolan mine on Pagan may not be economically feasible and no pozzolan mining occurs at present.

Ecotourism is also an area of potential economic growth; however, the revenue would not remain on Pagan. Emergency response and other infrastructure would need to be provided to sustain a viable ecotourism industry or permanent population.

5.3.15.2.2 Impacts of Present and Reasonably Foreseeable Actions

There is no economic activity, public services, or permanent population on Pagan. There are three present and reasonably foreseeable actions on Pagan that would impact socioeconomics (Chamorro Conference, Silver Explorer Cruise Ship Visit, and Ecotourism).

The Chamorro Conference and tourism visits could be beneficial through providing additional cultural awareness about Pagan and recreational use. The socioeconomic benefits of these actions would be to the CNMI government and individuals or organizations located elsewhere in the CNMI. All of these actions are transient and would not result in a permanent population, public services, or economic base on Pagan.

There is a potential for present and reasonably foreseeable actions to contribute to beneficial cumulative impacts to the socioeconomics of Pagan.

5.3.15.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.15.4, Pagan, and would be the same for all alternatives. There is no Pagan economy, public service, or permanent population. The Pagan proposed alternatives would not introduce any significant impacts in terms of population, economic conditions, environmental justice, and public services because there is no resident population or economic base. Due to their infrequent occurrences, with appropriate scheduling, the proposed
action would not have an effect on future ecotourism endeavors. The increase from federal lease revenue would improve the CNMI government’s financial position.

Potential impacts include decreased opportunity to access recreational and cultural sites on Pagan, and decreased opportunity for former Pagan residents or their descendants to be able to re-settle or homestead the island. The proposed action could affect community character by replacing some recreational and cultural opportunities on Pagan with U.S. military training. The decreased opportunity to engage in cultural and recreational activities on Pagan could affect community character and cohesion within the northern islands community residing elsewhere in the CNMI.

5.3.15.2.4 Potential Cumulative Impacts

The ecotourism and cultural events would have a beneficial impact to socioeconomics and sociocultural resources. However, there is no economic base, resident population, or public services on Pagan. These actions are infrequent, transient, and geographically distinct. With appropriate scheduling, the proposed action would not have an effect on future ecotourism endeavors. Therefore, there would be no cumulative impact to socioeconomics or environmental justice populations on Pagan.

5.3.16 Hazardous Materials and Waste

5.3.16.1 Tinian

5.3.16.1.1 Study Area and Health of Resources Considered

The study area for the hazardous materials and waste cumulative impact analysis is Tinian.

The volume of hazardous materials and waste that is managed under capacity is stable and expected to continue to be stable or become more resilient. Natural degradation of some released materials and the active clean-up efforts proposed for other areas suggest that, while the volume would fluctuate with changes in human activity, the overall trend is a reduction in volume of hazardous materials and waste and an improved capacity to manage it, over time.

The volume of hazardous materials and waste is largely due to human activities, but natural events such as typhoons and earthquakes can result in inadvertent releases of regulated hazardous materials and waste. The regulations that were developed in the 1970s continue to evolve to protect the environment from future accidental releases.

As described in Section 3.16.4, Tinian, World War II and historical agricultural activities resulted in releases of hazardous materials and waste to the environment. These materials included munitions and explosives of concern, petroleum products, insecticides, and herbicides. Since World War II the impacts associated with hazardous materials and waste have been associated with increases in residential and commercial development, agricultural activity, and industrial activity. During the 1970s, there were numerous local and federal environmental regulations enacted to protect human health and the environment through mandates that control and regulate the transport, storage, use, and disposal of hazardous materials, hazardous waste, and toxic substances. The trend in the volume of hazardous materials and waste managed on Tinian is expected to fluctuate over time, consistent with the economy and population. The regulations currently in place minimize the risk of release to the environment as
well as the risk to human health. Sites of potential environmental concern have been identified and are in various stages of cleanup (see Section 3.16.4.4, Potential and Confirmed Contaminated Sites).

Access to the Military Lease Area is largely unrestricted; therefore, there is the potential for unpermitted dumping of hazardous materials and unreported releases of petroleum products from vehicles using the area in association with tourism or simply passing through.

5.3.16.1.2 Impacts of Present and Reasonably Foreseeable Actions

There are six present and reasonably foreseeable actions that would increase the storage, distribution, and use of hazardous materials and waste (Divert, Mariana Islands Training and Testing, Joeten Tinian Ace Hardware, Health Center Improvements and Expansion, Alter City Resort, and Tinian Ocean View Resort).

The hardware store, health center improvements and expansion, and the two resort developments would increase the volume of hazardous materials brought on island. Development activities would also temporarily increase the amounts of hazardous waste generated on Tinian. The management of these materials and the waste is regulated to protect the environment but the negligible increased risk of a release for each action would contribute to an impact.

Three actions would have a beneficial impact (Chiget Mortar Range Cleanup, Brownfields Grants, and Masalog Ammunition Depot Cleanup) because they address existing hazardous materials and waste impacts. Chiget Mortar Range Cleanup is within the Military Lease Area and access to the area continues to be limited to authorized personnel. The Masalog Cleanup and Brownfields project are outside of the Military Lease Area. These actions would address hazardous materials that have already been released to the environment.

There is potential for present and reasonably foreseeable actions to contribute to adverse and beneficial cumulative impacts to hazardous materials and waste on Tinian.

5.3.16.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.16.3, Tinian. The Tinian proposed action alternatives would result in less than significant impacts to human health and the natural environment due to hazardous materials, toxic substances, hazardous waste, and contaminated sites. The affected areas vary slightly among alternatives, but the overall impacts would be similar. The impacts would be associated with an increase in the volume of hazardous materials and waste managed. Hazardous materials would be managed (i.e., stored, used, and transported) according to applicable resource management measures that would minimize the potential for accidental spills and releases that would result in such impacts. The impacts would be similar for all of the alternatives. The transportation, storage, handling, use, and disposal of these substances would be heavily documented, controlled, and regulated at the federal and local level. Residual amounts of munitions and explosives constituents associated with live-fire training would be minimal. Ultimately, the hazardous waste would be managed on Guam, which has sufficient capacity to handle the additional volume.

There are existing contaminated (e.g., contaminated soil) sites within the areas affected by the Tinian proposed action alternatives. Disturbance of these sites would be avoided to the maximum extent
practical. Where avoidance is not possible, these sites would be characterized and remediated to the appropriate level for construction activity and for the intended use. With the implementation of resource management measures and the identification and removal of munitions and explosives of concern, impacts to contaminated sites would be minimized.

5.3.16.1.4 Potential Cumulative Impacts

The present and reasonably foreseeable actions outside the Military Lease Area would require minimal handling of hazardous materials and waste, which would also be subject to federal and local regulations that are applicable to the proposed action. The Chiget Mortar Range Cleanup, Brownfields Grants, and Masalog Ammunition Depot Cleanup actions would have beneficial impacts because they address existing hazardous materials and waste issues. Hazardous materials, toxic substances, and hazardous waste transportation, handling, storage, use, and disposal procedures and protocols would be properly implemented and modified as appropriate to address the increased hazardous substances demand. Therefore, there would be no cumulative impact to hazardous materials and waste.

5.3.16.2 Pagan

5.3.16.2.1 Study Area and Health of Resources Considered

The study area for the hazardous materials and waste cumulative impact analysis is Pagan. There are no hazardous materials and waste currently managed on Pagan. Due to the expectation of continued limited human activity on the island, that trend is expected to continue. Historically, there were hazardous materials managed and used on Pagan. Natural degradation of some released materials suggests the trend is for a reduction in volume of hazardous materials and waste over time.

As described in Section 3.16.5, Pagan, the historical influences of World War II and agricultural production on Pagan are likely to have resulted in hazardous materials and waste releases. There are areas of high probability of munitions and explosives of concern and there are areas in vicinity of the Japanese Imperial Army infrastructure that were likely to result in hazardous releases to the environment. After the 1981 volcanic eruption and evacuation, many potentially contaminated sites may have been covered by ash and lava. Since that time there has been no industrial activity and minimal residential activity on Pagan; therefore, the volume of hazardous materials being handled in recent history is negligible and associated with camping, fishing, and airfield activities. The regulations that were developed in the 1970s continue to evolve to protect the environment from future accidental releases.

5.3.16.2.2 Impacts of Present and Reasonably Foreseeable Actions

No present and reasonably foreseeable actions would have a potential impact to hazardous materials and waste management on Pagan. Therefore, there is no potential for the present and reasonably foreseeable actions to contribute to a cumulative impact to hazardous materials and waste on Pagan.

5.3.16.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.16.4, Pagan. Both Pagan proposed action alternatives would result in less than significant direct and indirect impacts to human
health and the natural environment due to hazardous materials, toxic substances, hazardous waste, and contaminated sites. The affected areas vary among alternatives, but the overall impacts would be similar.

Most of the ordnance used for combined level training exercises on Pagan would be similar to those used on Tinian, though annual quantities of the various types of munitions would be greater than from the Tinian proposed action. The main difference is that ordnance used on Pagan would also include air-to-ground missiles, sea surface-to-ground gunfire, and high-explosive bombs (inert aviation ordnance would also be used on Pagan). The High Hazard Impact Area(s) would be managed according to range management policies designed to protect the environment. Other hazardous materials and waste would be managed to comply with applicable federal and local regulations.

5.3.16.2.4 Potential Cumulative Impacts

No present and reasonably foreseeable actions would have a potential impact to hazardous materials and waste on Pagan. These actions are infrequent, transient, and geographically distinct. Therefore, there would be no cumulative impact to hazardous materials and waste on Pagan.

5.3.17 Public Health and Safety

5.3.17.1 Tinian

5.3.17.1.1 Study Area and Health of Resources Considered

The study area for public health and safety cumulative impact analysis is the airspace, land areas, and marine waters (sea space) of Tinian. Long term public health and safety impacts can result from historic activities, such as World War II unexploded ordnance and historical use of pesticides in large-scale agricultural production. Current U.S. military training has created potential risk to public health and safety, reducing resiliency; however, there are management controls to limit these risks. In addition, there are current impacts associated with increases in population. It is anticipated that without future improvements to island infrastructure, resiliency to additional stress would continue to decline.

World War II is the most damaging recent event in Tinian’s history that affected public health and safety. Health and safety issues addressed in this EIS/OEIS include the following: risks of public exposure to U.S. military operations and local/regional emergency response matters. Risks related to current U.S. military operations may be related to flight safety, ground training, munitions-related hazards, energy hazards, and marine safety. U.S. military personnel and construction workers on federal contracts are subject to U.S. military-specific and other federal occupational safety regulations. There are no homes within the Military Lease Area.

Coordination of flight and ground taxi is accomplished through the Saipan control tower and via a common traffic advisory frequency. Airport lighting and aircraft rescue and firefighting capabilities are available at Tinian International Airport during field operating hours. U.S. military aircrews currently use both the Tinian International Airport and Tinian’s North Field for training.

As described in Section 3.17.4, Tinian, ground transportation facilities on Tinian include the existing road network (primarily developed in 1944 to accommodate the U.S. military), with limited designated bicycle paths, and isolated sidewalks along roads within San Jose. All Tinian roadways currently operate
under capacity at acceptable level of service (Level of Service A), as evidenced by free-flowing traffic and no traffic delays. However, many of the existing roads throughout Tinian are in poor condition due to lack of maintenance. There are currently no plans by the CNMI government to improve roads and reduce risk.

U.S. military operations and training have occurred in the Military Lease Area since the 1940s. Due to the historic use of Tinian during World War II, it is likely that unexploded ordnance and/or historically discarded munitions still exist. Unexploded ordnance includes munitions (i.e., ordnance) components that were fired from a weapon and failed to function properly (i.e., explode). Historically discarded munitions include munitions that were not fired but abandoned or not disposed of properly. The risk varies throughout the island.

The Port of Tinian is used by the public, commercial and supply barges, as well as U.S. Coast Guard vessels. The current harbor infrastructure is in need of improvements and repairs to ensure its continued safe use. The CNMI government is assessing the use and priorities of the port and the harbor, examining options for rehabilitating the piers, and conducting fieldwork (topographic and hydrographic studies) to support a basis of design and dredging requirements.

5.3.17.1.2 Impacts of Present and Reasonably Foreseeable Actions

One reasonably foreseeable action would potentially impact public health and safety (Mariana Islands Training and Testing) because of the increased training. However, through the implementation of Navy safety procedures, the impacts were determined to be unlikely in the EIS/OEIS. Chiget Mortar Range Cleanup and Masalog Ammunition Depot Cleanup would have beneficial impacts because they address existing public health and safety issues.

There is potential for present and reasonably foreseeable actions to contribute to adverse and beneficial cumulative impacts to public health and safety on Tinian.

5.3.17.1.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.17.3, Tinian. There would be the same less than significant impacts to public health and safety for all three Tinian proposed action alternatives. There would be an increased risk of accidents associated with proposed live-fire range activities and public exposure to unexploded ordnance. A permanent range control facility would be maintained in the Military Lease Area. The Marine Corps Guam Range Management office would be responsible for implementing access control, and safety and fire prevention/response protocols to minimize and avoid impacts to public health and safety. Similarly, there are management policies and procedures to ensure the safe, efficient, effective, and environmentally sustainable use of the range area, which includes periodic range clearance to identify and destroy unexploded ordnance. The implementation of these standard protocols and policies reduces the potentially significant impact to less than significant.

5.3.17.1.4 Potential Cumulative Impacts

The Chiget Mortar Range Cleanup, Brownfields Grants, and Masalog Ammunition Depot Cleanup would have beneficial impacts because they address existing public health risks. Under the proposed action,
implementation of range safety and access control procedures would prevent the public from accessing the Military Lease Area during live-fire training events. The High Hazard Impact Area and certain training areas would be fenced and gated to restrict the public from entering during non-training periods. Danger zones over water would be closed to the public on a full-time or intermittent basis during training and open to the public when no training is occurring in that area. Public access would be prohibited or limited in certain areas, and range control would monitor and control access. The U.S. military training activities including the proposed action would increase the risk to public health and safety. The same populations would be impacted for all U.S. military actions. However, implementation of Navy safety procedures and best management practices for range clearing and fire prevention would minimize the impacts. Therefore, there would be no cumulative impact to public health and safety on Tinian.

5.3.17.2 Pagan

5.3.17.2.1 Study Area and Health of Resources Considered

The study area for the public health and safety cumulative impact analysis is airspace, land areas, and marine waters (sea space) of Pagan. Public health and safety risks include volcanic activity and the unexploded ordnance from World War II. These factors have not changed in the recent past and are not expected to change. As such, the trend in public health and safety status on Pagan is expected to remain stable.

As described in Section 3.17.5, Pagan, the most prevalent health and safety risks on Pagan are the active volcano and the potential for unexploded ordnance from World War II. The active volcano located on Northern Pagan is monitored by the U.S. Geological Survey by satellite imagery.

There is no resident population on Pagan but people visit Pagan for recreation and resource gathering. Visitors have been observed using temporary encampments. No U.S. military ranges exist on Pagan. Temporary visitors to Pagan on approved visits are required to have the ability to contact the CNMI Homeland Security and Emergency Management Office, normally by using a satellite phone. Pagan airfield is an unattended/uncontrolled World War II-era, grass field, truncated at one end by 30-foot (9-meter) lava flow. The Pagan airfield is used as an evacuation airfield for medical emergencies in the Northern Islands, coordinated via satellite phone.

Pagan was a Japanese Imperial Army stronghold that was continuously bombed from June 1944 through September 1945. There is the likelihood that unexploded ordnance and/or historically discarded munitions would be encountered throughout Pagan. Areas identified by historical records indicating locations of military importance have a higher probability of unexploded ordnance than others. There are no existing training ranges on Pagan.

There is no operable pier or port facilities on Pagan and there are no regularly scheduled marine operations. However, as described in Section 3.8, Recreation, there are currently limited ecotourism activities that occur on the island.

5.3.17.2.2 Impacts of Present and Reasonably Forseeable Actions

There are three present and reasonably foreseeable actions that would potentially impact public health and safety (Ecotourism, Silver Explorer Cruise Ship Visit, and cultural events such as the Chamorro
Conference). A fourth action is the U.S. Geological Survey volcanic activity monitoring station that was installed in 2013, but service was discontinued due to lack of funding for satellite uplink. This project could be considered to have a beneficial impact to human health and safety because it provides the infrastructure to collect data that allows advance notice of pending volcanic hazards and the need for evacuation.

The various short-term ecotourism and cultural actions would result in additional visitors to the island, possibly during training. In addition, there are pre-existing conditions on Pagan that would impact the health and safety of a visiting population, such as: volcanic eruptions, lack of safe waterfront or airfield access, lack of medical care facilities, and low to high probability of unexploded ordnance.

There is potential for present and reasonably foreseeable actions to contribute to adverse and beneficial cumulative impacts to public health and safety on Pagan.

### 5.3.17.2.3 Impacts of the Proposed Action That May Contribute to a Cumulative Impact

Direct and indirect impacts of the proposed action are detailed in Section 4.17.4, Pagan. With implementation of safety and access control procedures, operation of the proposed Pagan proposed action alternatives would result in a less than significant impact to public health and safety.

During training periods, the public would be restricted from accessing the Pagan RTA encumbered by surface danger zones for safety reasons. Depending on the type of training and training scenario, other portions of the island and surrounding waterways may be used for training and public access would be restricted in those areas. The intent is to provide public access to Pagan to the extent practical.

### 5.3.17.2.4 Potential Cumulative Impacts

The potential increase in visitors to the island would increase the risk to public health and safety during training events. However, access to Pagan would be managed to protect the public health and safety of the visiting population. The proposed action includes implementation of safety and access control procedures. The volcanic activity monitoring station project could be considered to have a beneficial impact to human health and safety because it provides the infrastructure to collect data that allows advance notice of pending volcanic hazards and the need for evacuation. Therefore, there would be no cumulative impact to public health and safety.

### 5.4 Need for Mitigation

No additional potential mitigation measures beyond those described for the proposed action in Chapter 4, Environmental Consequences, are proposed for potential cumulative impacts on Tinian or Pagan.
# CHAPTER 6

## ADDITIONAL CONSIDERATIONS REQUIRED BY NEPA

## Table of Contents

CHAPTER 6 ADDITIONAL CONSIDERATIONS REQUIRED BY NEPA ................................................................. I

ACRONYMS AND ABBREVIATIONS ........................................................................................................... II

6.1 INTRODUCTION ........................................................................................................................................ 6-1

6.2 CONSISTENCY WITH OTHER FEDERAL, COMMONWEALTH, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS ....................................................................................... 6-1

6.3 UNAVOIDABLE SIGNIFICANT ADVERSE IMPACTS .............................................................................. 6-3

6.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES............................................. 6-5

6.5 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY .................................................................................................................. 6-6

## List of Tables

6.3-1 Unavoidable and Irreversible Significant Adverse Impacts ................................................................. 6-4
### Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>CJMT</td>
<td>Commonwealth of the Northern Mariana Islands Joint Military Training</td>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>CNMI</td>
<td>Commonwealth of the Northern Mariana Islands</td>
<td>OEIS</td>
<td>Overseas EIS</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
<td>RTA</td>
<td>Range and Training Area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U.S.</td>
<td>United States</td>
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</table>
CHAPTER 6 ADDITIONAL CONSIDERATIONS REQUIRED BY NEPA

6.1 INTRODUCTION

This chapter addresses additional considerations required by the National Environmental Policy Act (NEPA) and possible conflicts between the proposed action and the objectives of existing land use plans, policies, and controls; irreversible and irretrievable commitment of resources; and short-term use versus long-term productivity. The cumulative impacts analysis is presented in Chapter 5.

6.2 CONSISTENCY WITH OTHER FEDERAL, COMMONWEALTH, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS

The proposed action alternatives have been assessed to determine their consistency and compliance with applicable environmental regulations and other plans, policies, and controls. In summary, this analysis indicates that the proposed action alternatives would not conflict with the objectives of applicable federal regulations, but there may be inconsistencies with the Commonwealth of the Northern Mariana Islands (CNMI) and local land use plans and policies (Section 4.7, Land and Submerged Land Use).

6.2.1 Federal Plans

Throughout the Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) process, other federal agencies (including cooperating agencies) were provided opportunities to identify potential conflicts with their plans and policies. No conflicts were identified to date.

The proposed action on Tinian is compatible with the present and reasonably foreseeable United States (U.S.) military training actions described in Chapter 5, Cumulative Impacts.

There are no federal plans, policies, or controls currently associated with Pagan. The U.S. Geological Survey is best suited to maintain monitoring equipment for volcanic activities on the island; however, stable support for these efforts is yet to be identified. This activity would not present any significant inconsistencies with proposed military training.

The management of the ranges and training areas (RTAs) proposed in this EIS/OEIS would be linked to the overall management by the Commander Naval Installations Command, Joint Region Marianas. As the Marine Corps Forces Pacific is the Executive Agent for this action, Marine Corps policies and procedures would likely provide the basis for joint and multi-national range and training area management. Marine Corps Order P3550.10 Policies and Procedures for Range and Training Area Management, establishes Marine Corps responsibilities and prescribes policies and procedures concerning safety and management of Marine Corps operational ranges and training areas, to include associated training facilities (Department of the Navy [DoN] 2005). An organization such as a Marine Corps Guam Range Management Division is envisioned as the designated range control facility organization with responsibility for the Tinian and Pagan ranges. This organization would provide safety,
control, maintenance, environmental compliance, and administrative functions for aviation, ground, and combined arms training events within RTAs, to include both live-fire and non-live-fire events.

The management of all ranges would be coordinated to avoid conflicts among the various U.S. military training activities. If the proposed action were implemented, the existing Joint Region Marianas Integrated Natural and Integrated Cultural Resource Management Plans would be updated to include Pagan military lands and all new activities associated with the proposed action.

### 6.2.2 Regional and Local Land Use Plans

As described in Section 3.7, *Land and Submerged Land Use*, the CNMI Public Land Use Plan (Marianas Public Land Corporation 1989) is the current land use planning guidance.

#### 6.2.2.1 Tinian

On Tinian, military use is identified for the Military Lease Area, the Tinian International Airport and the Port of Tinian. Future land use planning goals on Tinian include continued military use of lease areas; development of casinos and hotels as infill, rather than sprawling resort with golf course-style development; 533 homesteads by 2015; preservation of conservation lands; continued agriculture; and an increase in fisheries productivity.

The Tinian alternatives are consistent with this planned U.S. military use within the Military Lease Area and with planned use of the Tinian airport and seaport with additional airspace modifications due to proposed military training. Additional acreage would be leased from the CNMI at the Tinian International Airport with the purpose of using the area for military aviation purposes compatible with existing and future commercial aviation, and at the Port of Tinian with the purpose of using the area for military operations compatible with future commercial marine operations at the seaport. No reasonably foreseeable competing land uses (other than the federal actions mentioned in the previous section) are identified for these two areas within the reasonably foreseeable timeframe (2026). The proposed land uses, therefore, would be consistent with the CNMI government airport and harbor land uses.

The proposed action would remove 2,375 acres (961 hectares) within the Military Lease Area from agricultural use. The new restriction in land use is consistent with the terms and conditions of the lease agreements. However, there would be an impact to the total land available for agricultural land use on Tinian. The DoN has identified an area east of Broadway Avenue, within the Military Lease Area, that could be made available for agricultural use.

#### 6.2.2.2 Pagan

The 1989 *CNMI Public Land Use Plan* does not mention Pagan specifically and refers to all islands north of Saipan collectively as the “Northern Islands.” It states that “public lands in the Northern Islands will remain in their current designation as conservation areas (Marianas Public Land Corporation 1989).” Conservation lands are public lands that are set aside to protect critical habitats, forests, wetlands and historic/cultural sites. The proposed action is inconsistent with the land use designation of conservation.

As discussed in Section 3.7, *Land and Submerged Land Use*, the CNMI prepared a Five-Year Land Use Plan. There is no recent land use plan for Pagan that has been officially adopted by the CNMI government. Public Law 16-50 states that lands in the northern islands (including Pagan) may be
designated for homesteading, public/private facilities, and commercial activities. The 2013 CNMI Department of Public Lands’ Pagan land use planning effort generated three potential land use plan options for consideration. The CNMI Department of Public Lands has not selected any of these options or officially adopted any land use plans for Pagan. There are no reasonably foreseeable CNMI investments in infrastructure or public services on Pagan. Therefore, the proposed action is consistent with the existing land use. However, the proposed action is not consistent with Public Law 16-50 as it precludes the CNMI legislative mandate to provide homesteads on Pagan. Full time residential land use would not be compatible with the proposed U.S. military training.

6.2.3 Applicable Federal and Local Regulations

The U.S. military must comply with all applicable federal environmental laws, regulations, and Executive Orders, including, those introduced in Chapters 3 and 4 under each resource section and summarized in Appendix E, Applicable Federal and Local Regulations. The EIS/OEIS process has provided federal and local agencies opportunities to review and comment on the proposed action, and the requisite coordination and consultation activities have been initiated.

6.3 UNAVOIDABLE SIGNIFICANT ADVERSE IMPACTS

Chapter 4, Environmental Consequences identifies the significant adverse impacts of the proposed action. Many of these impacts are mitigable to less than significant adverse impacts, but the impacts listed in Table 6.3-1 are unavoidable. Either mitigation is not proposed or the mitigation proposed would not reduce the impact to less than significant. The unavoidable impacts are similar among the action. Briefly, the unavoidable significant impacts related to the Tinian alternatives would be to the following resources:

- Geology and Soils
- Noise
- Land and Submerged Land Use
- Recreational Resources
- Visual Resources
- Socioeconomics

In addition, unavoidable adverse impacts related to the Tinian alternatives would occur due to: removal of native vegetation including limestone forest wildlife habitat; permanent loss of marine habitat including coral during construction and operations; and degradation of marine habitats through runoff and munitions. These would be irreversible/irretrievable impacts.

The unavoidable significant impacts related to the Pagan alternatives would be to the following resources:

- Land and Submerged Land Use
- Socioeconomics and Environmental Justice
Table 6.3-1. Unavoidable and Irreversible Significant Adverse Impacts

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Unavoidable Impact</th>
<th>Irreversible/Irretrievable? (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geology and Soils</td>
<td>Operations in the High Hazard Impact Area would result in permanent loss of prime farmland soils.</td>
<td>Yes</td>
</tr>
<tr>
<td>Noise (similar for all alternatives)</td>
<td>Noise generated at the RTA by large-caliber weapons, during unfavorable weather conditions, could result in increased risk of complaints from locations outside, and south of the Military Lease Area on Tinian, and to the north of the Military Lease Area from locations in the southwestern portion of Saipan.</td>
<td>No</td>
</tr>
</tbody>
</table>
| Land and Submerged Land Use            | • Additional federal land acquired under long-term real estate agreement.  
• New and more frequent restrictions on public access to Military Lease Area and submerged lands.  
• Landing beach would impact two CNMI Areas of Particular Concern: Shoreline and Lagoon and Reefs.  
• Federal land acquisition and development at the port would impact the CNMI Port and Industrial Area of Particular Concern.  
• Port development would be within the Coastal Hazards CNMI Area of Particular Concern.  
• Land uses within the Military Lease Area would change to U.S. military training and may preclude agricultural and grazing use of the area. DoN has identified some areas that could be set aside for grazing, but a U.S. commitment to agricultural use is pending. | Yes                                 |
| Recreational Resources                 | • New and more frequent restrictions on public access to recreational resources within the Military Lease Area and submerged lands.  
• Year-round loss of access to cultural sites within the High Hazard Impact Area.                                                                                                                                   | To be determined pending Section 106 |
| Visual Resources                       | Views from Mount Lasso permanently altered.                                                                                                                                                                             | Yes                                 |
| Socioeconomics and Environmental Justice| Increased population and number of children on island attending schools.                                                                                                                                               | No                                  |
Table 6.3-1. Unavoidable and Irreversible Significant Adverse Impacts

<table>
<thead>
<tr>
<th>Resource Area</th>
<th>Unavoidable Impact</th>
<th>Irreversible/Irretrievable? (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pagan</td>
<td>• Additional federal land acquired under long-term lease.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>• New restrictions on public access to Pagan and submerged lands.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Landing beach would impact two CNMI Areas of Particular Concern: Shoreline and Lagoon and Reefs.</td>
<td></td>
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<tr>
<td></td>
<td>• The High Hazard Impact Areas would be permanently off-limits to visitors, even when there are no training events.</td>
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<tr>
<td></td>
<td>• U.S. military use would be incompatible with conservation land use designation of Pagan.</td>
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</tr>
<tr>
<td></td>
<td>• U.S. military use would preclude extended visits and permanent residents.</td>
<td></td>
</tr>
<tr>
<td>Socioeconomics and Environmental Justice</td>
<td>Decreased access to recreational and cultural activity, and decreased likelihood that former Pagan residents or their ancestors would be able to re-settle or homestead the island.</td>
<td>No</td>
</tr>
</tbody>
</table>

In addition, unavoidable adverse impacts related to the Pagan alternatives would occur due: removal of native vegetation including forest wildlife habitat; permanent loss or marine habitat including coral during construction and operations; and degradation of marine habitats through runoff, munitions and noise. These would be irreversible/irretrievable impacts.

6.4 Irreversible and Irretrievable Commitment of Resources

NEPA requires a detailed statement on “any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented” (40 Code of Federal Regulations § 1502.1). Irreversible effects are related to the permanent use of a non-renewable resource (such as minerals or energy) and the effects that the use of those resources have on future generations. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural site).

Irreversible and irretrievable commitments of resources would occur under all alternatives. There would be no appreciable difference among the Tinian alternatives or between the Pagan alternatives with respect to irreversible and irretrievable commitment of resources.
General irreversible and irretrievable commitment of resources related to the construction and operation of the proposed action on Tinian and Pagan would include the following:

- Consumption of fossil fuels and energy for construction and training equipment, transportation and facility operation by U.S. military.
- Use of raw materials (i.e., wood, metal, components of concrete, asphalt, fabricated building materials) for construction of new facilities.
- Increases in the demand for potable water. While there is sufficient capacity of groundwater resources, the use does represent an irreversible use of the resource that is not available for other users.
- Expenditures of time (labor) and money.

In addition to the U.S. military fuel and time expenditures, civilians may also experience a greater expenditure of resources when they are required to travel greater distances to accommodate new airspace and marine navigation restrictions.

As summarized in the last column of Table 6.3-1, most of the unavoidable significant impacts would be irreversible. In addition, there are unavoidable impacts that would be reversible when the military training ends. But because the training would continue well into future generations, there is less certainty that the impact would be completely reversible. If these additional unavoidable impacts are included, only the unavoidable noise and socioeconomic impacts to Tinian would be reversible. None of the unavoidable impacts to Pagan would be reversible.

Under the no-action alternative, current military-approved training activities would continue. These activities include limited non-tactical live-fire and other non-live-fire training as well as the construction and operation of four ranges on Tinian (see Section 2.4.5, Tinian No-Action Alternative). Therefore, under the no-action alternative there would also be irreversible and irretrievable commitments of resources that were described in the 2010 Guam and CNMI Military Relocation EIS (DoN 2010b). The only U.S. military training that occurs on Pagan under the no-action alternative is infrequent search and rescue type training exercises following coordination and approval from the CNMI government. However, under the no-action alternative this would represent irreversible and irretrievable commitments of resources.

### 6.5 Relationship Between Short-Term Use of the Environment and Long-Term Productivity

NEPA states in Section 102 (42 U.S. Code 4332) that the lead agency provide a detailed statement on “...the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity.” This requirement is aimed at implementing NEPA Section 101 (b) (1) that states the Nation should “...fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.”

It is important to note that this assessment of short-term use and long-term productivity is based on short-term use not impact. Short-term use, in the context of generations, is defined by the life of the
proposed action which is currently unknown. However, the U.S. military lease terms would be a minimum of 50 years (minimum two generations).

There would be benefits and gains over the life of the proposed action, as well as costs and impacts. This section presents an evaluation of the short-term use of the environment in relation to adverse effects on the maintenance or enhancement of long-term productivity. The discussion is from the standpoint of a trustee for future generations and explains the decision to incur lasting losses in potential productivity in exchange for meeting short-term goals.

Benefits achieved through the proposed action could limit the range of opportunities for the enhancement of long-term productivity of the affected environment. At the same time there will usually be costs, side effects, and loss of natural resources that have long-term productive value. Long-term productivity refers to valuable uses for existing environment (e.g., wetlands, open space, visual resources, recreation areas, floodplains, wildlife habitat, groundwater recharge, areas that support valued species, or cultural practices and sites) and renewable resources (e.g., agriculture, fisheries, water supply, socioeconomics). Long-term productivity also refers to environmental quality such as low ambient noise levels, clean air, clean water, and low levels of other kinds of pollutants.

6.5.1 Benefits of Short-Term Use

As stated in Section 1.3, *Purpose of and Need for the Proposed Action*, the purpose for the proposed action is to reduce training deficiencies for U.S. military services in the Western Pacific. Existing U.S. military live-fire, unit and combined RTAs are insufficient to support U.S. Pacific Command Service Components’ training requirements in the Western Pacific. The proposed action is needed to enable U.S. Pacific Command forces to meet their Title 10 requirements to maintain, equip and train combat and humanitarian forces in the Western Pacific. The primary benefit of this short-term use is a well-trained military force and improved national security.

Regionally, the CNMI government and citizens would benefit from the short-term U.S. military training use due to an increase in revenue from lease payments and from the proposed infrastructure (i.e., roadways, airport) improvements that would benefit both the short-term proposed use and long-term productivity of the environment. There would be additional socioeconomic benefits due to increased employment opportunities during construction and operation.

6.5.2 The Cost of Short-Term U.S. Military Training Use

Under all alternatives, the utilization of irretrievable and irreplaceable resources of labor, federal expenditures, construction/operation materials and supplies, and fossil fuels would not be available for use by future generations.

The trade-offs associated with short-term use are related to the unavoidable significant impacts (*Section 6.3, Unavoidable Significant Adverse Impacts*) and irreversible and irretrievable commitment of resources (*Section 6.4, Irreversible and Irretrievable Commitment of Resources*), both of which adversely affect the long-term productivity of the environment and impact future generations. In addition, actions that would be precluded by the proposed action also represent tradeoffs in long-term productivity.
There would be no appreciable difference among the three Tinian or between the two Pagan proposed action alternatives with respect to the impacts to short-term uses and long-term productivity of the environment.

### 6.5.3 Tinian

The area on Tinian leased by the U.S. military would be expanded under the proposed action. No private competing land use plans were identified for the new lease areas or the existing Military Lease Area in the Five-Year Land Use Plan (1989). The new lease areas would be available for other land uses at the end of the life of the proposed action.

There are existing agricultural land uses within the Military Lease Area that would be precluded; however, there are ongoing efforts to mitigate this impact to long-term agricultural productivity by designating specific areas for cattle grazing within the Military Lease Area. In addition, there are lands outside of the Military Lease Area that could potentially be suitable for grazing and agricultural productivity to mitigate for the impacts of the short-term military use. Future Tinian land use plans would need to address the changes in land use.

Another cost of the proposed action would be related to the short-term use of the Military Lease Areas due to new public access restrictions, but these access restrictions are reversible at the end of the life of the proposed action and during non-training periods. The U.S. military training access restrictions would not affect the long-term productivity of the environment, except there may be discrete areas that remain restricted, for health and safety reasons, beyond the life of the proposed action, representing a loss of land available for future generations.

The irreversible and irretrievable commitment of resources associated with the short-term use (U.S. military training) would adversely affect the long-term productivity of the environment for the following resources (see Table 6.3-1): airspace, water resources, terrestrial biology, marine biology, cultural resources, and visual resources.

There have been land use proposals for Tinian that did not meet the criteria for reasonably foreseeable in the cumulative impact analysis in Chapter 5, *Cumulative Impacts*, but they are relevant to the discussion of trade-offs associated with the proposed short-term U.S. military use and environmental productivity for future generations. Most of the large-scale land use proposals identified are tourism related and would increase the hotel room capacity. Each of the proposals would have their own “short-term” tradeoffs that would impact long-term environmental productivity; however, there are no environmental impact documents for these proposals to rely upon for a comparison of the trade-offs among the proposals and the proposed action. The proposals for land use outside of the Military Lease Area could proceed concurrently with the proposed action and would not be precluded. However, the limited public access to prime tourist sites (e.g., historic, recreational) within the Military Lease Area could diminish the tourist experience during the life of the proposed action and have long-term impacts to economic productivity.
6.5.4 Pagan

The CNMI government did not identify U.S. military use of Pagan in their *Five-Year Land Use Plan* (1989). There have been competing land use ideas for Pagan that did not meet the criteria for reasonably foreseeable in the cumulative impact analysis in Chapter 5, *Cumulative Impacts*, but they are relevant to the discussion of trade-offs associated with the proposed short-term use and environmental productivity for future generations. Homesteading, thermal energy, mining, aquaculture and agriculture proposals have all been considered for Pagan. Increases to temporary ecotourism visits are considered reasonably foreseeable and would be scheduled to avoid training events. Each or any combination of these proposals would have their own “short-term” opportunity costs impacting long-term environmental productivity; however, there are no environmental impact documents for these proposals to rely upon for a comparison of the trade-offs among the proposals and the proposed action. Proposals that would require full-time resident populations on Pagan would be precluded by the limited public access imposed during training. Ecotourism is one example of an activity that could continue during non-training periods, with no loss to the long-term productivity or success of the venture. Aquaculture also could proceed to a limited extent with restrictions on siting the aquaculture facilities and island access during U.S. military training. All land use proposals that are precluded in the short-term could resume on termination of the federal lease for U.S. military training. However, with the passage of time and generations over the long-term U.S. military lease, the delays in homesteading could represent a cultural loss to future generations that is not reversible because cultural ties to Pagan by former residents would not be maintained.

The irreversible and irretrievable commitment of resources associated with the short-term use (U.S. military training) of Pagan would adversely affect the long-term productivity of the environment for the following resources (see Table 6.3-1): terrestrial biology, marine biology, and cultural resources.
CHAPTER 7
REFERENCES

Table of Contents

CHAPTER 7 REFERENCES................................................................................................................................. I

ES.1 EXECUTIVE SUMMARY .............................................................................................................................. 7-1
7.1 CHAPTER 1 .................................................................................................................................................. 7-2
7.2 CHAPTER 2 .................................................................................................................................................. 7-3
7.3 CHAPTER 3 .................................................................................................................................................. 7-5
7.4 CHAPTER 4 .................................................................................................................................................. 7-37
7.5 CHAPTER 5 .................................................................................................................................................. 7-57
7.6 CHAPTER 6 .................................................................................................................................................. 7-60
This page intentionally left blank.
CHAPTER 7 REFERENCES

ES.1 EXECUTIVE SUMMARY


7.1 CHAPTER 1


7.2 Chapter 2


7.3 CHAPTER 3

7.3.1 Introduction

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7.3.2 Geology and Soils


7.3.3 Water Resources

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### 7.3.4 Air Quality


### 7.3.5 Noise


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### 7.3.6 Airspace


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### 7.3.7 Land Use and Submerged Land Use


### 7.3.8 Recreation


7.3.9 Terrestrial Biology


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### 7.3.10 Marine Biology


### 7.3.11 Cultural Resources


### 7.3.12 Visual Resources


### 7.3.13 Transportation


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### 7.3.14 Utilities


7.3.15 Socioeconomics and Environmental Justice


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7.3.16 Hazardous Materials and Waste


### 7.3.17 Public Health and Safety


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#### 7.4.1 Introduction

No references cited.

#### 7.4.2 Geology and Soils


### 7.4.3 Water Resources


Marine Corps Reserve. (2014). Draft Final Environmental Assessment for Amphibious Assault Vehicle Training Exercises for Marine Corps Forces Reserve Centers: Jacksonville, Florida; Tampa, Florida; Gulfport, Mississippi; and Galveston, Texas.


### 7.4.4 Air Quality


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### 7.4.7 Land Use and Submerged Land Use


### 7.4.8 Recreation


7.4.9 Terrestrial Biology


### 7.4.10 Marine Biology


### 7.4.11 Cultural Resources


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7.4.12 Visual Resources


7.4.13 Transportation


7.4.14 Utilities


7.4.15 Socioeconomics and Environmental Justice


7.4.16 Hazardous Materials and Waste


### 7.4.17 Public Health and Safety


### 7.4.18 IBB Programmatic Analysis


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7.4.19  Section 4(f) Evaluation


7.5  Chapter 5


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7.6 CHAPTER 6


CHAPTER 8
LIST OF PREPARERS

TABLE OF CONTENTS

CHAPTER 8 LIST OF PREPARERS .......................................................................................................... I
8.1 GOVERNMENT CONTRIBUTORS ......................................................................................... 8-1
8.2 CARDNO TEC-AECOM PACIFIC JOINT VENTURE ............................................................ 8-2
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</tr>
</tbody>
</table>
CHAPTER 9
DISTRIBUTION

TABLE OF CONTENTS

CHAPTER 9 DISTRIBUTION

9.1 PARTIES RECEIVING NOTICE OF AVAILABILITY OF DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT
CHAPTER 9 DISTRIBUTION

9.1 PARTIES RECEIVING NOTICE OF AVAILABILITY OF DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

Chapter 9 provides a list of parties who were directly notified about a Notice of Availability of the Draft Environmental Impact Statement (EIS)/Overseas EIS (OEIS). The Notice of Availability indicates when the Draft EIS/OEIS was issued, where copies may be obtained or reviewed, the duration of the comment period, where comments may be sent, and the location, date, and time of public hearings regarding the Draft EIS/OEIS. Private citizens may receive a Notice of Availability, but their names are not included in the list. Also included is a list of libraries receiving an electronic copy on compact disk or hard copy of the Draft EIS/OEIS.

9.1.1 Elected Officials – CNMI

Office of the Governor of the CNMI, The Honorable Governor Eloy S. Inos
Office of the Lt. Governor of the CNMI, The Honorable Lt. Governor Ralph DLG Torres
CNMI Senate, The Honorable Senator Victor Hocog
CNMI House of Representatives, The Honorable Representative Joseph P. Deleon Guerrero
Office of the Resident Representative, The Honorable U.S. Representative Gregorio C. (Kilili) Sablan

9.1.2 Elected Officials – CNMI Local

Mayor of the Northern Islands, The Honorable Mayor Francisco Jerome Kaipat Aldan
Mayor of Rota, The Honorable Mayor Ephraim Manglona
Mayor of Saipan, The Honorable Mayor David Mundo Apatang
Mayor of Tinian and Aguiguan, The Honorable Mayor Joey Patrick San Nicolas

9.1.3 Federal Agencies

Advisory Council on Historic Preservation
Department of the Air Force
Department of the Army
Department of Army, U.S. Army Engineer District, Honolulu, Regulatory Branch
Federal Aviation Administration
Headquarters, Department of the Army
Headquarters U.S. Marine Corps
International Broadcasting Bureau
National Park Service
National Trust for Historic Preservation
Naval Facilities Engineering Command, Headquarters
Naval Facilities Engineering Command, Pacific
National Oceanic and Atmospheric Administration
National Oceanic and Atmospheric Administration, Fisheries Service
National Oceanic and Atmospheric Administration Fisheries, Pacific Islands Regional Office
National Oceanic and Atmospheric Administration National Marine Fisheries – CNMI Office
National Oceanic and Atmospheric Administration National Marine Fisheries – Pacific Islands Regional Office
Natural Resources Conservation Service
Office of Insular Affairs
U.S. Air Force, Pacific
U.S. Army Air and Missile Defense Command
U.S. Army Corps of Engineers
U.S. Army Engineer District, Hawaii
U.S. Army Installation Management Command
U.S. Coast Guard, Sector Guam
U.S. Coast Guard, Marianas Section
U.S. Department of Agriculture
U.S. Department of Agriculture, Animal and Plant Health Inspection Services
U.S. Department of Agriculture, Animal Plant Inspection Health Service, Wildlife Services
U.S. Department of Interior
U.S. Department of Transportation
U.S. Department of Transportation, Federal Highway Administration
U.S. Department of Transportation, Maritime Administration
U.S. Environmental Protection Agency, Region 9
U.S. Environmental Protection Agency, Pacific Islands Office, Region 9
U.S. Environmental Protection Agency, Region 9, Environmental Review Office Communities and Ecosystems Division
U.S. Fish and Wildlife Service
U.S. Fish and Wildlife Service, Pacific Islands Office
U.S. Fish and Wildlife Service, Pacific Islands Refuge Complex
U.S. Marine Corps Forces, Pacific
U.S. Navy, Chief of Naval Operations
U.S. Navy Commander, Navy Region Marianas
U.S. Navy Commander, Pacific Fleet
U.S. Navy, Joint Guam Program Office
U.S. Navy, Office of the Assistant Secretary

9.1.4 CNMI Agencies

CNMI Bureau of Environmental and Coastal Quality
CNMI Capital Improvement Office
CNMI Department of Public Lands
CNMI Military Integration Management Committee
Commonwealth Ports Authority
Commonwealth Utilities Corporation
Department of Community and Cultural Affairs
Department of Community and Cultural Affairs, Historic Preservation Office
Department of Lands and Natural Resources
Division of Fish and Wildlife
Marianas Public Lands Authority
Marianas Visitors Authority
Office of Military Liaison and Veterans Affairs
Western Pacific Region Fisheries Management Council

9.1.5 Hawaii Agencies

Western Pacific Region Fisheries Management Council
9.1.6 Libraries Receiving Hard Copy and Electronic Copy on Compact Disk

University of Guam Robert F. Kennedy Memorial Library, Guam
Nieves M. Flores Memorial Library, Hagåtña, Guam
Joeten Kiyu Public Library, Saipan
Northern Marianas College Olympio T. Borja Memorial Library, Saipan
Tinian Public Library
Antonio C. Atalig Memorial Rota Public Library

9.1.7 CNMI Interest Groups

First Hawaiian Bank
Hotel Association of the Northern Mariana Islands
Mariana Resource Conservation and Development Council
Saipan Chamber of Commerce
Tinian Cattlemen’s Association
Tinian Chamber of Commerce

9.1.8 National/International Environmental Interest Groups

Earth Justice National Headquarters
Micronesia Nature Conservancy
Natural Resources Defense Council
Pacific Concerns Resource Centre
Sierra Club