Final

Environmental Impact Statement

GUAM AND CNMI MILITARY RELOCATION

Relocating Marines from Okinawa, Visiting Aircraft Carrier Berthing, and Army Air and Missile Defense Task Force

Reader's Guide

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Guam and CNMI Military Relocation EIS

Reader's Guide

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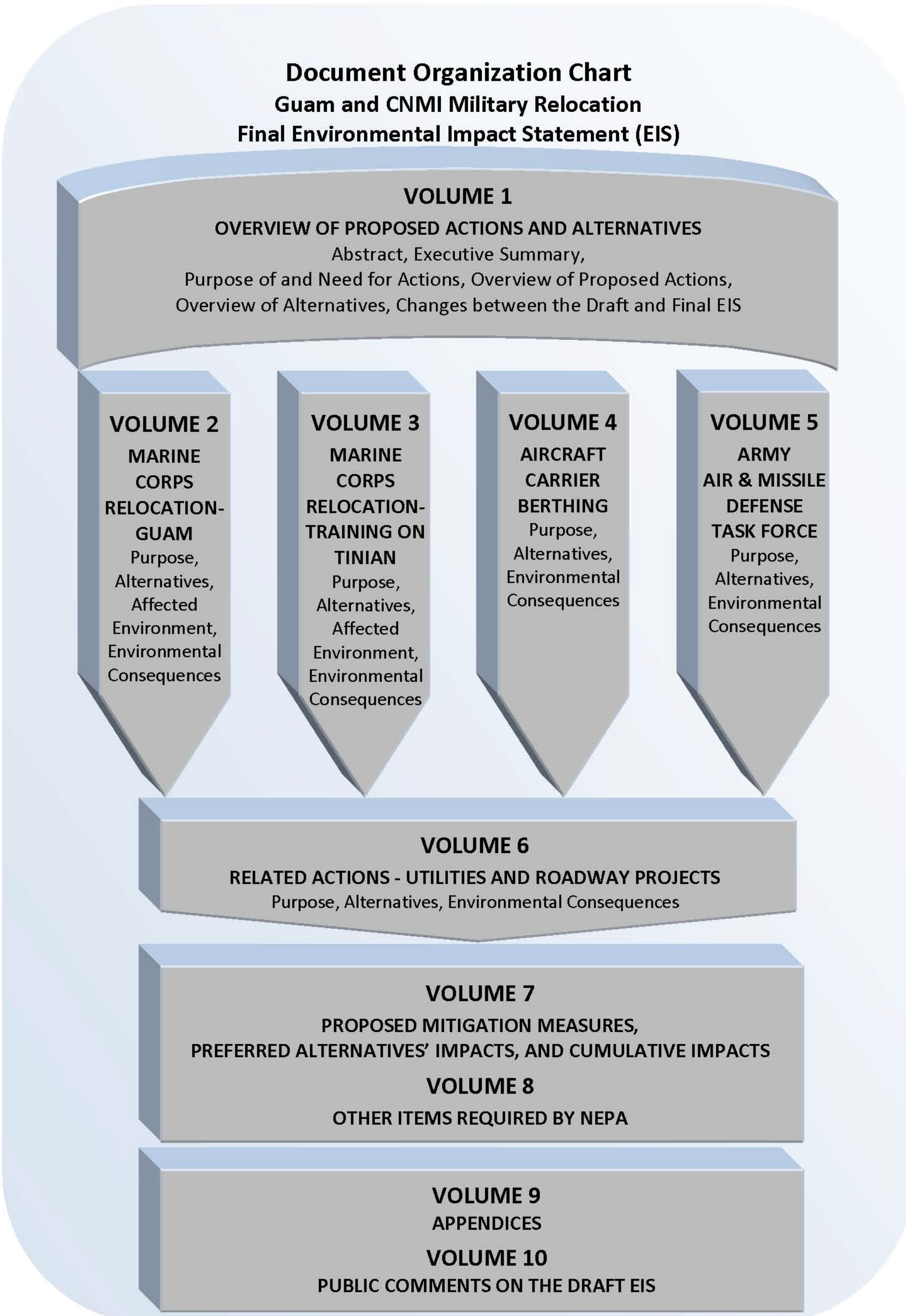

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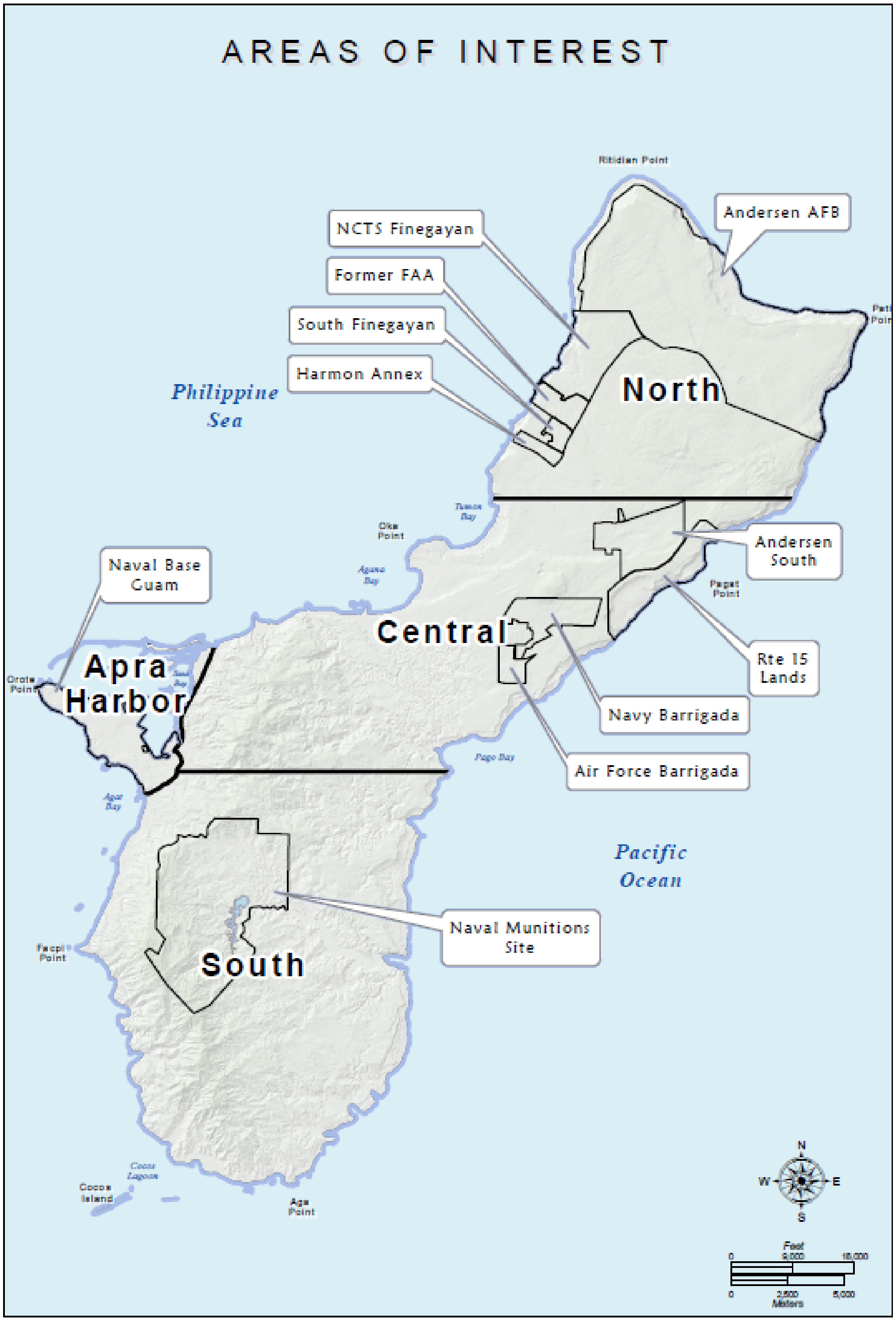

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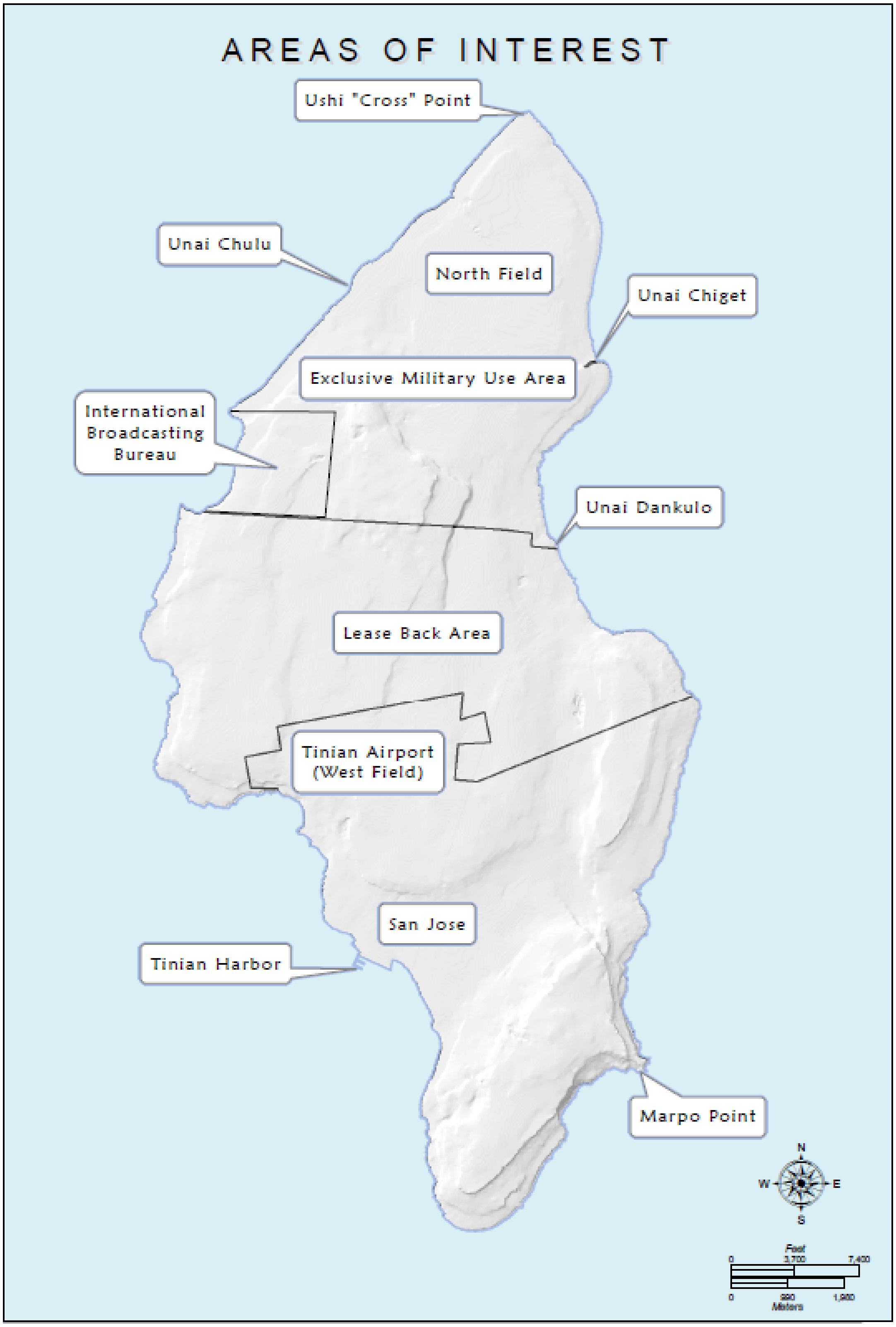
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Unai Chulu
North Field
Unai Chiget
Exclusive Military Use Area
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Unai Dankulo
Lease Back Area
Tinian Airport (West Field)
San Jose
Tinian Harbor
Marpo Point
N
W
E
S
Feet
Meters

CHAPTER 4. GLOSSARY

Access—the right to transit to and from and to make use of an area.

Activity—an individual scheduled training function or action such as missile launching, bombardment, vehicle driving, or Field Carrier Landing Practice.

Air Traffic Control Assigned Airspace (ATCAA)—Federal Aviation Administration-defined airspace not over an Operating Area (OPAREA) within which specified activities, such as military flight training, are segregated from other Instrument Flight Rules air traffic.

Airfield—usually an active and/or inactive airfield, or infrequently used landing strip, with or without a hard surface, without Federal Aviation Administration-approved instrument approach procedures. An airfield has no control tower and is usually private.

Airport—usually an active airport with hard-surface runways of 3,000 feet or more, with Federal Aviation Administration-approved instrument approach procedures regardless of runway length or composition. An airport may or may not have a control tower. Airports may be public or private.

Airspace, Controlled—airspace of defined dimensions within which air traffic control service is provided to Instrument Flight Rules flights and to Visual Flight Rules flights in accordance with the airspace classification. Controlled airspace is divided into five classes, dependent upon location, use, and degree of control: Class A, B, C, D, and E.

Airspace, Special Use—airspace of defined dimensions identified as the space or portion thereof over an area on the surface of the earth wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon non-participating aircraft.

Airspace, Uncontrolled—airspace, or Class G airspace, refers to airspace not otherwise designated and operations below 1,200 feet above ground level. No air traffic control service to either Instrument Flight Rules or Visual Flight Rules aircraft is provided other than possible traffic advisories when the air traffic control workload permits and radio communications can be established.

Airspace—the space lying above the earth or above a certain land or water area (such as the Pacific Ocean); more specifically, the space lying above a nation and coming under its jurisdiction.

Amphibious Craft Laydown— location for storing, maintaining and deploying amphibious vehicles.

Army Air and Missile Defense Task Force (AMDTF)—a ground force that includes command and control, missile field teams, maintenance, and logistics/supplies support. They also include Weapons Emplacement Sites that would accommodate Terminal High-Altitude Area Defense (THAAD) and Patriot Missile operations.

Base load power—the minimum load over a given time period. The generation capacity needed to meet the continuous (24/7) demand for the system.

Battalion—in general, a battalion is a group of 5 companies, approximately 960 individuals.

Biosecurity Risk Assessment—a risk assessment to evaluate the proposed actions described in this EIS to determine the potential for invasive species to cause harm to ecological or economic systems on Guam or at locations where they may be inadvertently exported.

Biosecurity Plan—a plan that includes an invasive species risk assessment (biosecurity risk assessment) and management of risks and damage from invasive plant and animal species.

Biosecurity—a multi-level, multi-disciplinary, collaborative program to prevent the introduction and establishment of new invasive species.

Booster—an auxiliary or initial propulsion system that travels with a missile or aircraft and that may not separate from the parent craft when its impulse has been delivered; may consist of one or more units. Boosters contain high explosives sensitive enough to be detonated by a small initiator and powerful enough to set off a less sensitive main explosive charge.

Carrier Vessel Nuclear (CVN)—a nuclear powered aircraft carrier.

Coastal Zone—a region occupying the area near the coastline in depths of water less than 538.2 ft (164.0 m). The coastal zone typically extends from the high tide mark on the land to the gently sloping, relatively shallow edge of the continental shelf. The sharp increase in water depth at the edge of the continental shelf separates the coastal zone from the offshore zone. Although comprising less than 10% of the ocean's area, this zone contains 90% of all marine species and is the site of most large commercial marine fisheries. This differs from the way the term "coastal zone" is defined in the Federal Coastal Zone Management Act where "coastal zone" typically extends from the low tide mark to several hundred feet upland.

Continental United States (CONUS)—the United States and its territorial waters between Mexico and Canada, but excluding Alaska, Hawaii, U.S. territories, and possessions.

Company—in general, a company is a group of 4 platoons, approximately 192 individuals.

Controlled Access—area where public access is prohibited or limited due to periodic training operations or sensitive natural or cultural resources.

Controlled Airspace—airspace of defined dimensions within which air traffic control service is provided to Instrument Flight Rules flights and to Visual Flight Rules flights in accordance with the airspace classification. Controlled airspace is divided into five classes, dependent upon location, use, and degree of control: Class A, B, C, D, and E.

Controlled Firing Area—area where ordnance firing is conducted under controlled conditions so as to eliminate hazard to aircraft in flight.

Council on Environmental Quality (CEQ)—established by the National Environmental Policy Act, the CEQ consists of three members appointed by the President. A CEQ regulation (Title 40 Code of Federal Regulations 1500-1508, as of July 1, 1986) describes the process for implementing the National Environmental Policy Act, including preparation of environmental assessments and environmental impact statements, and the timing and extent of public participation.

Cumulative Impact—the impact on the environment which results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Discarded Military Munitions—military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations.

Distance X—the maximum distance a projectile (including guided missiles and rockets) will travel when fired or launched at a given quadrant elevation with a given charge or propulsion system.

Economic Adjustment Committee (EAC)—established by Executive Order 12788 (as amended), the EAC coordinates Federal interagency and intergovernmental assistance to support the Defense Economic Adjustment Program and help communities respond to economic impacts caused by significant Defense program changes. The EAC is chaired by the Secretary of Defense. The Secretaries of Labor and Commerce serve as the Vice Chair men and there are a total of twenty-two federal agencies and departments represented on the EAC.

Encroachment (per Navy instruction)—any non-Navy action planned or executed that inhibits, curtails, or possesses the potential to impede the performance of Navy activities. Additionally, the lack of action by the Navy to work proactively with local communities, to monitor development plans, or to adequately manage its facilities and real property could also impact the Navy mission and thereby result in encroachment." Therefore, encroachment may stem from both internal (Navy) and external (civilian) sources.

Explosive Ordnance Disposal (EOD)—the detection, identification, field evaluation, rendering-safe recovery, and final disposal of conventional, nuclear, and chemical/biological ordnance. EOD activities are performed by specially trained active duty military personnel.

Explosive Safety Quantity-Distance (ESQD)—for a given quantity of explosive material, the distance separation relationships providing defined types of protection based on levels of risk considered acceptable. The size of the ESQD arc is proportional to the net explosive weight present.

Facilities—physical elements that can include roads, buildings, structures, and utilities. These elements are generally permanent or, if temporary, have been placed in one location for an extended period of time.

Fleet Area Control and Surveillance Facility (FACSFAC)—Navy facility that provides air traffic control services and controls and manages Navy-controlled off-shore operating areas and instrumented ranges.

Hardfill—a disposal facility for demolition debris (e.g. reinforced and non-reinforced concrete, asphalt, brick, block, tile, stone, roofing material, drywall, wood, and metal) that is not contaminated with solid waste, infectious waste, or hazardous waste.

High Explosive (HE)—an explosive substance designed to function by detonation (e.g., main charge, booster, or primary explosive). High Explosives when initiated change from basic form at a velocity greater than that of sound throughout the material exploding. The reaction, which generates a large volume of gas at high temperature and results in intense shattering effect, is usually referred to as a detonation. Examples: RDX, TNT, dynamite, and HBX.

Impact Area—the identified area within a range intended to capture or contain ammunition, munitions, or explosives and resulting debris, fragments, and components from various weapons systems (e.g., the ground and associated airspace within the training complex) A weapon system impact area is the area within the surface danger zone used to contain fired, or launched ammunition and explosives, and the resulting fragments, debris, and components. Indirect fire weapon system impact areas include probable error for range and deflection. Direct fire weapon system impact areas encompass the total surface danger zone from the firing point or position downrange to distance X.

Instrument Flight Rules (IFR)—regulations and procedures for flying aircraft by referring only to the aircraft instrument panel for navigation.

Major Exercise—a significant operational employment of live, virtual, and/or constructive forces during which live training is accomplished. A Major Exercise includes multiple training objectives, usually occurring over an extended period of days or weeks. An exercise can have multiple training operations (sub-events each with its own mission, objective and time period. Examples include C2X, JTFEX, SACEX, and CAX. Events [JTFEX] are composed of specific operations [e.g., Air-to-Air Missile], which consist of individual activities [e.g., missile launch]).

Maneuver Element—basic element of a larger force independently capable of maneuver. Normally, a Marine Division recognizes its infantry battalions, tank battalion, and light armored reconnaissance (LAR) battalion as maneuver elements. A rifle (or tank/LAR) battalion would recognize its companies as maneuver elements. A rifle (or tank/LAR) company would recognize its platoons as maneuver elements. Maneuver below the platoon level is not normally possible since fire and movement can be combined only at the platoon level or higher. The Army and National Guard recognize a squad and platoon as maneuver elements.

Maneuver—employment of forces on the battlefield through movement in combination with fire, or fire potential, to achieve a position of advantage with respect to the enemy in order to accomplish the mission.

Marine Air-Ground Task Force (MAGTF)— This is how the Marine Corps is set up to perform all types of their military actions. It insures that ground forces and air forces are working together under single leadership and a clear goal.

Marine Expeditionary Force (MEF)—A MEF is the largest MAGTF group, and is comprised of a MEF Headquarters Group, Marine Division, Marine Air Wing and Marine Logistics Group.

Marine Expeditionary Brigade (MEB)—A MEB is larger than a Marine Expeditionary Unit (MEU) but smaller than a Marine Expeditionary Force (MEF). It is comprised of a reinforced infantry regiment, a composite Marine aircraft group, and a brigade service support group. It can function as part of a joint task force, as the lead echelon of the MEF, or alone.

Marine Expeditionary Unit (MEU)—A MEU is the smallest MAGTF group, and is comprised of an air and ground combat team, and combat service support. The specific makeup of the MEU can be customized with additional artillery, armor, or air units.

Marine Corps Ground Unit—Marine Expeditionary Unit Ground Combat Element, or Battalion Landing Team, composed of an infantry battalion of about 1,200 personnel reinforced with artillery, amphibious assault vehicles, light armored reconnaissance assets and other units as the mission and circumstances require.

Material Potentially Presenting an Explosive Hazard (MPPEH)— material owned or controlled by the Department of Defense that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris) or potentially contains a high enough concentration of explosives that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization, or disposal operations). Excluded from MPPEH are munitions within the DoD-established munitions management system and other items that may present explosion hazards (e.g., gasoline cans and compressed gas cylinders) that are not munitions and are not intended for use as munitions.

Munitions and Explosives of Concern (MEC)—this term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) Unexploded Ordnance (UXO), as defined in 10 U.S.C. 101(e)(5)(A) through (C): (B) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710(e)(2): or (C) munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.

National Environmental Policy Act (NEPA)—42 U.S.C. 4321, et seq 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 NEPA procedures require that environmental information be made available to the public and the decision-makers before decisions are made. Information contained in the NEPA documents must focus on the relevant issues in order to facilitate the decision-making process.

Outside the Continental United States (OCONUS)—the areas of Alaska, Hawaii, U.S. territories, and possessions and their territorial waters excluding the U.S. and its territorial waters between Mexico and Canada.

Operation—A combination of activities accomplished together for a scheduled period of time for an intended military mission or task. An operation can range in size from a single unit exercise to a Joint or Combined event with many participants (e.g., aircraft, ships, submarines, troops).

Operational Range—a range that is under the jurisdiction, custody, or control of the Secretary of Defense and is used for range activities; or although not currently being used for range activities, that is still considered by the Secretary to be a range and has not been put to a new use that is incompatible with range activities per 10 U.S.C. 101(e)(3).

Ordnance—broadly encompasses all weapons, ammunition, missiles, shells, and expendables (e.g., chaff and flares).

Peak load—the maximum load consumed or produced by a unit or group of units in a stated time period. It may be the maximum instantaneous load or the maximum average load over a designated period of time. The peak system demand during a period of time (peak demand for a day, hour, month).

Platoon—in general, a platoon is a group of 42 individuals.

Range—a land or sea area designated and equipped for firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access, exclusionary areas. Also includes airspace areas designated for military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration [10 U.S.C. 101 (e)(3)].

Range Activity—an individual training or test function performed on a range or in an Operating Area. Examples include missile launching, bombardment, and vehicle driving. Individual RDT&E functions are also included in this category.

Range Complex—a geographically integrated set of ranges, operational areas, and associated special use airspace, designated and equipped with a command and control system and supporting infrastructure for freedom of maneuver and practice in munitions firing and live ordnance use against scored and/or tactical targets and/or Electronic Warfare tactical combat training environment.

Range Operation—a live training exercise, a research, development test and evaluation (RDT&E) test, or a field maneuver conducted for a specific strategic, operational or tactical military mission, or task. A military action. Operations may occur independently, or multiple operations may be accomplished as part of a larger event. One operation consists of a combination of activities accomplished together. The type of operation can include air, land, sea, and undersea warfare training or testing. Participants can include a specific number and type of aircraft, ships, submarines, amphibious or other vehicles and personnel.

Range Safety Zone—area around air-to-ground ranges designed to provide safety of flight and personnel safety relative to dropped ordnance and crash sites. Land use restrictions can vary depending on the degree of safety hazard, usually decreasing in magnitude from the weapons impact area (including potential ricochet) to the area of armed overflight and aircraft maneuvering.

Readiness—the ability of forces, units, weapon systems, or equipment to deliver the outputs for which they were designed (includes the ability to deploy and employ without unacceptable delays).

Regiment—a Regiment is a unit of three Battalions, approximately 2,880 individuals.

Restricted Area—a designated airspace in which flights are prohibited during published periods of use unless permission is obtained from the controlling authority.

Safety Zone—administratively designated/implied areas designated to limit hazards to personnel and the public, and resolve conflicts between operations. Can include range safety zones, ESQDS, surface danger zones, special use airspace, hazards of electromagnetic radiation to ordnance/hazards of electromagnetic radiation to personnel areas, etc.

Scoping—a process initiated early during preparation of an Environmental Impact Statement to identify the scope of issues to be addressed, including the significant issues related to the Proposed Action. During scoping, input is solicited from affected agencies as well as the interested public.

Sortie—a single operational training or RDT&E event conducted by one aircraft in a range or operating area. A single aircraft sortie is one complete flight (i.e., one take-off and one final landing).

Special Use Airspace—consists of several types of airspace used by the military to meet its particular needs. Special use airspace consists of that airspace wherein activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of these activities, or both. Special use airspace, except for Control Firing Areas, are charted on instrument flight rules or visual flight rules charts and include hours of operation, altitudes, and the controlling agency.

Stakeholder—those people or organizations that are affected by or have the ability to influence the outcome of an issue. In general, this includes regulators, the regulated entity, and the public. It also includes those individuals who meet the above criteria and do not have a formal or statutorily defined decision-making role.

Submerged Lands—the areas in coastal waters extending from the Guam coastline into the ocean 3 nautical miles (nm) (5.6 kilometers [km]).

Surface Danger Zone (SDZ)—the area surrounding a range that allows for the probability of a munition not landing within the designated target or impact area within which access is controlled for safety during firing.

Sustainable Range Management—management of an operational range in a manner that supports national security objectives, maintains the operational readiness of the Armed Forces, and ensures the long-term viability of operational ranges while protecting human health and the environment.

Targets—earthwork, materials, actual or simulated weapons platforms (tanks, aircraft, EW systems, vehicles, ships, etc.) comprising tactical target scenarios within the range/range complex impact areas.

Uncontrolled Airspace—airspace of defined dimensions in which no air traffic control services to either instrument flight rules or visual flight rules aircraft will be provided, other than possible traffic advisories when the air traffic control workload permits and radio communications can be established.

Unexploded Ordnance (UXO)—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.C. 101 (e)(5)(A) through (C)].

Ungulate—any animal having hoofs such as deer, pigs, cattle, etc.

Upland—an area of land of higher elevation.

U.S. Territorial Waters—sea areas within 12 nm of the U.S. coastline, normally measured from the low water mark on the shoreline.

Visual Flight Rules (VFR)—regulations which allow a pilot to operate an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going.

Wholly Inert—ordnance with no explosive, propellant, or pyrotechnic component (non-reactive); example: BDU-50, BDU-56 (both are non-reactive heavy-weights with no explosive charges).

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CHAPTER 5.
ACRONYM AND ABBREVIATION LIST

°F	degrees Fahrenheit
36 WG	36th Wing
III MEF	Third Marine Expeditionary Force
AAV	Amphibious Assault Vehicle
AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ac	acre(s)
ACE	Air Combat Element
ACHP	Advisory Council for Historic Preservation
ACM	asbestos-containing material
A.D.	Anno Domini
AD/ADFM	Active Duty/Active Duty Family Members
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
ADNL	A-weighted Day Night Average Level
ADT	Average Daily Traffic
AFB	Air Force Base
AFI	Air Force Instruction
A-G	air-to-ground
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
AIDS	Acquired Immune Deficiency Syndrome
AIP	Agreed Implementation Plan
ALPCD	Alien Labor Processing and Certification Division
AMC	Air Mobility Command
AMDTF	Air and Missile Defense Task Force
AMVOC	Advanced Motor Vehicle Operators Course
AOC	Area of Concern
AOR	Area of Responsibility
APC	Areas of Particular Concern
APCSR	Air Pollution Control Standards and Regulations
APE	Area of Potential Effect
APZ	Accident Potential Zone
ARG	Amphibious Readiness Group
APHIS	Agricultural Animal Plant and Health Inspection Service
ARPA	Archaeological Resource Protection Act
A-S	air-to-surface
ASHRAE	American Society of Heating Refrigeration and Air Conditioning Engineers
ASN	Assistant Secretary of the Navy
AST	Aboveground Storage Tank
ASTM	American Standards Society for Testing and Measurements
ATARA	Alliance Transformation and Realignment Agreement
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
AT/FP	Antiterrorism/Force Protection
AUPM	Above and Underground Storage Tank and Pesticide Management
B	billion
BA	Biological Assessment
BACT	Best Available Control Technology
BASH	Bird Airstrike Hazard Plan
B.C.	Before Christ
BCD	Base Command Officer
BCDC	Bureau of Communicable Disease Control
BDDT	BASH Detection and Dispersal Team
BEQ	Bachelor Enlisted Quarters
BFHNS	Bureau of Family Health and Nursing Services
BFR	Basic Facility Requirements
BHC	Bird Hazard Condition
BI	Beneficial Impact
BMD	Ballistic Missile Defense
BMDTF	Ballistic Missile Defense Task Force
BMP	Best Management Practice
BMUS	Bottomfish Management Unit Species
BO	Biological Opinion
BOD	biological oxygen demand
BOMBEX	Bombing Exercise
BOQ	Bachelor Officer Quarters
BOW	Bilge Oily Waste
BOWTS	Bilge Oily Waste Treatment System
B.P.	Before Present
BPC	Bureau of Primary Care
BFR	Basic Facility Requirements
BQ	Bachelors Quarters
BRAC	Base Realignment and Closure
BRD	Biological Resources Discipline
BRS	Biennial Reporting System
BRSA	Biological Resource Study Area
BS 0	Battle Site Zero
BSP	Bureau of Statistics and Plans
BSTF	Battle Staff Training Facility
BSTS	Battle Staff Training and Simulation
BTS	brown tree snake
Btu	British Thermal Units
BUMED	Bureau of Medicine and Surgery
C&D	Construction and Demolition
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAL	Confined Area Landings
CAST	Combined Arms Staff Trainer

CATEX	Categorical Exclusion
$CBOD_5$	Chemical Biological Oxygen Demand – Five Day
CCU	Consolidated Commission on Utilities
CDC	Center for Disease Control
CDF	Confined Disposal Facility
CDL	Clandestine Drug Labs
CDNL	C-weighted DNL
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Act Information Systems
CESQG	Conditionally Exempts Small Quantity Generators
CEQ	Council on Environmental Quality
CFA	Controlled Firing Area
CFR	Code of Federal Regulations
cfs	cubic feet per second
CG	Guided Missile Cruiser
CGC	Coast Guard Cutter
CGP	Construction General Permit
CH_4	methane
CHC	Community Health Clinic
CHCRT	Currently Harvested Coral Reef Taxa
CIP	Capital Improvements Program
CLOMR	Conditional Letter of Map Revision
CLTC	Chamorro Land Trust Commission
cm	centimeter(s)
cm/s	centimeters per second
CMCC	Civil-Military Coordination Council
CMP	Coastal Management Program
CMUS	Crustacean Management Unit Species
CNM	Commander Navy Region Marianas
CNMI	Commonwealth of the Northern Mariana Islands
CNO	Chief of Naval Operations
CO	carbon monoxide
CO_2	carbon dioxide
COFA	Compact of Free Association
COMNAV	Commander Navy Region
COMPACFLT	Commander, U.S. Pacific Fleet
COMSCINST	Commander, Military Sealift Command Instruction
CONOPS	Concept of Operations
CONSENT	Superfund Consent Decrees
CONUS	Continental United States
CORRACTS	Corrective Action Sites
CPA	Commonwealth Ports Authority
CPF	Commander U.S. Pacific Fleet
CPI	Consumer Price Index
CQC	Close Quarters Combat
CREMUS	Coral Reef Ecosystem Management Unit Species
CRM	Coastal Resources Management
CRMO	Coastal Resources Management Office
CRMP	Coastal Resources Management Program
CRRC	Combat Rubber Raiding Craft
CSA	Customer Service Agreement
CSAR	Combat Search and Rescue
CSG	Carrier Strike Group
CSS	Commander Submarine Squadron
CT	Combustion Turbine
CUC	Commonwealth Utilities Corporation
CVN	Carrier Vessel Nuclear
CVW	Carrier Air Wing
CWA	Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategy
CY	cubic yard(s)
CZ	Clear Zone
CZMA	Coastal Zone Management Act
DAMOS	Disposal Area Monitoring System
DAR	Defense Access Road
dB	decibel(s)
dBA	A-weighted decibel(s)
dBC	C-weighted decibel(s)
DD	Destroyer
DDESB	Department of Defense Explosive Safety Board
DDESS	Dependent Elementary and Secondary Schools
DDG	Guided Missile Destroyer
DEH	Division of Environmental Health
DELISTED NPL	National Priority List Deletions
DEQ	Division of Environmental Quality
DERP	Defense Environmental Restoration Program
DISID	Department of Integrated Services for Individuals with Disabilities
DLM	Department of Land Management
DLNR	Department of Lands and Natural Resources
DM	Defensive Maneuvers
DMHSA	Department of Mental Health and Substance Abuse
DMM	Discarded Military Munitions
DMR	Discharge Monitoring Report
DNL	Day-Night Sound Level
DO	dissolved oxygen
DoC	Department of Corrections
DoD	Department of Defense
DoDEA	Department of Defense Education Activity
DOE	Department of Energy
DOI	Department of the Interior
DOJ	Department of Justice
DoN	Department of the Navy
DOPAA	Description of Proposed Action and Alternatives
DOT	Department of Transportation

DOT OPS	Department of Transportation Office of Pipeline Safety Incident and Accident Data
DPHSS	Department of Public Health and Social Services
DPL	Department of Public Lands
DPRI	Defense Policy Review Initiative
DPS	Department of Public Safety
DPW	Department of Public Works
DRMO	Defense Reutilization and Marketing Office
DRS	Demand Response Service
DSAY	Discount Service Acre Year
DSMOA	DoD & State/Territorial Memorandum of Agreement
DU	dwelling unit
DU/ac	dwelling units per acre
DYA	Department of Youth Affairs
E&ECR	Erosion and Sediment Control Regulation
EA	Environmental Assessment
EAC	Economic Adjustment Committee
EC	Electronic Combat
ECM	earth-covered magazine
ECO	Environmental Compliance Officer
EC-OPS	Electronic Combat Operations
ECHO	Enforcement and Compliance History Online
ECP	entry control point
EDR	Environmental Data Resources
EET	Energy Efficient Transport
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EMI	Electromagnetic Interference
EMR	Electromagnetic Radiation
EMUA	Exclusive Military Use Area
ENSO	El Niño Southern Oscillation
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPACT	Energy Policy Act of 2005
EPCRA	Emergency Planning & Community Right-To-Know Act
EPP	Environmental Protection Plan
ERA	Ecological Reserve Area
ERNS	Emergency Response Notification System
ER-L	Effects Range-Low
ER-M	Effects Range-Median
ESA	Endangered Species Act
ESAL	Equivalent Single Axle Loading
ESG	Expeditionary Strike Group
ESQD	Explosive Safety Quantity Distance
ESS	Explosive Safety Submission
FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
FAM	Familiarization and Instrument Flight
FARP	Forward Arming and Refueling Point
FAS	Freely Associated States of Micronesia
FCLP	Field Carrier Landing Practice
FDC	Fire Direction Center
FDM	Farallon de Medinilla
FEMA	Federal Emergency Management Agency
FEP	Fishery Ecosystem Plan
FEPCA	Federal Pesticide Control Act
FFCA	Federal Facilities Compliance Act
FHWA	Federal Highway Administration
FINDS	Facility Index System
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
FIP	Flight Information Public
FIREX	Firing Exercise
FIRM	Flood Insurance Rate Map
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
FOC	Full Operational Capability
FPPA	Farmland Protection Policy Act
FR	Federal Register
FSM	Federated States of Micronesia
ft	foot/feet
ft^2	square foot/feet
FTA	Federal Transit Administration
FTE	full time equivalent
FTTS	FIFRA/TSCA Tracking System
FTX	Field Training Exercise
FUDS	Formerly Used Defense Sites
FWCA	Fish and Wildlife Coordination Act
FY	Fiscal Year
GAIN	Guam Animals in Need
GALC	Guam Ancestral Lands Commission
GAR	Guam Administrative Regulations
GBB	Gershman, Brickner, & Bratton, Inc.
GBSP	Guam Bureau of Statistics and Plans
GCA	Guam Code Annotated
GCC	Guam Community College
GCE	Ground Combat Element
GCMP	Guam Coastal Management Plan
GCR	General Conformity Rule
GCWCS	Guam Comprehensive Wildlife Conservation Strategy
GDAWR	Guam Division of Aquatic and Wildlife Resources
GDISID	Guam Department of Integrated Services for Individuals with Disabilities
GDLM	Guam Department of Land Management
GDMHSA	Guam Department of Mental Health and Substance Abuse
GDoC	Guam Department of Corrections
GDoL	Guam Department of Labor
GDP	Guam Police Department
GDPHSS	Guam Department of Public Health and Social Services

GDPR Guam Department of Parks and Recreation
GDPW Guam Department of Public Works
GDYA Guam Department of Youth Affairs
GEDA Guam Economic Development Authority
GEPA Guam Environmental Protection Agency
GFD Guam Fire Department
GHG greenhouse gas
GHMP Guam Hazard Mitigation Plan
GHPO Guam Historic Preservation Office
GHRA Guam Hotel and Restaurant Association
GIAA Guam International Airport Authority
GIMDP Guam Integrated Military Development Plan
GIP Gross Island Product
GIS Geographic Information System
GJMMP Guam Joint Military Master Plan
GLUC Guam Land Use Commission
GLUP Guam Land Use Plan
GMH Guam Memorial Hospital
GMHA Guam Memorial Hospital Authority
GNWR Guam National Wildlife Refuge
GoJ Government of Japan
GovGuam Government of Guam
GPA Guam Power Authority
gpcd gallons per capita per day
gpd gallons per day
GPD Guam Police Department
GPLS Guam Public Library System
gpm gallons per minute
GPSS Guam Public School System
GRHP Guam Register of Historic Places
GRN Guam Road Network
GRT Gross Receipts Tax
GSCSCR Government of Guam Soil Erosion And Sediment Control Regulations
GSF gross square feet
GSM gross square meters
GTP 2030 Guam Transportation Plan
GTR Ground Threat Reaction
GUNEX Gunnery Exercise
GVB Guam Visitors Bureau
GW groundwater
GWA Guam Waterworks Authority
GWMPZ ground water management protection zone
GWP global warming potential
GWQS Guam Water Quality Standards
GWUDI groundwater under the direct influence of surface water
ha hectare(s)
HACCP Hazard Analysis and Critical Control Points
HAP Hazardous Air Pollutant(s)
HAPC Habitat Area of Particular Concern
HC hydrocarbon
HCF hydroflurocarbon
HCM Highway Capacity Manual
HDPE high-density polyethylene
HDD Horizontal Directional Drilling
HE high explosive
HEA Habitat Equivalency Analysis
HERO Hazards of Electromagnetic Radiation to Ordnance
HERP Hazards of Electromagnetic Radiation to Personnel
HFC hydrofluorocarbons
HIE Helicopter Insertion/Extraction
HIV Human Immunodeficiency Virus
HMIRS Hazardous Materials Information Reporting System
HMMP Hazardous Materials Management Plan
HMMWV High Mobility Multi-Purpose Wheeled Vehicle
HMU Habitat Management Unit
HPO Historic Preservation Office(r)
HPV high-priority violation
HQ Headquarters
hr hour(s)
HSC Helicopter Sea Combat Squadron
HSIP Highway Safety Improvement Program
HSV High Speed Vessel
HSWA Hazardous and Solid Waste Amendments
HUBZone Historically Underutilized Business Zone
HVAC heating, ventilation, and air conditioning
HWMP Hazardous Waste Management Program
Hz hertz
IAP International Airport
IAS invasive alien species
IBB International Broadcasting Bureau
ICC information coordination central
ICIS Integrated Compliance Information System
ICRMP Integrated Cultural Resources Management Plan
IGPBS Integrated Global Presence and Basing Strategy
IFR Instrument Flight Rules
IMP Integrated Management Practice
IMS invasive marine species
in inch(es)
INRMP Integrated Natural Resources Management Plan
INST CONTROLS Sites with Institutional Controls
IOC Initial Operational Capability
IPCC Intergovernmental Panel on Climate Change
IPMP Integrated Pest Management Plan
IPP Independent Power Producers
IRIS Integrated Risk Information System
IRP Installation Restoration Program
ISA Inter-Service Agreement
ISO International Organization for Standardization
ISR Intelligence, Surveillance, and Reconnaissance
ISWMP Integrated Solid Waste Management Plan

ITC	International Trade Center
IWPS	Island-Wide Power System
JBIC	Joint Bank of International Cooperation
JGPO	Joint Guam Program Office
JSDF	Japanese Self-Defense Force
JRC	Joint Region Commander
JRM	Joint Region Marianas
KD	known distance
kg	kilogram
kg/day	kilograms per day
km	kilometer(s)
km^2	square kilometer(s)
knots	nautical miles per hour
kph	kilometers per hour
kV	kilovolts
kW	kilowatt(s)
kW/hr	kilowatts per hour
L	liter(s)
LAER	Lowest Achievable Emission Rate
LandGEM	Landfill Gas Emissions Model
LAV	Light Armored Vehicle
lb	pound(s)
LBA	Leaseback Area
LBP	lead-based paint
LCAC	Landing Craft Air Cushion
LCE	Logistic Combat Element
LCU	Landing Craft Utility
LEDPA	Least Environmentally Damaging Practicable Alternative
LEED	Leadership in Energy and Environmental Design
L_{eq}	equivalent sound level
LF	linear feet
LFG	Landfill Gas
LHA/LHD	Amphibious Assault Ship
LID	Low Impact Development
LIDAR	Light Detection and Ranging
LLDP	linear low-density polyethylene
L_{max}	Maximum Sound Level
LNG	Liquefied Natural Gas
LOS	Level of Service
LPD	Amphibious Transport Dock
lpm	liters per minute
LQG	large quantity generator
LSD	Dock Landing Ship
LSI	Less than significant impact
LUCIS	Land Use Control Information Systems
LZ	Landing Zone
m	meter(s)
m^2	square meter(s)
m^3	cubic meters(s)
M	million
MAGC	Marine Air Control Group
MAGTF	Marine Air Ground Task Force
MALS	Marine Aviation Logistics Squadron
MAP	Military Access Point
Marine Corps	United States Marine Corps
MARFORPAC	Marine Forces Pacific
MAW	Marine Aircraft Wing
MBP	Micronesia Biosecurity Plan
MBTA	Migratory Bird Treaty Act
MCB	Marine Corps Base
MCMEX	Mine Counter Measures Exercise
MC	Munitions Constituents
MCCS	Marine Corps Community Service
MCL	Maximum Concentration Level
MCMEX	Mine Counter Measures Exercise
MCO	Marine Corps Order
MCP	Mariana Islands Concept Plan
MCTL	Marine Corps Task List
MDA	Missile Defense Agency
MEB	Marine Expeditionary Brigade
MEC	Munitions and Explosives of Concern
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MFP/CPF	Marine Forces Pacific/Commander Pacific Fleet
MFR	multi-family residential
MG	million gallons
mg/cm^2	milligrams per square centimeter
MGd	million gallons per day
mg/L	milligrams per liter
mi	mile(s)
mi^2	square miles
MILCON	Military Construction
MIP	Medically Indigent Program
MIRC	Mariana Islands Range Complex
MISSILEX	Missile Exercise
ML	million liters
MLA	Military Lease Area
MLd	million liters per day
MLG	Marine Logistic Group
MLLW	mean lower low water
MLTS	Material Licensing Tracking System
mm	millimeter(s)
MMPA	Marine Mammal Protection Act
MMR	Military Munitions Rule
MMRP	Military Munitions Response Program
MMT	Marine Monitoring Team
MOA	Memorandum of Agreement
MOS	Military Occupational Specialty
MOU	Memorandum of Understanding
MOUT	Military Operations in Urban Terrain
MP	Military Police
MPA	microscopic particulate analyses
MPA	Marine Protected Area
mph	miles per hour
MPLA	Marianas Public Land Authority
MPPEH	material potentially presenting an explosive hazard
MPRSA	Marine Protection, Research, and Sanctuaries Act

MRA	Munitions Response Area
MRC	Marine Research Consultants
MRP	Marine Resource Preserve
MRS	Munitions Response Sites
MSA	Munitions Storage Area
M-SA	Magnuson-Stevens Fishery Conservation and Management Act
MSAT	Mobile Source Air Toxics
MSC	Military Sealift Command
msl	mean sea level
MSM	modular storage magazine
MSWLF	Municipal Solid Waste Landfill Facility
MTVR	Medium Tactical Vehicle Replacement
MUS	Management Unit Species
MUSE	Mobile Utilities Support Equipment
MUTCD	Manual on Uniform Traffic Control Devices
MVA	mega volt ampere
MW	megawatts
MWDK	Military Working Dog Kennel
MWR	Morale, Welfare, and Recreation
N_2O	nitrous oxide
NA	not applicable
NAA	Non-Attainment Area
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NATA	National Air Toxics Assessment
NAV	Navy Ashore Vision
NAVCAMS	Naval Communication Area Master Station
NAVFAC	Naval Facilities Engineering Command
NC	New Construction
NCP	National Contingency Plan
NCTMS	Naval Computer and Telecommunications Main Station
NCTS	Naval Computer and Telecommunications Station
ND	Neighborhood Development
NDAA	National Defense Authorization Act
NDWWTP	Northern District Wastewater Treatment Plant
NELHA	National Energy Laboratory of Hawaii Authority
NEO	Noncombatant Evacuation Operations
NEPA	National Environmental Policy Act
NEW	net explosive weight
NEXRAD	Next Generation Weather Radar
NFIP	National Flood Insurance Program
NFRAP	No Further Remedial Action Planned List
NGL	Northern Guam Lens
NGLA	Northern Guam Lens Aquifer
NGO	Non-Governmental Organization
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NHP	National Historic Park
NI	No impact
NIOSH	National Institute for Occupational Safety and Health
NISC	National Invasive Species Council
NITTS	Noise Induced Temporary Threshold Shift
NLNA	northern land navigation area
nm	nautical mile(s)
nm^2	square nautical mile(s)
NMC-DET	Navy Munitions Command Detachment
NMFS	National Marine Fisheries Service
NMS	Naval Munitions Site
NNPP	Naval Nuclear Propulsion Program
NO_2	nitrogen dioxides
NO_X	nitrogen oxides
NOA	notice of availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOPH	notice of public hearing
NOSSA	Naval Ordnance Safety and Security Activity
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NRC	Nuclear Regulatory Commission
NRCHC	Northern Region Community Health Center
NRCS	Natural Resources Conservation District
NRHP	National Register of Historic Places
NRMC	Navy Regional Medical Center
NSR	New Source Review
NSV	North San Vitoris
NTU	nephelometric turbidity unit
NW	nearshore waters
NWF	Northwest Field
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
O_3	ozone
O&M	Operations and Maintenance
ODMDS	Ocean Dredged Material Disposal Site
OEA	Overseas Environmental Assessment
OEIS	Overseas Environmental Impact Statement
OHA	Overseas Housing Allowance
OIA	Office of Insular Affairs
OPA	Oil Pollution Act
OPNAVINST	Office of the Chief of Naval Operations Instruction
OSD	Office of the Secretary of Defense
OSHA	Occupational Safety and Health Administration
OTEC	Ocean Thermal Energy Conversion
P2	Pollution Prevention
PA	Programmatic Agreement
PAC-3	Patriot Advanced Capability-3

PACAF	Pacific Air Forces
PACOM	U.S. Pacific Command
PAG	Port Authority of Guam
PAH	polynuclear aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PCE	perchloroethylene
PE	private entity
PFC	perfluorocarbon
PHCRT	potentially harvested coral reef taxa
PHL	Potential Hearing Loss
PI	potential impact
PK-15	Unweighted Peak, 15% Metric
PL	Public Law
PLS	Public Library System
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
PMO	Personnel Management Office
PMUS	Pelagic Management Unit Species
POL	petroleum, oil, and lubricants
POV	privately-owned vehicle
PPA	Pollution Prevention Act
PPE	personal protective equipment
ppm	parts per million
ppt	parts per thousand
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
PUC	Public Utilities Commission
pv	photovoltaic
PVC	polyvinyl chloride
PYE	person years of employment
PWC	Public Works Center
QDR	Quadrennial Defense Review
QOL	Quality of Life
RA	Restricted Area
RAATS	RCRA Administrative Action Tracking System
RAB	Restoration Advisory Board
RADINFO	Radiation Information Database
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Act Information System
REA	Rapid Ecological Assessment
REC	Regional Environmental Coordinator
REDHORSE	Rapid Engineer Deployable Heavy Operations
Req'd	required
RHA	Rivers and Harbors Act
RHIB	Rigid Hull Inflatable Boat
RIA	Regulatory Impact Analysis
RO	reverse osmosis
ROD	Record of Decision
ROI	region of influence
RORO	roll-on roll-off
ROW	right-of-way
RPM	revolutions per minute
RSE	Repair Squadron Engineer
RTA	Range Training Area
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users
SAIA	Sikes Act Improvement Act
SARA	Superfund Amendments and Reauthorization Act
SAR	Second Assessment Report
SARNAM	Small Arms Range Noise Assessment Model
SAS	Special Aquatic Sites
SAT	Stationary Armor Target
SBHSR	Ship-Borne Hazardous Substance Regulations
SCC	Security Consultative Committee
SCH	school
SCR	Selective Catalytic Reduction
SCS	Soil Conservation Service
SCUBA	self-contained underwater breathing apparatus
SDWA	Safe Drinking Water Act
SDZ	Surface Danger Zone
SEABEE	Construction Battalion
SECNAV	Secretary of the Navy
SEI	Sea Engineering Inc.
SEL	Sound Exposure Level
SF_6	sulfur hexafluoride
SFR	single-family residential
SHSP	Strategic Highway Safety Plan
SHPO	State Historic Preservation Office
SI	Significant impact
SIAS	Socioeconomic Impact Assessment Study
SI-M	Significant impact mitigable to less than significant
SINKEX	Sink Exercise
SIP	State Implementation Plan
SIT	Stationary Infantry Target
SLAMRAAM	Surface-Launched Advanced Medium-Range Air-to-Air Missile
SLC	Submarine Learning Center
SMMP	Site Management and Monitoring Plan
SNC	Significant Non-Compliance
SNU	Skilled Nursing Unit
SO	stipulated order
SO_2	sulfur dioxide
SOC	species of concern
SOFA	Status of Forces Agreement
SOGCN	Species of Greatest Conservation Need
SOP	Standard Operating Procedure
SPAWAR	Space and Naval Warfare Systems Command
SPCC	Spill Prevention, Control and Countermeasure

SPE	Special Purpose Entity
SPS	Sewage Pump Station
SQG	small quantity generator
SRBM	Short-range Ballistic Missile
SRCHC	Southern Region Community Health Center
SRF	Ship Repair Facility
S-S	surface-to-surface
SSTS	Section Seven Tracking System
STD	sexually transmitted disease
STOM	Ship-to-Objective Maneuver
STP	sewage treatment plant
SUA	Special Use Airspace
SW	surface water/stormwater
SWMD	Solid Waste Management Division
SWMP	Stormwater Management Plan
SWMU	solid waste management unit
SWPPP	Stormwater Pollution Prevention Plan
T&D	Transmission and Distribution
T-AKE	Auxiliary Dry Cargo/Ammunition Ship
T-AKR	Sealift Ship
TAOC	Tactical Air Operations Center
TB	tuberculosis
TBD	To Be Determined
TBP	To Be Provided
TBT	tributyl tin
TCE	trichloroethylene
TCP	Training Concept Plan
TDS	total dissolved solids
TEC JV	TEC Inc. Joint Venture
TERF	Terrain Flights
THAAD	Terminal High-Altitude Area Defense
TJS	Tactical Jamming System
TMDL	Total Maximum Daily Load
TMP	Traffic Management Plan
TNAP	Traffic Noise Abatement Policy
TNM	Traffic Noise Model
TOC	total organic carbon
TORPEX	Torpedo Exercise
TPFD	Time-Phased Force Deployment
TPY	tons per year
TRIS	Toxic Release Inventory System List
TSCA	Toxic Substance Control Act
TSS	total suspended solids
TTIP	Territorial Transportation Improvement Plan
TTLC	total threshold limit concentration
UAV	Unmanned Aerial Vehicle
UD	unknown distance
UF	usage factor
UFC	Unified Facilities Criteria
UFW	Unaccounted for Water
µg/L	micrograms per liter
UoG	University of Guam
UNFCC	United Nations Framework Convention on Climate Change
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USCRTF	U.S. Coral Reef Task Force
USDA	U.S. Department of Agriculture
USDA-APHIS	U.S. Department of Agriculture Animal and Plant Health Inspection Service
USDA-WS	U.S. Department of Agriculture-Wildlife Services
US ENG CONTROLS	Engineering Controls Site List
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGBC	U.S. Green Building Council
USGS	U.S. Geological Service
USLE	Universal Soil Loss Equation
UST	underground storage tank
UXO	unexploded ordnance
v	volt(s)
VA	Veterans Affairs
v/c	volume to capacity
VCO	Volunteer Conservation Officer
VCP	vitrified clay pipe
VFR	Visual Flight Rules
VHF	very high frequency
VHT	vehicle hours traveled
VIF	Vehicle Inspection Facility
VMT	vehicle miles traveled
VOC	volatile organic compound
vpd	vehicles per day
VQCF	Vehicle Queuing Control Facility
VWP	Visa Waiver Program
WA	Warning Area
WPC	Watershed Planning Committee
WPCP	Water Pollution Control Program
WPRFMC	Western Pacific Regional Fisheries Management Council
WQC	Water Quality Certification
WQMP	Water Quality Monitoring Plan
WRDA	Water Resource Development Acts
WRMP	Water Resources Master Plan
WTE	Waste-to-Energy
WTP	Water Treatment Plant
WWII	World War II
WL	wetlands
WWTP	Wastewater Treatment Plant
yd	yard
ZID	zone of initial dilution

Final

Environmental Impact Statement

GUAM AND CNMI MILITARY RELOCATION

Relocating Marines from Okinawa, Visiting Aircraft Carrier Berthing, and Army Air and Missile Defense Task Force

Volume 3: Marine Corps Relocation – Training on Tinian

July 2010

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Guam and CNMI Military Relocation EIS

Volume 3: Marine Corps Relocation – Training on Tinian

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CHAPTER 1.
PURPOSE OF AND NEED FOR ACTIONS

1.1 INTRODUCTION

Volume 3 focuses on development of live-fire training ranges to support training and operations that would occur on Tinian in the Commonwealth of the Northern Mariana Islands (CNMI) associated with the proposed United States (U.S.) Marine Corps relocation to Guam. Training is proposed to occur on Guam but not all training can be accommodated there. The existing training capabilities on Tinian would be expanded to support up to two companies (200-400 personnel). The training activities, alternatives, affected environment, and environmental consequences presented in this Volume are distinct from those described on Guam. The main components of the proposed action in Volume 3 are as follows:

- *Development of Live-Fire Training Ranges*: a Platoon (42 personnel) Battle Course, Automated Combat Pistol/Military Police (MP) Firearms Qualification Course, Rifle Known Distance (KD) range, and Field Firing Range.
- *Airspace use*: there is no requirement for Special Use Airspace (SUA) associated with the proposed firing ranges and there would be no changes to designated airspace overlying the proposed firing.

These proposed training components complement the existing ground training practices undertaken on Tinian and in the CNMI as described in the Mariana Islands Range Complex (MIRC) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) (DoN 2010).

This Volume is organized as follows:

- *Chapter 1*: Purpose of and Need for Actions. States the purpose of and need for the proposed action and presents background information about the proposed action.
- *Chapter 2*: Proposed Action and Alternatives. Describes the siting criteria and the screening process to evaluate and identify the reasonable alternatives, the proposed action and reasonable alternatives, and the no-action alternative.
- *Chapters 3-19*: Resource Sections. Describes existing conditions and identifies potential impacts to the respective resources:
    - *Chapter 3*: Geological and Soil Resources
    - *Chapter 4*: Water Resources
    - *Chapter 5*: Air Quality
    - Chapter 6: Noise
    - *Chapter 7*: Airspace
    - *Chapter 8*: Land and Submerged Lands Use
    - *Chapter 9*: Recreational Resources
    - *Chapter 10*: Terrestrial Biological Resources
    - *Chapter 11*: Marine Biological Resources
    - *Chapter 12*: Cultural Resources

- *Chapter 13*: Visual Resources
- *Chapter 14*: Transportation This chapter covers marine transportation. Volume 6 covers roadway transportation.
- *Chapter 15*: Utilities
- *Chapter 16*: Socioeconomics and General Services
- *Chapter 17*: Hazardous Materials and Waste
- *Chapter 18*: Public Health and Safety
- *Chapter 19*: Environmental Justice and the Protection of Children
- *Chapter 20*: References

1.2 PURPOSE AND NEED

Chapter 1:

1.1 Introduction

1.2 Purpose and Need

As discussed in Volume 1, Chapter 1, Section 1.3.1, the overarching purpose for the proposed actions is to locate U.S. military forces to meet international agreement and treaty requirements and to fulfill U.S. national security policy requirements to provide mutual defense, deter aggression, and dissuade coercion in the Western Pacific Region. The need for the proposed actions is to meet the following criteria based on U.S. policy, international agreements, and treaties:

- Position U.S. forces to defend the homeland, including the U.S. Pacific territories
- Location within a timely response range
- Maintain regional stability, peace, and security
- Maintain flexibility to respond to regional threats
- Provide powerful U.S. presence in the Pacific region
- Increase aircraft carrier presence in the Western Pacific
- Defend U.S., Japan, and other allies' interests
- Provide capabilities that enhance global mobility to meet contingencies around the world
- Have a strong local command and control structure

Volume 1 provides detailed information regarding the international context for the purpose and need for the proposed action. Volume 2 describes the purpose and need for basing and training of Marines on Guam. The need for Marine training and operations is closely dependent on the relocation. Marines can only be "readily and rapidly deployable" if they are able to meet training and readiness requirements. Units require reliable access and maximum opportunity to realistically train with their weapons and equipment while minimizing "down time" lost when travelling to training locations. The purpose of increasing training and operational capabilities on Guam would be to provide the most efficient means to support present training requirements for the Marine forces relocating from Okinawa to Guam pursuant to the Roadmap Agreement with Japan.

The following outlines the process that evaluated potential training locations, including Tinian. The key reasons that Tinian is the proposed location for the proposed training are:

- Department of Defense (DoD) property is available for access to these training resources because of the existing land lease agreement between the CNMI and the DoD
- Proximity to U.S. military forces on Guam

1.2.1 Availability

As the U.S. analyzed where the Marine relocation would be, it also studied where the Marines would be able to train and maintain their readiness. Emphasis was placed on maximizing use of existing DoD properties. Guam and Tinian possessed the most available DoD properties for exclusive military use within the Marianas, and therefore were considered for maximum utilization. Other islands in the Marianas such as Pagan, Saipan, and Rota do not have existing DoD properties of sufficient size. Not all Marine Corps' training requirements could be met on Guam. The DoD then considered whether additional training could occur on the northern two-thirds of Tinian that is leased to the DoD. Company and battalion level non live-fire training areas exist within the lease area. However, this land could be developed to also accommodate live-fire ranges.

1.2.2 Proximity

Tinian would provide a training range approximately 100 miles (160 kilometers [km]) from Guam and would be the largest (approximately 15,400 acres [ac], 6,232 hectares [ha]) range located completely on DoD-leased property within the MIRC (discussed in Section 1.2.4). Guam-based Marines and other military personnel transiting from Guam would be able to quickly and routinely access these training capabilities through use of both tactical aviation and surface transportation assets and facilities.

A training range on Tinian would be required in addition to training ranges on Guam. Marine Corps training is built along a continuum that is well-defined and structured to provide combat-ready Marines, Marine Corps units, and Marine Air Ground Task Forces. The training continuum begins at the individual level and progresses to common skills, skills progression, and finally unit collective training. The ranges planned on Guam support individual and common skills live-fire training. For skills progression and unit collective training, ranges of greater complexity and size than those found on Guam are required. These advanced live-fire ranges would be located on Tinian and would allow Marines to meet the higher level requirements of the training continuum.

Table 1.2-1 presents potentially available lift (air and sea) options and their corresponding speed and range capabilities. With the relatively short travel times to Tinian, the required training would be accomplished for 200-400 Marines within a 1-week period, 12 times per year. A similar level of training at any other location would require more than a 1-week training evolution, and time spent in travel is not available for meeting other training requirements such as classroom training. Loss of time due to travel would impact the overall ability to achieve training requirements.

Table 1.2-1. U.S. Lift Options and Corresponding Capacities

Potential Lift (Rotary and Fixed Wing)	*Speed (knots [kph])*	*Distance Capacity (nm [km])*
CH-53 (Tactical)	170 (315)	312 (579)
MV-22 (Tactical)	278 (515)	751 (1,392)
C/KC-130 (Tactical)	278 (515)	2,172 (4,023)
C-17 (Strategic)	448 (829)	2,420 (4,482)
C-5 (Strategic)	470 (871)	5,161 (9,560)
Commercial	478 (885)	N/A
Potential Lift (Ocean Vessels)	*Speed*	*Distance Capacity*
Amphibious Ships (Strategic)	20 (39)	4,344 (8,047)
Commercial	20 (39)	4,344 (8,047)

Legend: kph = kilometers per hour, nm=nautical miles, knots = nautical miles per hour.
Sources: Navy 2001, 2004; Air Force 2008.

1.2.3 Reliability of Access to Training Resources

The northern two-thirds of Tinian contain two adjacent and connected training ranges within the DoD Military Lease Area (MLA): the Exclusive Military Use Area (EMUA) and the Leaseback Area (LBA). The EMUA includes landing beaches, expeditionary airfield, bivouac areas (i.e., temporary camps set up during training), maneuver areas, live-fire sniper areas, and areas designated for pyrotechnics and hazardous activities. The LBA, a joint military and civilian use area, is used primarily for logistics, maneuver and other nonintrusive training requirements compatible with its joint civilian agricultural uses. Time spent on coordination and scheduling with local authorities limits timely accessibility to the LBA for some activities. Termination of the LBA agreement, which provides full unfettered access to the LBA for military training, is possible with appropriate notification to the CNMI government. The military use of this area, subject to other applicable laws and agreements, is (by conditions of the lease) flexible and assured within specified limits. Tinian is the only island within the CNMI that the DoD has a training use agreement that would allow the weapons range development that would meet the purpose and need for training of the relocated Marines.

Accordingly, Tinian, with its availability of land, proximity to Guam, and reliability of access makes it the only suitable location for this training for Marines based on Guam.

1.2.4 Additional Considerations

The proposed action would increase training capabilities in the CNMI by building on the existing training infrastructure contained within the MIRC. The MIRC is a joint training complex consisting of service ranges utilized in a coordinated joint manner. The proposed action would continue development of training capabilities in the region by developing ranges on Tinian. All services have contributed to the training capabilities in the Marianas. The development of the training range complex has been a phased development starting with the Marianas Training Plan in 1999. Each successive range or range enhancement has added additional capabilities to the overall range complex. Over time, the inclusion of new capabilities has resulted in the existing MIRC 2009. Under the proposed action, the development of training capabilities in the region would continue with the addition of live-fire small arms ranges and other capabilities in the CNMI to the MIRC. The proposed action would complement the existing non live-fire capabilities by adding live-fire training ranges. By supplementing existing non live-fire training with limited live-fire ranges, the proposed action assures mission readiness training availability for Marine Corps units on Guam while enhancing the overall training infrastructure in the region. The proposed action would involve changes to the operations and training activities presently conducted on Tinian through development of ranges required to support the proposed Marine Corps relocation. The development, operation, and ongoing periodic use of these ranges is necessary to maintain the state of readiness required for Marine Corps forces relocated to Guam pursuant to the Roadmap Agreement with Japan. This progression of development of range capabilities would continue as technology, weapon systems, and operational requirements continue to evolve.

The 1999 Marianas Training Plan, the subsequent MIRC Management Plan, and the associated MIRC EIS/OEIS establish the baseline for training facilities and operations in the Mariana Islands, including Guam and CNMI. The planning approach and methodology for key elements of the proposed action are documented in Volume 9, Appendix G, and include:

- Range Complex Management Plan 2006
- Training Concept Plan, U.S. Marine Forces Pacific 2008 (Marine Forces Pacific 2008)
- Guam Joint Military Master Plan, Joint Guam Program Office (in progress)
- CNMI Military Training Master Plan (in progress)

These four documents represent the next phases of the master planning effort for Guam and the CNMI. The Range Complex Management Plan identified specific range deficiencies, including lack of live-fire ranges in the Marianas. The Training Concept Plan provided an "unconstrained" view of training possibilities on Guam and the CNMI. Present planning efforts for Guam and CNMI that have occurred coincident with the development of this EIS, have identified proposed training actions for Guam and CNMI. Together, these planning efforts have identified the specific weapons training needed on Tinian for the additional forces moving from Okinawa (Japan) to Guam.

1.2.5 Training Activities

Training operations proposed on Tinian would support individual up to company level sustainment training for the relocated Marines. Sustainment training is training that enables Marine Corps forces to maintain combat readiness. The individual and crew-served weapons qualification ranges are proposed for Guam (refer to Volume 2, Chapter 2, Section 2.3). The training that would take place on Tinian is essential to the end-state of sustaining combat readiness of Guam-based Marines. The proposed Tinian ranges are for training Marines with use of weapons similar to the Guam ranges (5.65 mm and below) but in tactical scenarios. Individual-level training would occur on Guam as travel distances and logistics to Tinian would not be practical for individual-level training. Training in tactical scenarios requires larger areas than is available on Guam. Training units would include ground elements that would enable three of the four components of the Marine Air Ground Task Force (Command, Ground, Air, and Logistics) to accomplish weapons training tasks according to Mission Essential Task List, as designated by appropriate commanders.

CHAPTER 2.
PROPOSED ACTION AND ALTERNATIVES

2.1 OVERVIEW

Volume 3, Chapter 2 describes the proposed action, the alternatives development analysis, and the no-action alternative for the development of live-fire training ranges to support training and operations on Tinian for the relocated Marines. The proposed action at Tinian consists of the following:

- *Development of live-fire training ranges*: a Rifle Known Distance (KD) Range, Automated Combat Pistol/ Military Police (MP) Firearms Qualification Course, Platoon Battle Course, and Field Firing Range are proposed on Tinian
- *Airspace use*: airspace use overlying the proposed firing range would continue as currently managed by the Federal Aviation Administration (FAA). Establishment of Special Use Airspace (SUA) is not required or proposed for the firing ranges.

Individual, crew-served, and small unit weapons training would be required for Marine forces relocating from Okinawa to Guam pursuant to the Roadmap Agreement with Japan. Individual and crew-served weapons qualification and familiarization training ranges and maneuver areas including landing zones are proposed for Guam (refer to Volume 2, Chapter 2, Section 2.3). The concept for Tinian is to provide the next stage in the training progression, and includes development of ranges for tactical employment of the basic weapons skills developed on Guam. These skills complement the elements of ground training accomplished at Tinian and in Commonwealth of the Northern Mariana Islands (CNMI) as described in the Mariana Islands Range Complex EIS/OEIS.

Figure 2.1-1 summarizes the three alternatives carried forward in the EIS impact analysis.

2.1.1 Background

2.1.1.1 Existing Training

The MIRC consists of three primary components: ocean surface/undersea areas, SUA, and training land areas. The ocean surface/undersea areas extend from the 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. The range complex includes land ranges and training area/facilities on Guam, Rota, Tinian, Saipan, and Farallon de Medinilla (FDM). Existing SUA consists of Warning Area 517 (W-517), restricted airspace over FDM (Restricted Area 7201 [R-7201]), and Air Traffic Control Assigned Airspace (ATCAA) (Figure 2.1-2). Different DoD controlling authorities manage and schedule the MIRC range training areas.

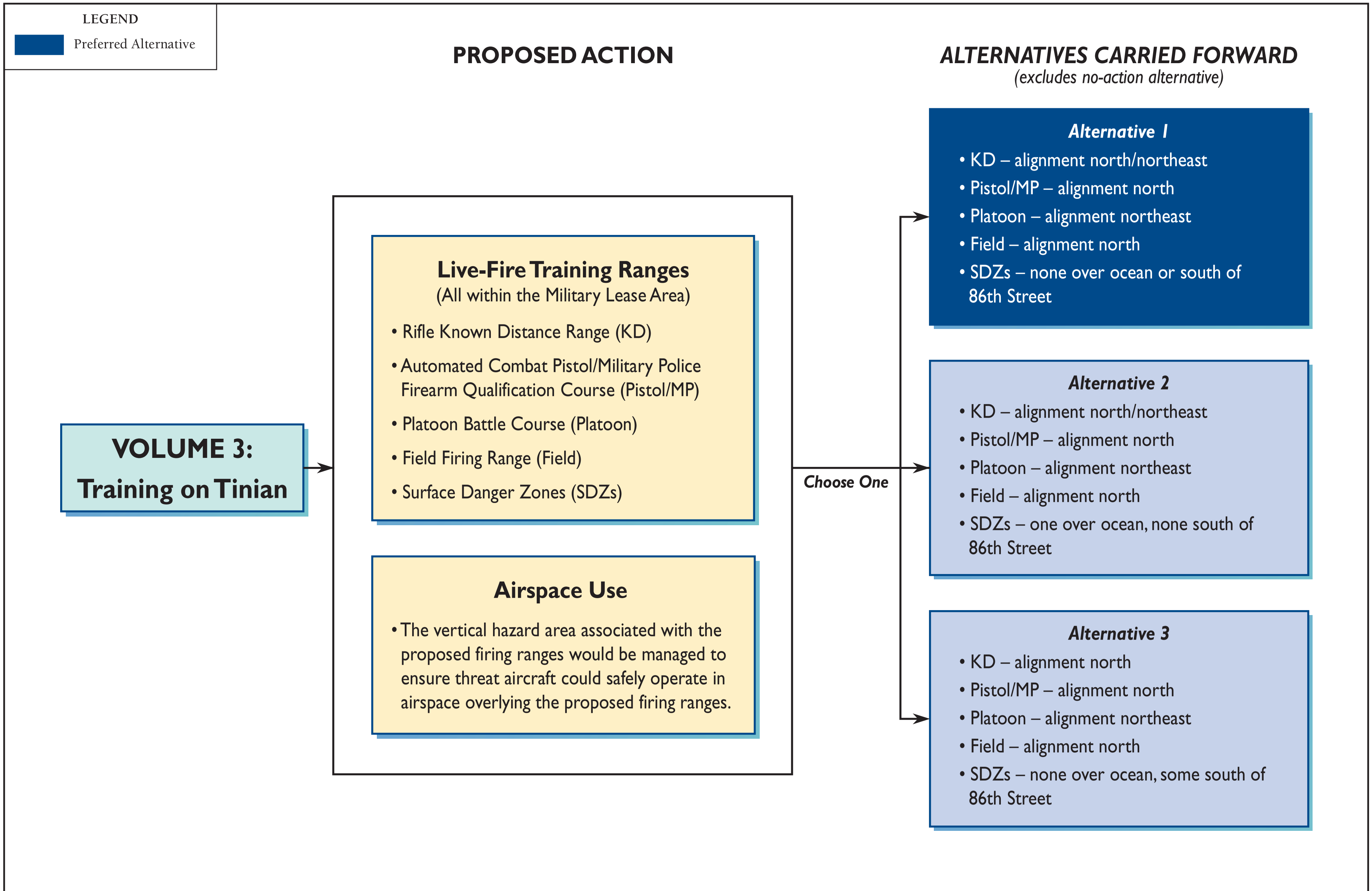

Figure 2.1-1
Summary of Proposed Action and Alternatives Carried Forward for the Marine Corps Relocation – Training, Tinian

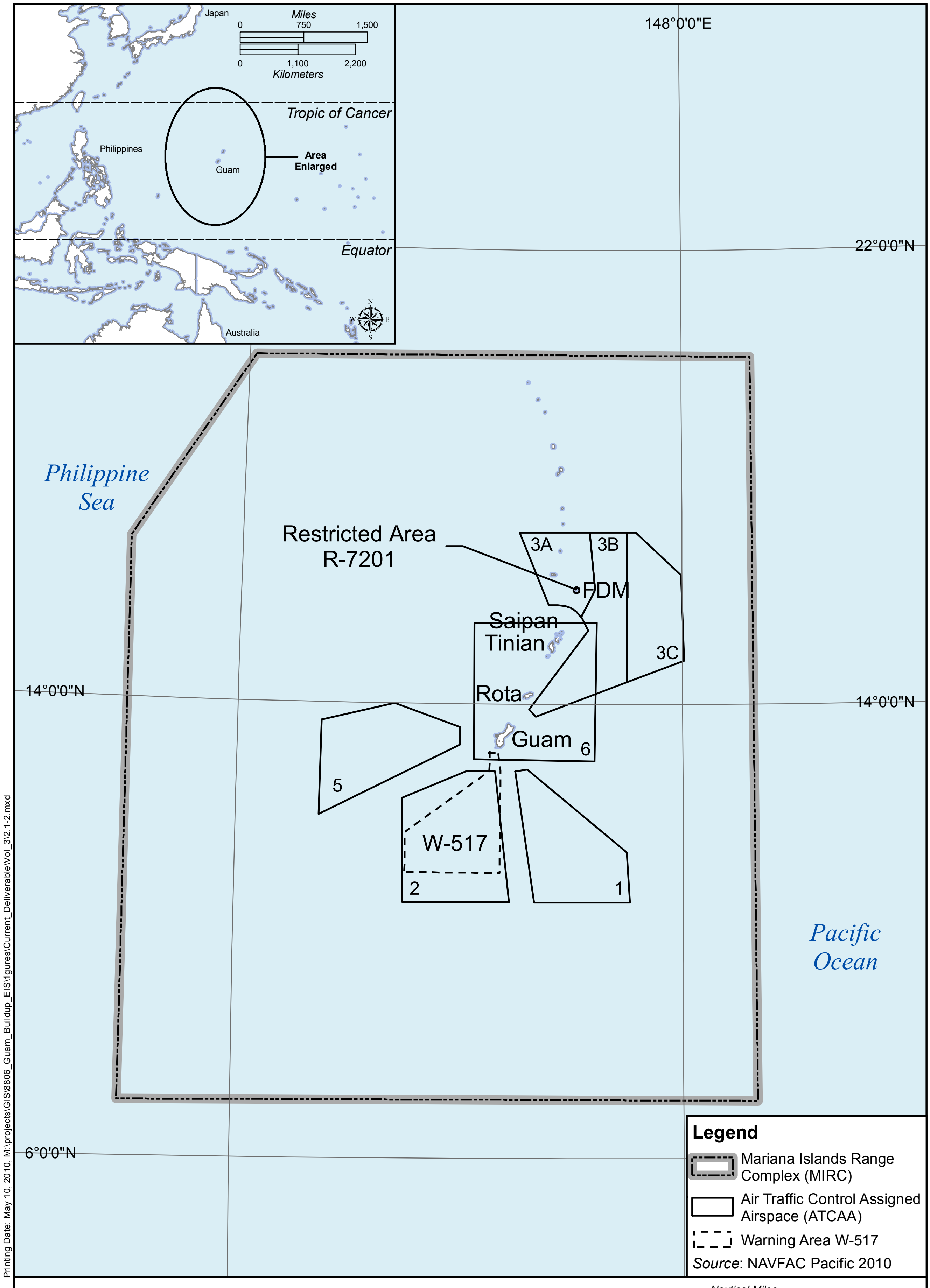

Figure 2.1-2
Mariana Islands Range Complex

Existing training on Tinian occurs at the Tinian Military Lease Area (MLA) that encompasses 15,353 acres (ac) (6,213 hectares [ha]) on the island of Tinian, leased by the Department of Defense (DoD) from CNMI. Training on Tinian is conducted on two parcels within the MLA: the Exclusive Military Use Area (EMUA) encompassing 7,574 ac (3,065 ha) on the northern third of Tinian and the Leaseback Area (LBA) encompassing 7,779 ac (3,148 ha) on the middle third of Tinian. The MLA supports small unit-level through large field exercises and expeditionary warfare training. An area within the MLA has been established as a mitigation area for a previous Tinian Airport improvement project (Figure 2.1-3).

The key feature at the EMUA is North Field, an abandoned and unmaintained World War II (WWII) era airfield with four runways: two are abandoned and overgrown, one is used for military fixed-wing and helicopter activities during training exercises, and the other is used for parachute drops and helicopter activities. North Field is also used for expeditionary airfield training including command and control, air traffic control, logistics, armament, fuels, rapid runway repair, and other airfield-related requirements. During WWII, aircraft originating from North Field bombed Japan and the deployed atomic bombs to Hiroshima and Nagasaki and, today, North Field is a National Historic Landmark. The surrounding area is used for force-on-force airfield defense and offensive training (DoN 2010).

The LBA is DoD-leased land covering the central portion of the island and makes up the middle third of Tinian. The LBA is used for ground element training including command and control, logistics, bivouac, vehicle land navigation, convoy training, and other field activities. A key feature is the proximity to the commercial airport, Tinian Airport (West Field) on the southern boundary of, but not included in the LBA, and the commercial port, Tinian Harbor, also not a part of the LBA but located near the southwest portion. The Tinian Airport (West Field) runway is not instrumented and has limited airfield services; however, it is capable of landing large aircraft. Tinian Harbor is in disrepair, but does support cargo and passenger ships requiring less than 20 feet (ft) (6 meters [m]) draft. The harbor has supported amphibious vehicles such as Landing Craft Utility (LCU) and Amphibious Assault Vehicle (AAV).

There are no active live-fire ranges in the EMUA or LBA, except sniper small arms into bullet traps. Tinian is capable of supporting Marine Expeditionary Unit (MEU) aviation events such as ground element training and air element training, simulated evacuations of noncombatants, airfield seizure training, expeditionary airfield training, and special warfare activities (DoN 2010).

2.1.1.2 Planned Enhancements to Existing Training Operations (MIRC EIS/OEIS)

Periodically, the military service training requirements and MIRC facilities are assessed for their capability of meeting future training requirements and recommendations are made to improve the training capabilities. The MIRC EIS/OEIS assesses the potential impacts of continuing and proposed military training activities on existing ranges onshore, offshore, and nearshore to Guam and the CNMI. This includes increased tempo of training and improvements to existing ranges based on all anticipated military service training requirements between 2010 and 2015. The MIRC EIS/OEIS does not propose new ranges, but proposes to:

- Maintain current operations
- Increase operational training
- Expand warfare missions
- Accommodate force structure changes (i.e., changes in weapons systems, new classes of homeported ships)
- Implement enhancements to enable each range to meet foreseeable needs

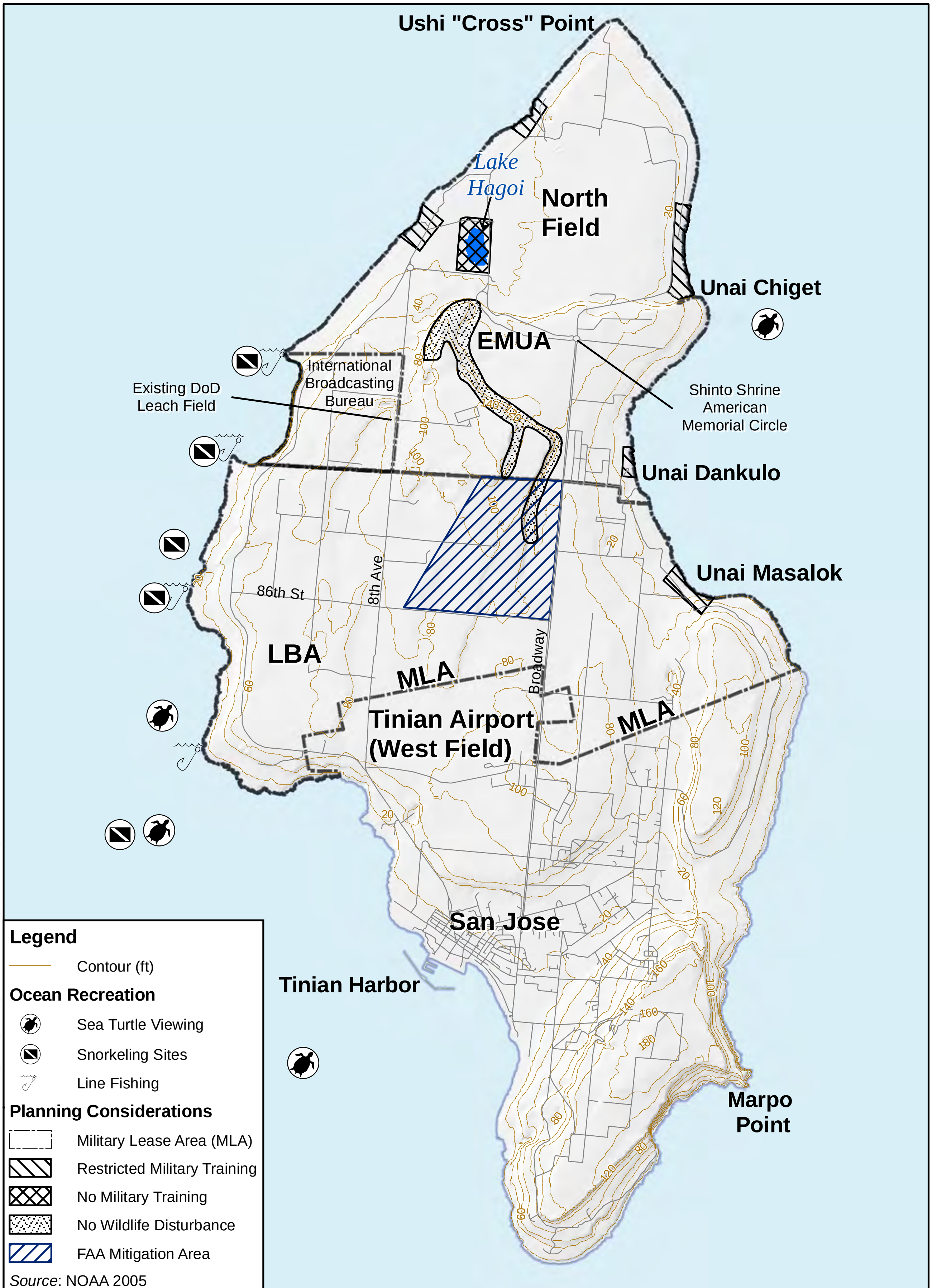

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Figure 2.1-3
Planning Limitations and Constraints

This Guam and CNMI Military Relocation EIS is based on the assumption that the MIRC EIS/OEIS preferred alternative represents "existing" or baseline conditions of training in the MIRC through 2015. Marine Corps training requirements associated with the relocation of the Marines from Okinawa to Guam are not identified in the MIRC EIS/OEIS (DoN 2010).

This Guam and CNMI Military Relocation EIS specifically addresses training associated with Marine forces relocating under the Roadmap Agreement with Japan. The MIRC EIS/OEIS updates ongoing MIRC training activities by existing forces unrelated to the Guam relocation. The range use rates evaluated in this EIS are based on the training requirements for the relocated forces that would be met on Tinian. This reiterative process for the MIRC allows for the incorporation and integration of any new capabilities and ranges proposed by the various services over time, and ensures that a comprehensive management plan is addressed in a complete and comprehensive manner.

2.1.1.3 Capabilities That Are Not in the Proposed Action

The proposed action is focused on providing the necessary training for relocating Marines from Okinawa to Guam. The proposed action does not include joint and multi-national training or future possibilities to support Marine Corps training. If these future training actions become more tangible, they would be subject to additional NEPA review. These future possibilities include:

- Joint and multi-national training
- Heavy machine gun live-fire, up to and including 7.62-millimeters (mm), .50 caliber, 40-mm MK19, and 20-mm
- Mortar live-fire, including 60-mm, 81-mm, and 120-mm
- Artillery live-fire, 155-mm
- Company-sized fire and movement
- Close air support with inert ordnance
- Firing of ground-to-ground rockets and missiles

2.1.2 Organization of the Chapter

This chapter is organized to describe the proposed action in terms of specific training requirements. First, a discussion of the alternatives analysis methodology is provided. This is followed by a discussion of the following two elements of the proposed action:

- Live-fire weapons training, which includes descriptions of proposed range facilities, training area management, and range operations.
- Management of the vertical hazard area and surrounding airspace to support the proposed firing ranges.

This is followed by a description of three alternatives for configuration of the proposed ranges as well as the no-action alternative.

2.2 ALTERNATIVES ANALYSIS METHODOLOGY

This section summarizes the methodology and criteria used to identify potential project alternatives on Tinian, to screen out alternatives that would not satisfy the purpose and need for the action, and to develop the range of reasonable action alternatives that are carried forward in the EIS impact analyses. As discussed in Chapter 1, Section 1.2, other islands in the Marianas such as Pagan, Saipan, and Rota do not meet the purpose and need for the action. The alternatives development process that was used to identify a reasonable set of project alternatives for the proposed action on Tinian involved the following four steps:

Step 1. *Identify Requirements*: Identify and evaluate the facility and operational requirements associated with proposed Marine Corps training on Tinian within the context of the overall mission of the Marine Corps and DoD in the Western Pacific.

Step 2. *Identify Site Alternatives*: Identify specific locations that would feasibly accommodate, with or without modification, each of the functional requirements identified in Step 1.

Step 3. *Identify Site-Specific Planning Alternatives*: Evaluate specific sites or groupings of available sites identified in Step 2 to determine if alternative combinations of functional elements could be feasibly planned to satisfy defined criteria and the purpose and need for the action.

Step 4. *Select Alternatives for Analysis*: In situations where multiple alternatives would be feasible for a particular function apply criteria to identify the alternatives that best satisfy the requirements identified in Step 1.

This four-step process was applied independently for individual projects comprising each of the four types of training proposed for Tinian. Sections 2.3 through 2.4 describe in detail, for each functional component of the action, the specific projects and operations that comprise the proposed action. Section 2.5 summarizes the set of all reasonable alternatives for the proposed action, as well as the no-action alternative.

2.2.1 Step 1 Requirements Analysis

Options for a Range Training Area (RTA) that could accommodate the four proposed ranges (Rifle KD Range, Automated Combat Pistol/MP Firearms Qualification Course, Platoon Battle Course, and Field Firing Range) were evaluated on Tinian. Based on planning limitations and constraints at Tinian and the purpose and need for the proposed action at Tinian, this process identified that the RTA would:

- Be located within the MLA.
- Complement, but not conflict with or infringe on, other training activities within the MLA (to the extent practicable).
- Complement, but not conflict with, other non-training activities within MLA including the International Broadcasting Bureau (IBB) property.
- Provide for controlled access to and through the range areas for safety prior to and during firing.

- Be suitable for company level training of approximately 200, but possibly up to 400, personnel that would periodically bivouac (i.e., a temporary camp under little or no shelter) at the RTA.

2.2.2 Step 2 Site Alternatives

In accordance with DoD's Record of Decision for Military Training in the Marianas (DoD 1999), areas have been established within certain portions of Tinian training areas to protect endangered and threatened species and areas of cultural significance from impacts caused by military personnel and equipment, and to ensure the safety of personnel in or near active training areas. Areas established as "No Wildlife Disturbance" include the Mount Lasso escarpment within the EMUA. This area is the focus of the Navy's habitat enhancement and restoration efforts and has established protective measures to preserve the tangantangan habitat. Areas established as "No Training" areas are off-limits, meaning that there is absolutely no training allowed in these areas. Entry to some of these areas can be authorized for administrative troop and vehicle movement on designated roads or trails only. "No Military Training" areas have been established to protect both endangered species habitat and areas of particularly sensitive cultural value. Any use or modification of these areas would be subject to agency consultation and compliance with Endangered Species and National Historic Preservation Act requirements. Surface danger zones (SDZs) overlapping the "No Wildlife Disturbance" areas were also considered.

The FAA Mitigation Area was established in the LBA in an agreement between the Commonwealth Ports Authority, FAA, Department of the Navy (DoN), and U.S. Fish and Wildlife Service (USFWS) for habitat protection as mitigation for past expansion of the Tinian Airport (West Field). The agreement is subject to the right of the U.S. military to use the FAA Mitigation Area for low-impact, non habitat destructive military training (CNMI and United States of America 2001). This is consistent with use of the area for an SDZ. However, range development that would involve habitat destruction, such as development of range footprints and roads, would have to provide replacement mitigation subject to renegotiation of the existing agreement for the FAA Mitigation Area.

Also within the MLA, the U.S. Information Agency IBB operates the Marianas Relay Station. The presence of the IBB facilities, located on 777 ac (314 ha) of the western coast of Tinian within the MLA, reduces the potential ranges and range orientation options on Tinian as neither range footprints nor SDZs can be established on this property.

2.2.3 Step 3 Site-Specific Planning Alternatives

Alternatives that could potentially meet the purpose and need for the proposed action were considered for the Tinian RTA. These included a number of variations on the configurations for the four ranges contemplated for Tinian.

2.2.4 Step 4 Selection of Alternatives Carried Forward for Analysis

Steps 2 and 3 of the alternatives analysis process were designed to yield project alternatives that are feasible strictly from a planning and project design perspective. In Step 4 of the process, other important factors were considered in order to eliminate alternatives that did not satisfy other defined (non-planning) criteria. Consistent with Chapter 12 of Marine Corps Order (MCO) 5090.2A with Change 2, the reasonable range of alternatives were further refined to avoid or minimize adverse impacts as follows:

- Earth Resources: In order to minimize the surface disturbing activity, sites with greater variation in topography that would require additional grading and filling to create the flat terrain needed for range footprints, were eliminated from consideration as range footprints, particularly in the area south of North Field, on the west coast, and in the southeastern portion of the MLA near Unai Masalok.

- Cultural Resources: Considerations were made for options that would avoid or minimize impacts to known cultural resources.
- Biological Resources: Considerations were made to avoid habitat-level impacts in the "No Wildlife Disturbance" Mount Lasso escarpment area and impacts to shorelines, Pacific Ocean, or Philippine Sea.
- Airspace: Considerations were made to minimize potential conflicts between the vertical hazard areas associated with the ranges and existing airspace uses.
- Human Environment: Considerations were made to avoid or minimize range footprint and SDZ impacts to recreation areas and shorelines, Pacific Ocean, and Philippine Sea.

Section 2.5 summarizes the resulting configurations for the four ranges that resulted from this process. These are the action alternatives that are carried forward in the EIS impact analysis.

2.3 PROPOSED ACTION: FIRING TRAINING

2.3.1 Elements Common to All Ranges

The following characteristics pertain to all ranges in general, and are provided for understanding of the range descriptions that follows.

2.3.1.1 Surface Danger Zones (SDZs)

For safety purposes, outdoor ranges have SDZs. SDZs are three-dimensional areas that delineate that portion of the earth 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 hazard. The size and configuration of SDZs are dependent on the performance characteristics of a given weapons system, training requirements, range configuration, geographical location, and environmental conditions. Criteria from MCO 3570.1B, *Range Safety* (Marine Corps No Date a), define the SDZs for individual weapons systems based on the weapon and ammunition characteristics. Firing ranges typically have fan-shaped SDZs that contain:

- Firing positions: location that weapons are fired.
- Target areas: the area that contains the targets/backstops and that is demarked by limits of fire delineators.
- Dispersion areas that include the ground and associated airspace within the training complex used to contain projectiles between point of fire and the farthest target, with allowance for overshot and horizontal aiming variation.
- Buffer zones: or secondary danger areas that contain the ricochets and fragments that by statistical analysis may extend beyond the dispersion area.

SDZs must be devoid of unrelated facilities and access to the SDZ is restricted to those involved in the conducted training. SDZs over water and affecting navigable airspace are published on charts with restrictions to access denoted as appropriate. Depending on the type of restriction, these spaces are monitored by range control during firing for safety.

For planning purposes in this EIS, notional SDZs have been developed based on the conceptual placement of ranges. As the planning process progresses, and range designs mature, the SDZs would be certified in accordance with MCO 3550.9, *Marine Corps Ground Range Certification and Recertification Program*. Limitations to use of water and airspace affected by SDZs are subject to regulation by the U.S. Coast Guard, U.S. Army Corps of Engineers (USACE) , and the FAA, as appropriate. SDZs, activities within the range footprint, and activities outside the range footprint were the planning parameters used to site firing ranges on Tinian.

To address the probability that expended projectiles, or projectile fragments, would fall outside the target area but within the SDZ, a 1995 Army study about SDZs was used (Army 1995). SDZs are developed for total confinement of expended munitions. Projectiles, or projectile fragments, landing outside the target area but within the SDZ would be at highest concentration in the downrange area outside the target area, just beyond the range backstop. This is based on studies conducted at other small arms ranges (Fort A.P. Hill 2005, Naval Facilities Engineering Command [NAVFAC] Southeast 2008).

Actual distribution in the Army study varied based on a number of factors including range type, weapons and type of ammunition fired, firing positions, range design, impact media, and a number of other specifics not currently available. Probability modeling for a particular .50 caliber range (with sand impact media and a range footprint that extended 800 m from the firing point) found that between 1 in 100,000 (0.001%) to 1 in 10,000,000 (0.00001%) rounds would fall beyond the 2,624 ft (800 m) long range footprint and within the SDZ in this particular circumstance (Army 1995). It is not possible to calculate actual numbers of complete rounds or munitions fragments that would fall outside the target area. Since no scientific studies or simulations are available to conduct a ballistic study of the proposed ranges, a non-scientific approach was used to estimate the potential for projectiles or projective fragments to fall outside the target area but within the SDZ. To ensure a conservative analysis in the EIS, the larger of the two percentages from the Army study was used as the basis and then multiplied by a factor of 10; this resulted in an assumption that 1 in 10,000 (0.01%) complete rounds or munitions fragments would fall beyond the target area but within the SDZ. Based on this assumption and projected munitions usage data presented later in this chapter (refer to Table 2.3-1), about 328 rounds annually could fall outside the target area but within the SDZs. Since this is a conservative assumption, it is likely that actual amounts would be less.

2.3.1.2 Activities within the Range Footprint

All firing of weapons occurs within the range footprint as defined. Within this space, ground disturbing activities may take place to maintain line of sight between firing points (i.e., location where weapons are discharged) and targets, and to place target mechanisms below ground level for protection. Bullet backstops, usually of dirt, are located behind the targets. Access ways are maintained to the targets for small vehicles for installation and retrieval of target mechanisms after use. Depending on the terrain, grading may be required during initial site development to provide lines of sight. Range cleanup would occur on a regular basis (refer to description in Section 2.3.3.3). Grass cutting and landscaping maintenance is required to keep range lines of sight and access intact, but does not usually require the entire site be cleared. A perimeter road may serve as a fire break.

2.3.1.3 Activities outside the Range Footprint

Outside the range footprint, activities proximate to the firing line would include those required for assembling the personnel undergoing training, parking vehicles, issuing ammunition, and passing orders and instruction. Sanitary facilities would be provided through portable means. Range targets would be operated on batteries. Surrounding the range, all people would be excluded from the SDZ area of the active range for safety reasons (refer to Section 2.3.1.1).

2.3.2 Proposed Firing Ranges

The proposed action consists of introducing live-fire weapons ranges into the Tinian MLA. Development of live-fire ranges would be compatible with existing live and non live-fire training presently conducted in CNMI per the MIRC Range Control Management Plan and MIRC EIS/OEIS. The specific set of ranges proposed to meet the purpose and need are listed below. Proposed operations on the ranges are described in Section 2.3.3.

2.3.2.1 Rifle KD Range

A Rifle KD Range (5.56 mm, 1,000 yards [yd] [914 m]), designed for training rifle marksmanship and target engagement techniques, would be constructed. This range 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 KD range on Guam (refer to Volume 2, Chapter 2, Section 2.3) by providing capability for the required eventual use of up to 1,000 yd (914 m). Twenty-five firing points would be constructed, with a range width of 100 yd (91 m) and a length of 1,000 yd (914 m). Firing line berms and back-stop berms would be constructed, along with sanitary facilities provided for shooters and target pullers. 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 yd (960 m) by 100 yd (91 m), or 22 ac (9 ha). The notional SDZ for this range, limited to firing of 5.56-mm ammunition, would extend 2.17 miles (mi) (3.5 kilometers [km]) horizontally, with a vertical hazard distance of 388 yd (355 m).

2.3.2.2 Automated Combat Pistol/MP Firearms Qualification Course

An Automated Combat Pistol/MP Firearms Qualification Course would be constructed. This range would be 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. All targets would be fully automated for scored training. This range would supplement the Pistol KD Qualification Course located on Guam. The range would be suitable for 9-mm and .45 caliber weapons. Up to 25 firing points would be constructed, with a maximum range distance of 50 yd (46 m). The total distance of ground disturbing activities would be approximately 55 by 50 yd (50 by 46 m), or 0.6 ac (0.2 ha). The notional SDZ for this range would extend 1.12 mi (1.8 km) horizontally, with a vertical hazard of 109 yd (100 m).

2.3.2.3 Platoon Battle Course

The Platoon Battle Course would be designed 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 SDZ exceeds available land areas. Weapons that would be used on this range are those found at the platoon level that are 5.56-mm carbines and rifles and Squad Automatic Weapons. The range footprint would be approximately 1,312-yd (1,200-m) long and 656 yd (600 m) wide, encompassing approximately 178 ac (72 ha). 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 SDZ would extend 2.17 mi (3.5 km) from the farthest firing position down range, with a vertical hazard distance of 388 yd (355 m). The notional SDZ 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.

2.3.2.4 Field Firing Range

The Field Firing Range would be designed 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-mm rifle, but also would be suitable for the M4 Carbine and Squad Automatic Weapons. The proposed range would be approximately 219-yd (200-m) wide by 547-yd (500-m) long, or approximately 25 ac (10 ha). The length of the SDZ is approximately 2.17-mi (3.5-km) long from the firing line and 388-yd (355-m) vertically.

2.3.3 Range Operations

2.3.3.1 Range Use

Table 2.3-1 provides an estimate of the annual range utilization for each of the ranges proposed at Tinian based on the training requirements for the forces addressed in the Roadmap Agreement. This is the typical range use scenario. There may be circumstances that range use could occur for longer periods of time than indicated herein, depending on the specifics of training exercises and conditions. The ranges as proposed would be used by up to 400 military personnel at a time. Ranges would primarily be used during daylight hours; however, some training is required during night-time hours, typically between the hours of 7:00 p.m. and 6:00 a.m. Maximum range usage for any given day is estimated below:

- Rifle KD Range: daytime and night-time use 25 firing points, 4 relays (i.e., one group fires at the 25 firing points, then the next, then the next, then the next, resulting in 100 person maximum per day), 12,000 rounds
- Automated Combat Pistol/MP Firearms Qualification Course: daytime and night-time use, 25 firing points, 4 relays, 5,000 rounds
- Field Firing Range: daytime and night-time use, 20 lanes, 6 relays, 12,000 rounds
- Platoon Battle Course: daytime and night-time use, 40 lanes, 4 events, 12,000 rounds

Table 2.3-1. Daily and Annual Use of Proposed Small Arms Qualification Ranges on Tinian under All Alternatives

Range	*Weapon*	*Ammunition Type*	*Typical Use Estimate*			*Ammunition Expenditure Estimates*		
			Crews or Pers-onnel	*Hours*	*Days Per Yr[(a)]*	*Busy Day (b)*		*Annual [(d)]*
						Day	*Night[(c)]*	
Known Distance (KD)	Rifle	5.56 mm	100	8 a.m.-12 p.m. 7-9 p.m.	80	9,000	3,000	960,000
Automated Combat Pistol/ MP Firearms Qualification	Pistol (M9)	9 mm	100	8-10 a.m. 7-9 p.m.	60	3,750	1,250	300,000
	45	.45 caliber	50	8-10 a.m. 7-9 p.m.	20	3,750	1,250	100,000
Field Firing Range	Rifle	5.56 mm	120	8 a.m.-4 p.m. 7 p.m.-1 a.m.	80	9,000	3,000	960,000
Platoon Battle Course	Rifle	5.56 mm	120	8 a.m.-4 p.m. 7 p.m.-1 a.m.	80	6,750	2,250	720,000
	SAW	5.56 mm	40	8 a.m.-4 p.m. 7 p.m.-1 a.m.	80	2,250	750	240,000
							Total	**3,280,000**

Legend: mm = millimeters, cal = caliber, SAW = Squad Assault Weapon

Notes:

[(a)]The figures for number of days of use are determined based on an estimated use of the ranges up to 16 weeks per year (1 week per month plus 1 additional week per quarter), 5 days per week. Range use would occur periodically throughout the year, with no predictably busy or non-use periods.

[(b)]Estimates based on the maximum number of shooters per day who could make use of each proposed range (calculated by multiplying the number of firing points or lanes by the number of firing relays), firing the number of rounds prescribed for a standard string of fire. This estimate is consistent with the ammunition allocation for the relocated units.

[(c)]Night refers to non-daylight hours that are generally 7:00 p.m. – 6:00 a.m. on Tinian.

[(d)]The estimate of annual numbers of rounds expended is consistent with the ammunition allocation based upon relocation.

2.3.3.2 Transportation

The transport of 200-400 Marines to Tinian from Guam for the proposed 1 week per month company-level training exercises would be via air transport. The estimated sorties associated with the notional airlift requirements are provided in Table 2.3-2. The rotary-wing sorties would be between Andersen AFB North Field on Guam and Tinian Airport (West Field) on Tinian. If equipment is moved by barge, a single barge would be able to carry the equipment necessary to support the estimated 200 to 400 Marine training evolution.

Table 2.3-2. Guam to Tinian Notional Airlift Requirements

Aircraft Type	*Capacity (Marines Transported) per Sortie*	*Sorties for Airlift of 200 Marines*	*Sorties for Airlift of 400 Marines*
CH-53D	37	6	11
CH-53E	55	4	8
MV-22	20	10	20
C-130	76	3	6
C-17	102	2	4

No new transportation infrastructure would be required for implementation of the proposed action at Tinian except biosecurity quarantine and inspection areas would be constructed at arrival locations on Tinian.

A Micronesia Biosecurity Plan (MBP) is being developed to address potential invasive species impacts associated with this EIS as well as to provide a plan for a comprehensive regional approach. The MBP will include risk assessments for invasive species throughout Micronesia and procedures to avoid, minimize, and mitigate these risks. It is being developed in conjunction with experts within other Federal agencies including the National Invasive Species Council, U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS), the U.S. Geological Survey, Biological Resources Discipline (USGS-BRD), and the Smithsonian Environmental Research Center (SERC). It will include brown tree snake (BTS) control measures to prevent BTS movement off Guam and management within Guam. For actions being proposed in this EIS, the DoN would implement specific biosecurity measures to supplement existing practices on Guam and Tinian. These would include BTS control to address potential unintentional transport and introduction of BTS to Tinian, including inspection requirements and procedures. For additional information on the MBP and existing and interim measures for invasive species control, please refer to Volume 2, Chapter 10, Section 10.2.2.6.

2.3.3.3 Typical Operating Scenario for Proposed Range Training Evolution on Tinian

The following scenario consolidates the elements of previously presented information to provide a notional analysis of activities and events that would occur during the typical on-week training cycle proposed for Tinian, a notional 200 Marine personnel training evolution. A 400-person training evolution scenario would be similar, but would require longer hours of range use for all personnel to complete training requirements.

- Prior to arrival:
  - Training activity would be scheduled and notice provided in newspapers and via public service announcements on radio and TV at least 1 week prior to training event.
  - Biosecurity training would be coordinated through informal consultations with USDA WS, CNMI Department of Fish and Wildlife, and DAWR through regional training authority 1 week prior to training event.

    - Environmental briefings (including BTS control) would be completed prior to departure from Guam.
    - Cultural resource briefing would be completed prior to departure from Guam.
    - Inspection for BTS would be conducted for supplies and equipment being shipped to Tinian by USDA or authorized inspectors.
- Monday:
    - In the morning hours, 200 Marines would arrive at Tinian Airport (West Field), including all weapons, equipment, and ammunition needed for the training evolution. If C-130 aircraft are used for the lifts, there would be four sorties assuming two High Mobility Multipurpose Wheeled Vehicles (HMMWVs) are included in the equipment lift (two sorties with two C-130s). If CH-53s are used, the HMWWVs (or other vehicles) would not be included in the lift and there would be six sorties. Vehicles and equipment would be inspected and subject to BTS inspection protocols on the airfield apron upon arrival.
    - After completion of arrival procedures at Tinian Airport (West Field), all Marines would either hike to the bivouac area or be bused to the bivouac area by a contracted busing service. Range orientation, environmental, and safety briefings would occur. Evening meals would be served in the bivouac area utilizing Meals Ready to Eat or Unitized Group Rations. Food waste would be composted and packaging crushed and bailed for transport to Guam.
    - Range maintenance personnel would prepare the ranges for use (e.g., place targets, charge batteries, verify scoring systems, position generators, clean and stock portable sanitary facilities).
    - Range security personnel would close the area encompassed by the SDZs to civilians by establishing and manning traffic control points and observation points and performing a security sweep of the area to ensure no unauthorized persons are present within the area affected by the SDZs.
    - Personnel not engaged in training on the live-fire ranges would engage in other training within the Tinian EMUA as described and assessed in the MIRC EIS/OEIS.
- Tuesday:
    - Range security personnel would perform another security sweep of the range and post range flags.
    - Aircraft watch personnel would be posted at the range observation site. These personnel would inform Saipan International Airport air traffic control tower when firing is about to commence, monitor Saipan International Airport and Tinian Airport (West Field) departure/arrivals information, and coordinate check firing procedures as required.
    - Targets would be emplaced at the ranges and generators and sounds systems would be operational.
    - Marines would clean up bivouac area, have breakfast, collect weapons from a secure storage brought with them to the ranges (e.g., container express box armory), and adhere to inspection and briefing protocols prior to traveling to the Rifle KD and Pistol ranges on foot or by contracted bus service. Prior to initiation of marksmanship training, the weapons would be “battle sight zeroed” for both iron sights (battle sight zeroing takes a weapons system and zeros it so that one can hit the target) and combat optical sights. All live-fire would immediately cease when range control is notified of an aircraft approach by air sentries, observation personnel, or air traffic control. Then, the Marines would conduct individual marksmanship training all day. A noon meal would be in the form of

Meals Ready to Eat. Marines would collect brass and ammunition containers for transport to Guam and the range would be secured by 3 p.m. The Marines would return to the bivouac area on foot or by contract bus service.

- At the end of the day at the range, range maintenance personnel would retrieve targets, maintain systems, and change batteries as needed.
- Once the Marines are back at the bivouac area, they would clean their weapons using individual equipment and supplies secured in the container express box armory; refuse from weapons cleaning would be collected for transport to Guam. Evening meals would be Meals Ready to Eat or Unitized Group Rations.

- Wednesday:
  - The same range control preparation and follow-up as presented for Monday and Tuesday would occur at the Field Firing Range and Platoon Battle Course.
  - The Marines would perform the same morning routine and evening routine as presented for Tuesday.
  - Marksmanship training would occur at the Field Firing Range and combat marksmanship training would occur at the Platoon Battle Course. Platoons would alternate between weapons employment instruction, Automated Field Firing, and blank firing run-throughs of the Platoon Battle Course.
- Thursday:
  - The same range control preparation and follow-up as presented for Monday and Tuesday would occur, but at the Platoon Battle Course.
  - The Marines would perform the same morning routine and evening routine as presented for Tuesday.
  - Marines would train at the Platoon Battle Course, alternatively conducting tactical maneuver training with blanks in the maneuver areas behind the firing line and conducting live-fire training runs through the course. Completion of the Platoon Battle Course requires two hours per Platoon, including preparation, scoring, and debriefing time.
- Friday:
  - The same range control preparation and follow-up as presented for Monday and Tuesday would occur.
  - The Marines would perform the same morning routine and evening routine as presented for Tuesday, with the exception that all equipment would be cleaned, weapons would be secured, and camp would be cleaned up in preparation of departure on Saturday.
  - The Marines would perform the same training at the Platoon Battle Course as described for Thursday and all Platoons would complete training at the course by the end of the day. Upon completion, the Marines would collect brass and trash from the course for transport to Guam.
- Saturday:
  - Marines would retrieve weapons and unused munitions and undergo departure protocols and inspections and travel to the Tinian Airport (West Field) on foot or by contracted bus service. All solid waste that is not composted at the bivouac area would be transported to Tinian Airport (West Field) with the Marines and equipment for transport to Guam.

Range Control would inspect ranges, contract service for portable sanitary facilities, retrieve and repair/service generators and equipment as needed and would reopen the area encompassed by the SDZs to civilian use by opening traffic control points and removing the range flags. Targets would be refurbished and routine range maintenance and vegetation control would occur. Marines may be granted the opportunity to visit San Jose during liberty time, if time permits.

2.3.4 Supporting Activities

No supporting facilities are proposed for the Tinian ranges. All training would be considered "expeditionary," in that the Marines would bring all necessary equipment to the ranges, would bivouac onsite, and would remove all equipment following completion of the training activities. No utilities systems would be required as commercial portable sanitation units would be utilized. An existing DoD leach field is located in the IBB, west of 8th Avenue (refer to Figure 2.1-3). This is designed to accommodate large-scale training activities on Tinian. This leach field would be used for disposal of wastewater from portable sanitation units. An RTA Management Plan would be developed following the Final EIS to support the operations on the Tinian ranges.

2.3.4.1 Security, Range Flags, and SDZ Observation Points

The RTA would need to be secured and assured clear of non-participating personnel during live firing to avoid the potential for injury from ricochet or misdirected shots. Therefore, continuously manned traffic control points, range flag poles (on which red flags would be flown during range operations), and manned observation points would be used during scheduled training to prevent inadvertent entry of civilians into to all the RTA, depending on firing condition. The portion of the MLA required to be closed to land access would depend on the alternative range configuration selected, the ranges scheduled for use, and the potential access points into the operating ranges and SDZs. This EIS assumes access to the MLA would be in accordance with Marine Corps safety regulations and would vary depending on the type of training activity that is being conducted. As an example, live-fire activities on proposed ranges would require limited access to the MLA on the eastern side of Tinian. Access limitations and security requirements would be part of the Standard Operating Procedures for all ranges. Traffic control points would be established and continuously manned 24 hours prior to the start of any live-fire training to prevent unauthorized civilian access to the RTA. A visual sweep of the RTA from helicopter would be conducted prior to the commencement of live-fire to ensure that all ranges and SDZs are clear of civilian and military personnel. Available monitoring capabilities would be utilized to assure public safety during training events. Training units would have direct communications with range control, and would fly a large red flag when the RTA is in use. All live-fire training would be immediately halted if unauthorized personnel are sighted in the RTA.

2.3.4.2 Storage

No storage of equipment or ammunition would occur on the ranges. The training units would bring all equipment, supplies, and ammunition necessary to conduct training. Units using the firing ranges would provide their own ammunition for use on the ranges, and would be responsible for its transportation to Tinian in accordance with DoD and U.S. Department of Transportation policies for movement of materials with hazardous classification. The proposed ranges would require use of non-explosive projectiles and small arms ammunition rated as class/division 1.4, for which "no explosive limit would be placed on the storage of these items" (Navy 2007).

2.3.4.3 Emergency Services

A fire management plan that would address the proposed action at Tinian is under development by NAVFAC Pacific as part of an RTA Management Plan. Units using the proposed Tinian ranges would be required to plan for and have the capabilities to respond to fires consistent with the fire management plan in preparation. Using units also would be responsible for their own medical service using corpsmen and would secure access to a casualty evacuation aircraft while training on Tinian. An aid station for range users would be established within the bivouac area.

2.3.4.4 Civilian Range Access, Security, and Safety

Range roads are typically graded gravel roads with drainage and culverts as needed. Each of the ranges depicted would have an access roadway from the existing adjacent road, with associated parking for vehicles and space for assembly of training personnel. Ranges would include dirt or gravel access ways for target emplacement and pick up. Parking areas are estimated at 0.5 ac (0.2 ha) and range roads are estimated at 5 mi (8 km) for all four ranges combined.

The range area would not be accessible by non-participating personnel during training. There would be sufficient lead-time before training to ensure range area clearance. Training periods would be scheduled in advance with signs posted and published on a regular basis. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would safeguard the public by keeping them out of any areas where there are potential dangers while simultaneously maintaining access to areas where training is not being conducted. This would ensure access to the National Historic Landmark, northern beaches, and the IBB via 8th Avenue. Broadway would be closed during training. However, the public would be able to travel on 8th Avenue, check in with personnel manning the first traffic control point. Once cleared by range control, they would proceed on 8th Avenue, checking in with each successive traffic control point until clear of the training area. Prior to training, range flags would be raised and traffic control points would be established and manned continuously throughout the duration of training. Interior portions of the range area (those affected by SDZs) would be inspected and watches would be posted at a range observation site for boats and aircraft, with positive observation of the sea and air space and having positive communications with range control.

During non-firing periods, the MLA would remain open to other approved civilian uses in accordance with the RTA Management Plan.

It is estimated that civilian use and access to and through the RTA would be affected approximately 12 to 16 weeks per year. The limit of the restrictions would depend on the training uses scheduled.

- For use of the weapons ranges, portions of the RTA would be closed for reasons of safety. Denial of access would occur along Broadway north of 86th Street and south of the Shinto Shrine American Memorial Circle on Broadway including all lands to the east, and east of 8th Avenue north of 86th Street and south of Mount Lasso. Location of traffic control points are presented in Section 2.5 for each action alternative.
- For larger exercises, the entire RTA would be closed to use; however, access to the IBB property would not be restricted.
- Periods of closure would last from a day before the scheduled event to ensure clearance, through post-event clean up and transport to Guam.
- It is anticipated that during periods of non-military use, the RTA would be available for other civilian purposes consistent with RTA policies, subject to management restrictions to protect public safety, property, and the environment. These uses include the proposed landfill, the proposed wastewater treatment plant, and agency personnel access for natural and cultural resource surveys on Tinian. Periods of potential civilian use would need to be defined and regulated within RTA management procedures.

2.3.5 Range Training Area Management

Because the RTA on Tinian is an enhancement to the existing range capabilities contained with the range complex, the MIRC, the RTA on Tinian would be managed in accordance with MCO 3550.10, *Policies and Procedures for Range Training Area Management,* which addresses safe, efficient, effective, and environmentally sustainable use of the range area. These policies and procedures would be reviewed and coordinated with Joint Region Marianas regional range management. All service policies include the following:

- The goal of range control and management practices is to enhance the safe and realistic training available to Operating Forces, and ensure viable RTAs for future generations of Marines. Effective RTA management provides programs and funding to protect ranges while ensuring compliance with environmental regulations.
- As part of RTA management and in coordination with Joint Region Marianas (the present range manager), the Marines would provide the following:
  - A Range Safety Program to conduct or coordinate 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.
  - Publication of advanced notice for periods of range use by providing notices to airman, mariners, and the general public as required for safe RTA operations.
  - Controls for RTA airspace in accordance with FAA regulations and agreements, with an objective of use by multiple agencies with minimal interference and maximum safety.
  - Management of movement and access into and within the RTA by monitoring and controlling use of surface roads, shorelines and adjacent water areas, and airspace above the RTA. Military personnel and civilian use of the RTA is subject to restrictions that may include checking in and out, or maintaining communications with Range Control. Unauthorized entry to the RTA during training would be strictly prohibited.
  - Maintenance of ranges, targets, and training devices.

Anticipated elements of the RTA Management Plan are described in the subsections that follow.

2.3.5.1 Range Maintenance

Range maintenance, such as the activities described in Section 2.3.1.2, would be required to protect the investment in range facilities, as well as for security, environmental management, and range operations. Range maintenance would be done by military personnel, civilian workforce, or contracted workers. If range maintenance is done by contracted workers, the DoD would award a contract in accordance with Federal Acquisition Regulations.

Proposed activities for range maintenance include removing expended rounds from the ranges periodically and transporting them to an appropriate recycling contractor or smelter in accordance with appropriate regulations. Munitions expended at ranges would be entrapped in soil impact berms that would be constructed in accordance with the specifications in Military Handbook 1027/3B, *Range Facilities and Miscellaneous Training Facilities Other than Buildings* (Marine Corps No Date b). This handbook addresses the required dimensions of the range and earthen berms for safe operation of the ranges. In order to properly maintain the range berms, the Marine Corps would periodically shut down the range, sift the expended rounds (i.e., ammunition fired from the weapons) from the soil on site, place the soil immediately back on the berm face, and contain and transport expended rounds to a local recycling contractor or smelter in accordance with all applicable regulations. Soils would be regularly evaluated and maintained at a neutral pH level (6 to 8). To manage stormwater and control erosion, engineering controls would be employed and grassy vegetation would be maintained on berms (but periodically would be disrupted for sifting). A monitoring program would be implemented to identify any early indications of lead movement and establish protocols for environmental protection if such indications are identified.

Field exercises, including bivouac, would be conducted in accordance with existing bivouac and field exercise requirements in the MIRC. Water, waste, and other requirements for field activities are contained in the MIRC operating procedures and Commander Navy Region (COMNAV Marianas) Instructions.

2.3.5.2 Environmental Protection

The following Standard Operating Procedures (SOPs) and Best Management Practices (BMPs) would be applied in the site development activities for the proposed ranges.

- Low Impact Development (LID) techniques would be incorporated into the range design to reduce stormwater runoff and pollutants using a combination of retention devices and vegetation for stormwater management.
- A National Pollution Discharge Elimination System (NPDES) permit would be obtained for construction activities that would require the preparation of a Stormwater Pollution Prevention Plan (SWPPP). A SWPPP is a self-implementing plan for compliance with an installation's stormwater permit. It requires development of pollution prevention measures/BMPs such as the use of check dams, diversion dikes/swales, silt fencing, etc. to reduce and control pollutants in stormwater discharge. The plan includes maintenance procedures, BMPs, and engineering controls intended to prevent or reduce pollution into receiving waters.
- Water Quality Monitoring Plans are normally required as part of the water quality certification process set forth in Section 401 of the Clean Water Act for construction activities requiring Clean Water Act Section 404 permits from the USACE. Applied during the construction phase, Water Quality Monitoring Plans identify ambient or control conditions and capture any deviations from those conditions resulting from construction activities. The Water Quality Monitoring Plan would include procedures for reporting results and observations and provisions for corrective actions.

In the ongoing periodic training use and maintenance of the proposed ranges and bivouac activities, 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 fire fighting capacity to 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 MCO P3550.10 for using units to protect the environment.
- Ensuring that bivouac activities occur on previously disturbed sites.
- Clear marking of ranges, bivouac areas, 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 SWPPP policies. Bivouac sites would be reviewed through processes established in COMNAV Marianas Instruction 3500.4, where erosion potential would be evaluated and the designated installation Natural Resource Specialist involved in the process.
- Compost or collect and consolidate all waste for transport to Guam.

2.4 PROPOSED ACTION: AIRSPACE

FAA Order JO 7400.2G, Procedures for Handling Airspace Matters (FAA 2008) does not require the establishment of SUA over small arms ranges. The Marine Corps would manage the airspace overlying the proposed ranges to ensure safety of nonparticipating aircraft. Personnel at a range observation site would observe the airspace overlying the ranges and associated vertical hazard distance. The personnel would have direct communications with range control and would fly a large red flag when any portion of the RTA was in use. All firing activities would cease upon notification of impending or actual incursion of the airspace by nonparticipating aircraft. Figure 2.4-1 depicts the existing airspace in the vicinity. The activity that would need to be de-conflicted in the airspace overlying the proposed ranges would consist of:

- Range vertical hazard distance: a vertical hazard distance of approximately 1,155 ft (352 m) or less associated with the 5.56 mm and 9 mm weapons at the proposed ranges.
- Tinian Airport (West Field) operations: an average of 67 aircraft operations per day occurred at Tinian Airport (West Field) for a 12-month period ending in May 2007 (FAA 2009a), where current traffic pattern altitudes may be as low as 1,532 ft (467 m) above ground level over the proposed RTA.
- Saipan International Airport: an average of 108 aircraft operations a day occurred at the Saipan International Airport during the 12-month period ending in December 2005 (FAA 2009b). The instrument landing system approach to Saipan International Airport continually descends from 2,100 ft (640 m) while over Tinian to the north of the proposed ranges (refer to Figure 2.4-1) (FAA 2009b). The majority of the approaches to Saipan International Airport use visual flight rules; the instrument landing system approach is used when weather minimums are below visual flight rule approach criteria or in training on the instrument landing system.

As stated above, no airspace changes are required in support of the proposed action. However, recent mission changes, new aircraft, modifications to weapons delivery tactics, and enhanced training requirements for existing military airspace users are among the other factors generating a need for expanded, modified, or new MIRC SUA. DoD has determined that the most prudent approach to meeting these integrated requirements is to conduct a comprehensive review of the existing SUA in order to develop any new SUA requirements for all future service needs in the region of influence as well as competing commercial and general aviation use requirements. It is assumed that a formal joint military airspace proposal would be made to the FAA in the future, at which time a separate determination would be made as to further environmental documentation requirements. Although it is possible that SUA may be designated to overlie the proposed ranges in the future, if range requirements change, it is not part of the proposed action evaluated in this EIS.

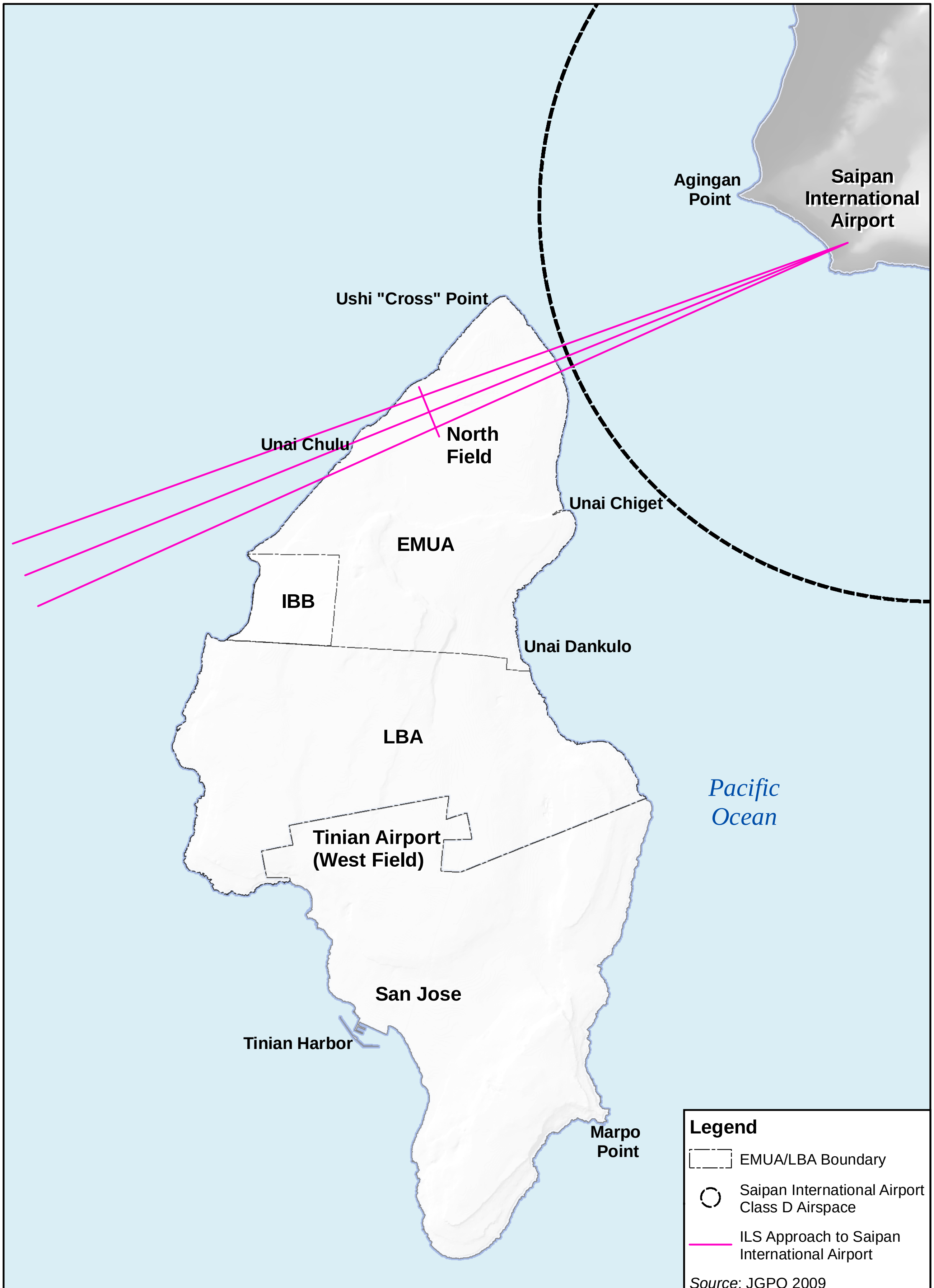

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Figure 2.4-1
Affected Airspace

2.5 ALTERNATIVES

Three primary alternatives for the proposed action on Tinian that meet the purpose and need have been identified. In addition, the no-action alternative is described (although the no-action alternative would not accomplish the purposed and need, it is included as required by the Council on Environmental Quality (CEQ) regulations). The primary difference among alternatives is the location and orientation of the firing ranges and associated notional SDZs. There would be relatively the same potential characteristics for range closure and availability during training under all action alternatives. Regardless of the alternative range configurations, there are two options for the location of the proposed range observation site.

The preferred alternative in this EIS was evaluated to ensure it met the purpose and need as outlined in Chapter 1. The DoN would not make its decision of which alternative it would implement until the Record of Decision is signed at the conclusion of the NEPA process. Alternative 1 is the preferred alternative for this component of the overall proposed action (refer to Figure 2.1-1).

2.5.1 Alternative 1 (Preferred Alternative)

As shown in Figure 2.5-1, all four ranges associated with Alternative 1 are in the south-central portion of the MLA within the area delineated by 8th Avenue, 86th Street, and Broadway. The Rifle KD Range, the Automated Combat Pistol/MP Firearms Qualification Course, and Field Firing Range are located along 86th Street and west of Broadway. All three are generally aligned to the north. The Platoon Battle Course is located northwest of the other ranges and is generally aligned toward the northeast. All four range footprints partially overlay the FAA Mitigation Area. The associated notional SDZs for these ranges would overlap to a large extent. They would extend over the FAA Mitigation Area, DoD “No Wildlife Disturbance” Mount Lasso escarpment area, and a segment of Broadway. No SDZs would extend beyond land and into the ocean.

2.5.2 Alternative 2

Under the Range Training Area Alternative 2 (Figure 2.5-2), no ranges would be located south of 86th Street. The Field Firing Range location differs from all ranges in Alternative 1 because it is located east of Broadway at the intersection with 86th Street. The alignment is to the northeast. Unlike Alternative 1, the range avoids the FAA Mitigation Area and the DoD “No Wildlife Disturbance” Mount Lasso escarpment area. The Field Firing Range differs from Alternative 1 ranges and the other three Alternative 2 ranges in that the SDZ extends over the ocean.

The Rifle KD Range and Automated Combat Pistol/MP Firearms Qualification Course would be located on 86th Street and generally aligned to the north. Both range footprints would overlay the FAA Mitigation Area. The associated notional SDZs for these two ranges would overlap to a large extent. They would extend over the FAA Mitigation Area and the DoD “No Wildlife Disturbance” Mount Lasso escarpment area. The Rifle KD Range SDZ would extend over Broadway, but the Automated Combat Pistol/MP Firearms Qualification Course would not. Neither of the SDZs would extend over the ocean.

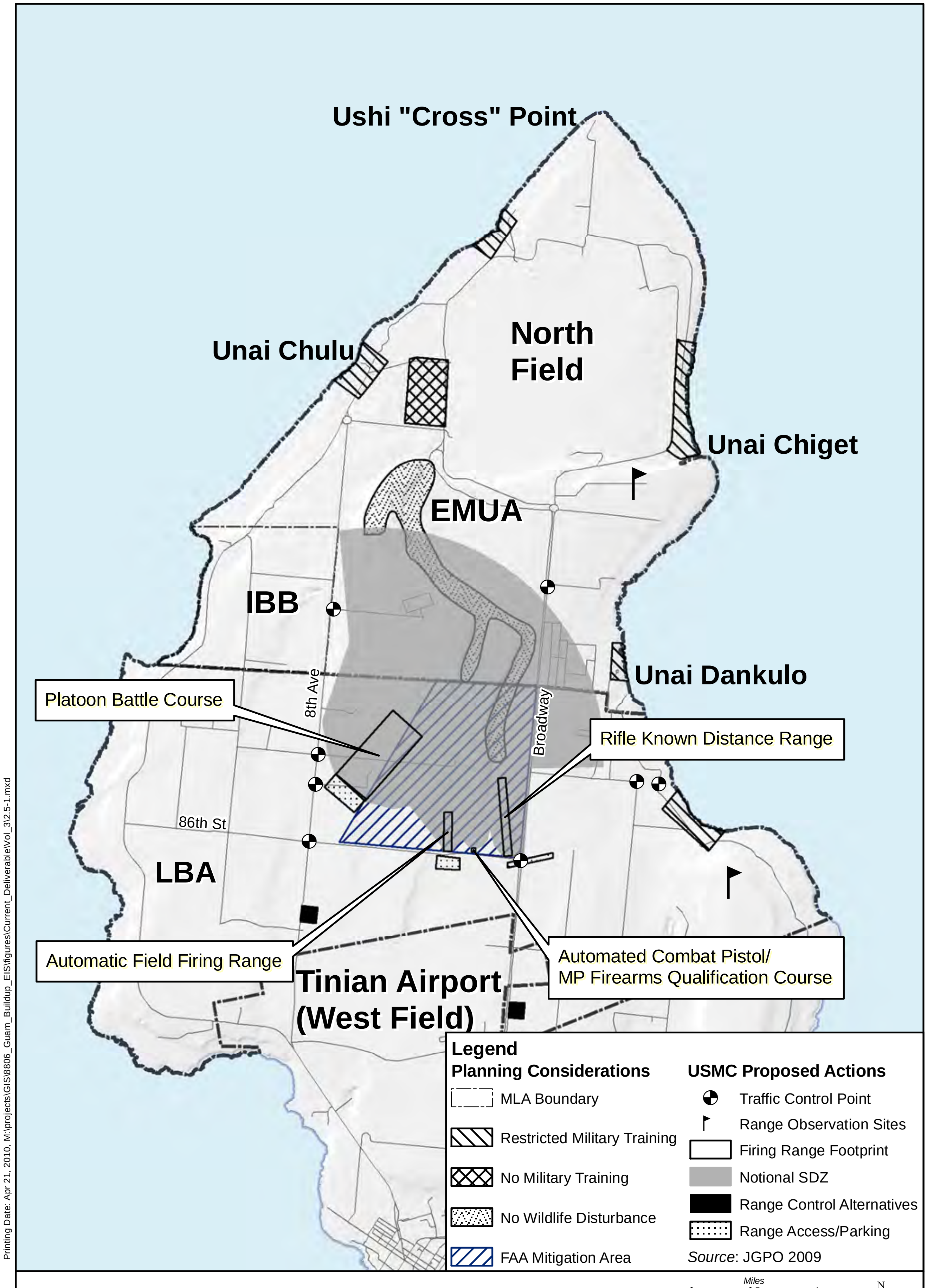

Figure 2.5-1
Range Training Area Alternative 1

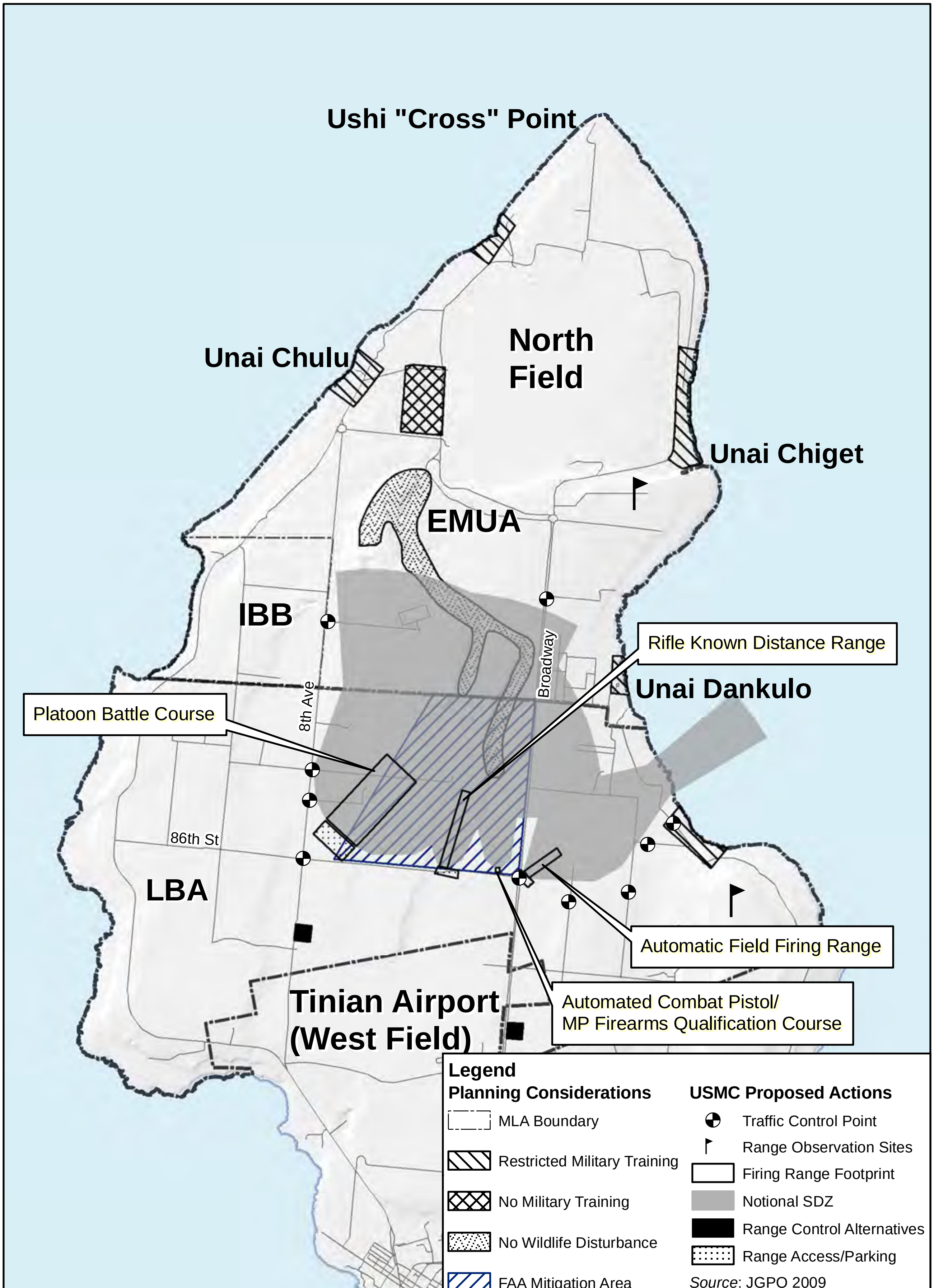

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Figure 2.5-2
Range Training Area Alternative 2

The Platoon Battle Course would be located south of its Alternative 1 location. The orientation would be aligned toward the northeast, similar to Alternative 1. Compared to Alternative 1, there would be more range footprint encroachment on the FAA Mitigation Area. The SDZ for the Platoon Battle course extends east across Broadway and overlaps the FAA Mitigation Area and the DoD “No Wildlife Disturbance” Mount Lasso escarpment area.

The SDZs in Alternative 2 cover a greater surface area than Alternative 1 and are not limited to land.

2.5.3 Alternative 3

As shown in Figure 2.5-3, the Alternative 3 configuration is notably different from Alternatives 1 and 2 due to three of the ranges being sited south of 86th Street and north of West Field. These three ranges are the Field Firing Range, Automated Combat Pistol/MP Firearms Qualification Course, and the Rifle KD Range. During range operations at any of these three ranges, 86th Street would be closed to traffic. All three ranges are sited along the southern MLA boundary and aligned generally to the north. None of these range footprints is within the FAA Mitigation Area. The SDZs overlap. The Rifle KD Range and the Automated Combat Pistol/MP Firearms Qualification Course overlap the FAA Mitigation Area, but not the “No Wildlife Disturbance” area. The Field Firing Range SDZ encroaches on both restricted areas.

The Platoon Battle Course would be sited as described in Alternative 2, above 86th Street. The alignment is to the northeast and the footprint encroaches on the FAA Mitigation Area. The SDZ encroaches on both restricted areas and overlap with the other three ranges.

None of the SDZs under Alternative 3 extend into the ocean. The surface area affected by ranges under Alternative 3 is less than the other two alternatives.

2.5.4 No-Action Alternative

Under the no-action alternative, no new site development or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian/CNMI to meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian/CNMI as described in Chapter 1 would not be met.

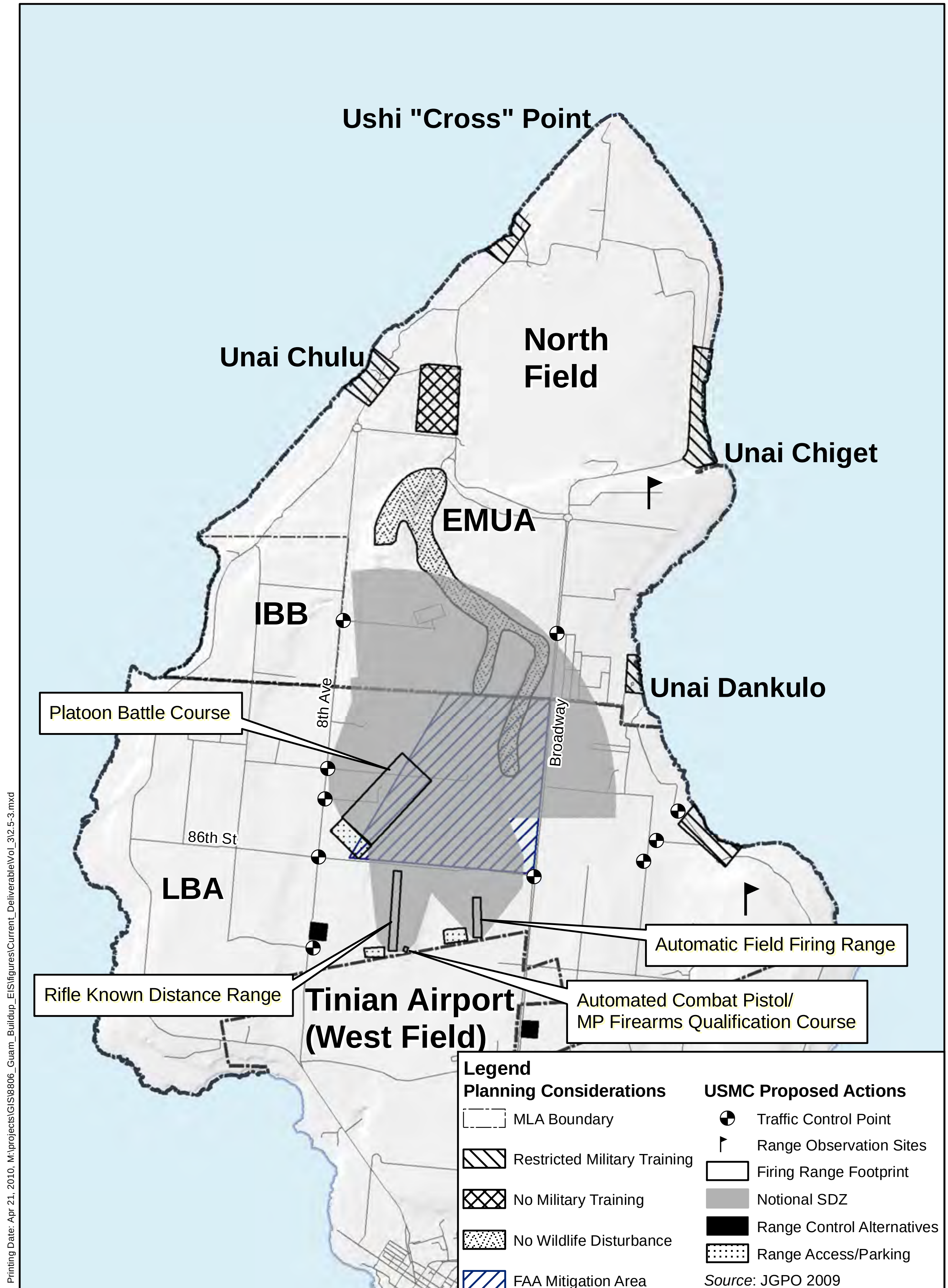

Figure 2.5-3
Range Training Area Alternative 3

CHAPTER 3.
GEOLOGICAL AND SOIL RESOURCES

3.1 AFFECTED ENVIRONMENT

3.1.1 Definition of Resource

This chapter discusses existing conditions and assesses how the proposed Guam Relocation action alternatives would potentially affect geological and soil resources within the region of influence (ROI) for Marine Corps training on Tinian. Geology describes the surface and subsurface materials of which a land area is composed, including soils and rocks. The characteristics of soils and underlying rocks include stability, slope, compatibility, shear strength, and productivity. Discussions of this resource area typically identify existing geological conditions and determine how action alternatives would likely affect geological and soil resources. Because geology and soils relate to the physical foundation of Tinian, the proposed land uses associated with the action alternatives would affect characteristics of erosion and surface changes (such as land clearing, slope cuts) but not the overall geological and soil conditions. Instead, geology and soils considerations are more pertinent with respect to the placement or location of a particular land use; for example, a sinkhole could provide an obstacle to establishing a housing land use. Consequently, the geological and soil characteristics of an area would have impact on the proposed action as well as the proposed action impacting the geology.

The geology of individual islands in the Marianas is largely dependent on the degree of recent volcanism. The older islands, including Tinian, generally consist of a volcanic core covered by coralline limestone in layers up to several hundred meters thick. As the original volcanoes subsided beneath the ocean surface, coral formations grew, ultimately forming the limestone caps on these southern islands. Uplifting of the Philippine Plate resulted in the limestone caps being pushed several hundred meters above sea level. The volcanic core is exposed in some areas through either volcanic activities or erosion.

3.1.2 Tinian

3.1.2.1 Topography

Topography comprises the natural and man-made features of a place or region that shows relative positions and elevations. Topography generally dictates the suitability of land for building purposes, and can be a major factor in defining an appropriate use of an area.

Tinian is a series of limestone plateaus separated by steep-slopes and cliffs (Young 1989). The five major plateaus are generally level and undulating. In the northern part of Tinian, the ground surface slopes gently, increasing in elevation slightly from west to east. In the northern part of the central plateau is a highland containing one of the highest elevations on Tinian, Mount Lasso, at 531 feet (ft) (162 meters [m]) above sea level. The north-central highland rises within the northern part of the central plateau, halfway between the east and west coasts. The highest point of the north-central highland is 545 ft (166 m). The only point higher on Tinian is on the southeastern ridge. The northern lowland generally is flat with an elevation of 100 ft (30 m) (United States Army Corps of Engineers [USACE] 2007).

The central plateau extends northward and comprises all of central, and some of the northern part of Tinian. The central portion of Tinian is a plateau isolated by steep slopes due to the north-south oriented faults. A broad depression separates the central plateau from the ridge covering the southeastern edge of

Tinian. The ridge includes the highest elevation on Tinian, Kastiyu, at 614 ft (187 m) above sea level (Stafford et al. 2004).

The southeastern ridge is the highest part of Tinian. The ridge consists of a north and south ridge that is separated by a gap near the midpoint. Steep slopes and cliffs rise up to 500 ft (15 m) from the southeast boundary of the ridge. Figure 3.1-1 shows the topography of Tinian. There are no permanent streams for surface drainage on Tinian because all water evaporates or percolates through the highly permeable limestone.

3.1.2.2 Geologic Units

A geologic unit is a volume of rock or ice of identifiable origin and age range that is defined by the distinctive, dominant, easily mapped and recognizable physical characteristics and features that characterize it. Figure 3.1-2 shows the geology of Tinian.

Volcanic

Tinian is located on the Mariana Ridge, a volcanic arc approximately 100 miles (mi) (160 kilometers [km]) west of the Mariana Trench. This ridge was formed as a result of subduction of the Pacific Plate under the Philippine Plate. The foundation of the island of Tinian is volcanic rock that is covered in limestone over most of its surface, with exposed volcanic rock found only in two small, isolated places due to extensive weathering (Young 1989). The volcanic rock has low permeability due to its texture and density.

Limestone

Tinian is composed mainly of coralline and algal limestone overlying volcanic tuff and breccias. The limestone tends to be highly permeable due to its high porosity (Gingerich 2003). Uplifting has occurred as demonstrated by the presence of high-angle normal faults (Stafford et al. 2004).

There are two main limestone formations on Tinian: Tagpochau and Mariana. Tagpochau Limestone covers approximately 16% of Tinian's surface and is composed of three rock types: detrital (majority of the formation), argillaceous, and sandy. It is composed mainly of biogenic calcium carbonate fragments and calcite cement. The Mariana Limestone covers approximately 83% of the Tinian's surface and is composed of seven rock types: constructional coralliferous, constructional algal, detrital coralliferous, detrital shelly, detrital Halimeda, detrital argillaceous and detrital undifferentiated. In the coastal regions, these deposits are overlain by Holocene limestone, developing sands and gravels, and reefs (Stafford et al. 2004).

Most of the shoreline consists of limestone cliffs with sea-level caverns, cuts, notches and slumped border, commonly bordered by intertidal benches. Beach deposits consist mainly of medium- to coarse grain calcareous sands, gravel and rubble interspersed in exposed limestone rock. The north, east and south coasts have very limited fringing or apron reef development. Submarine topography is characterized by limestone pavement with interspersed coral colonies and occasional zones of submerged boulders.

Unai Dankulo (Long Beach) is the largest beach on Tinian, extending approximately 492 ft (150 m) between limestone cliffs that extend to the water line. The Dankulo beaches are composed of white calcareous sands that gently slope into a shallow reef flat separated from the open ocean by a reef crest that is emergent at low tide. The reef crest is continuous across the entire run of the beach.

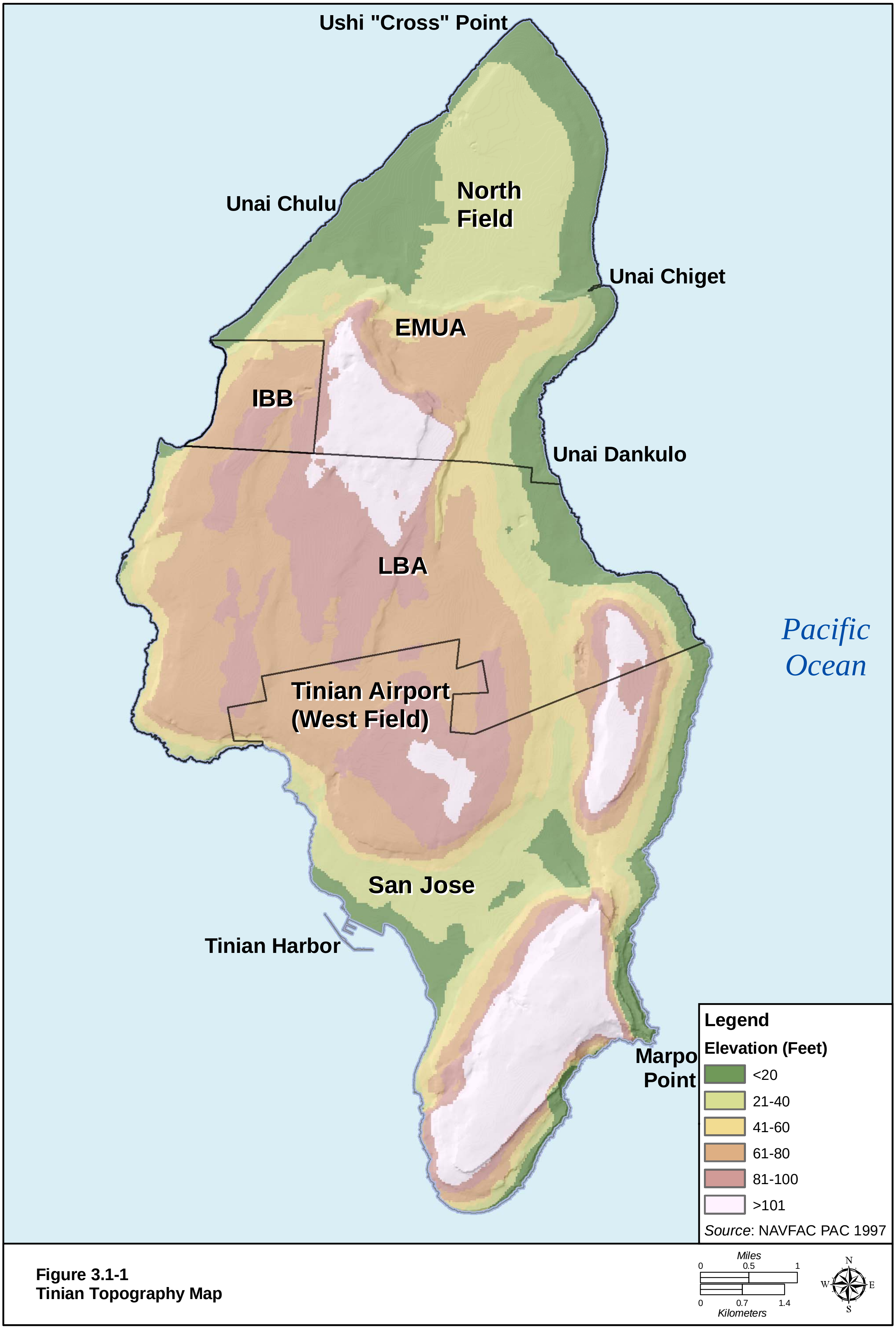

Figure 3.1-1
Tinian Topography Map

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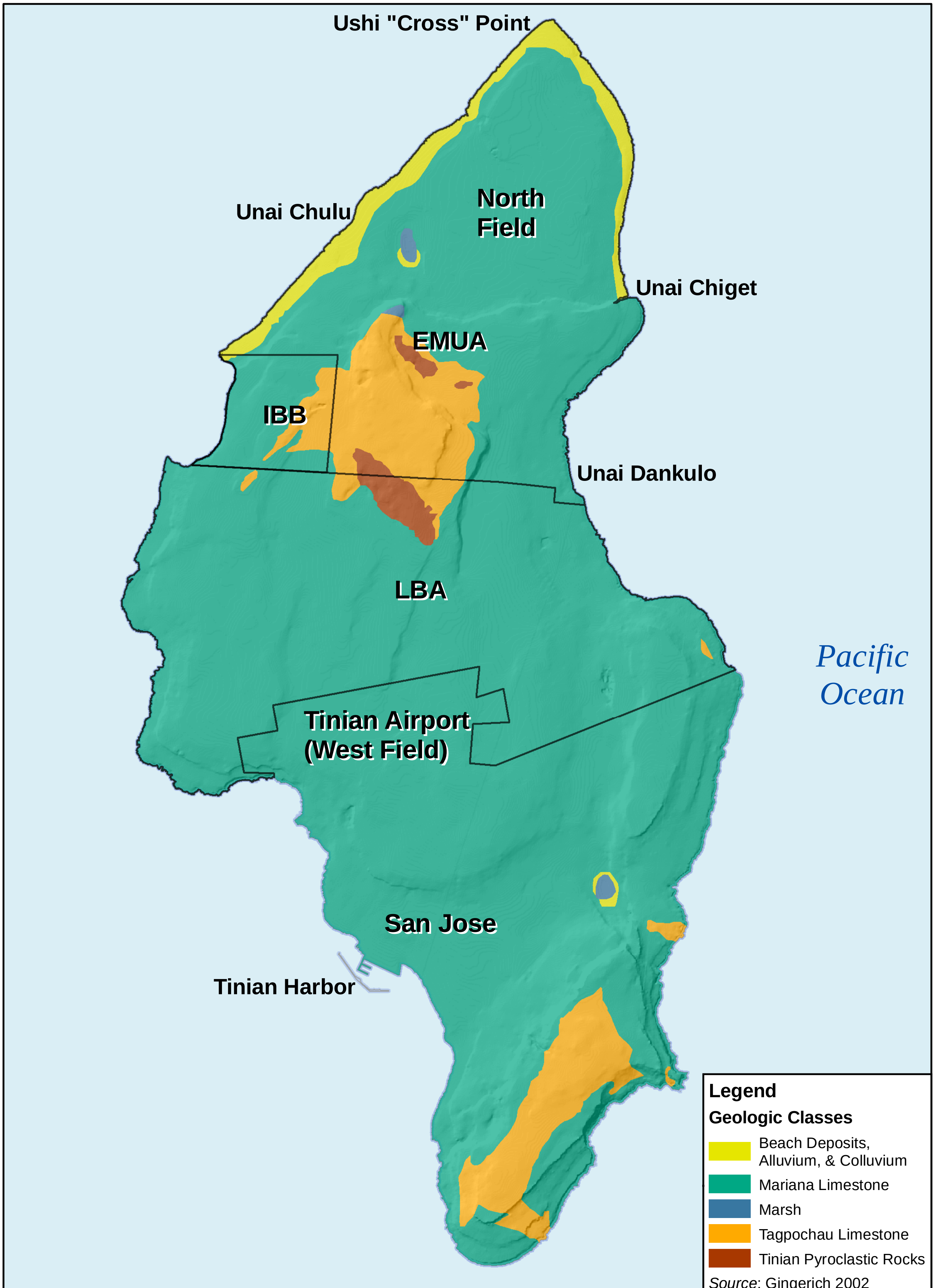

Figure 3.1-2
Tinian Geologic Map

Miles 0 0.5 1
0 0.7 1.4 Kilometers

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<u>Karst Geology</u>

Karst is a distinctive topography formed by dissolution of underlying soluble rocks by surface water or groundwater. Karst geology occurs when rainwater dissolves carbonate rocks, such as limestone, causing voids including epikarst, sinkholes, and caves in the surface and subsurface. Limestone is a soluble rock, primarily composed of calcium carbonate. Mylroie et al. (1999) discusses karst geology on Guam, including epikarst, sinkholes, and caves. Epikarst is defined as the upper layer of eroded rock, characterized by rough surfaces, little soil, and small cavities. Epikarst acts as a medium for flow of surface water to the aquifer below, either by diffusion or through pits connected directly to the groundwater. Unsaturated epikarst may provide a large amount of water storage in voids. The fast flow of water through the joints and planes of the epikarst does not allow for adsorption, uptake, or microbial processes to remove pollution from groundwater (Islam 2005).

Surface karst features on Tinian include epikarst, closed depressions, caves and freshwater discharge features (Stafford et. al. 2005). Epikarst is present in all carbonate rocks, such as limestone, on Tinian and its characteristics vary based on nearness to the coast. Coastal epikarst is jagged as a result of the effects of sea spray; surface features become less extreme moving inland (Stafford et al. 2005).

There are three main types of closed depressions found on Tinian: dissolutional, constructional, and human made or modified. Dissolutional depressions are the result of carbonate rock dissolving in surface water. Constructional depressions are formed during carbonate rock formation or as a result of faulting. Human made or modified depressions are the result of excavations such as quarries, borrows pits, and landfills. A karst survey identified 20 closed depressions on Tinian: 7 dissolutional, 8 constructional, and 5 human made or modified (Stafford et al. 2005). Construction activities are major sources of karst collapse that occurs when material overlying the karst geologic formations subsides down along the karst cavity forming sinkholes. Sinkholes can occur as a result of excavation, change of drainage patterns, and lowering of groundwater (Islam 2005). Soil disturbance from construction causes deposits to form in openings near the bedrock surface that get heavier when saturated, causing the underlying structure to collapse. Sinkholes are not only relevant to geological processes, they can potentially be of cultural significance, housing archaeological resources.

Subsurface karst on Tinian includes three types of caves: mixing zone, fissure, and contact. Mixing zone caves, the most common form on Tinian, are globular interconnected chambers that form where different waters meet, such as the interface of the fresh groundwater lens and the underlying salt water. Fissure caves form along faults fractures and joints and may act as a conduit for infiltration of surface water to groundwater. Contact caves develop when surface water is channeled into the subsurface (Stafford et. al. 2005).

Tinian has only a few small surface water bodies. The island has an aquifer of fresh water in the older limestone unit in the south-central portion of the island and may have a smaller aquifer in the north. There are two types of freshwater discharge features on Tinian: seeps and springs. Seeps are releases of freshwater along the surface on beaches. Springs are discharges at rock interfaces and fractures. Three seeps and 14 springs were identified on Tinian (Stafford et al. 2005).

3.1.2.3 Soils

Soils on Tinian are categorized as: lowland, volcanic upland, or limestone upland. Soils developed on volcanic rock tend to be poorly drained clays, while soils developed on limestone are usually shallow and highly porous. Soil classes across Tinian were identified by the United States Department of Agriculture (USDA) Soil Conservation Service in 1985 (Young 1989). Table 3.1-1 describes soil characteristics for soils found across Tinian. Figure 3.1-3 depicts the soil types found across Tinian. Prime farmland soil classes and potential impacts to agricultural uses are described under land use Volume 3, Chapter 8. Volume 3, Chapter 16 describes the socioeconomic impacts related to agricultural use.

Table 3.1-1. Soils Across Tinian

Soil Class	*Soil Description*	*Runoff Rate*	*Permeability*	*Erodibility Factor (K)*	*Location*
Mesei variant	Moderately deep, very poorly drained, level soils in depressions.		1.5 – 5.0	0.05	Lowlands
Shioya	Very deep, excessively drained, level to nearly level soils; on coastal strands.	Slow	15.0-50	0.15	Coastal Limestone Sands
Takpochao variant – Shioya	Very shallow to very deep, excessively drained, levels to gently sloping soils; on coastal strands and plateaus.		1.5 – 5.0	0.15	Lowlands
Banaderu – Rock outcrop	Shallow, well drained, nearly level to moderately steep soils and rock outcrops.		1.5 – 5.0	0.20	Limestone Plateaus
Chinen - Takpochao	Very shallow and shallow, well drained, nearly level to strongly sloping soils; on plateaus and side slopes.		1.5 – 5.0	0.10	Limestone Plateaus
Chinen – Urban Land	Shallow, well drained, nearly level soils and urban areas.		1.5 – 5.0	0.15	Limestone Plateaus
Dandan – Chinen	Shallow and moderately deep, well drained, nearly level to strongly sloping soils.		1.5 – 5.0	0.15	Limestone Plateaus
Kagman – Saipan	Deep and very deep, well drained, nearly level to strongly sloping soils.		0.5 – 1.5	0.15	Limestone Plateaus
Luta	Very shallow, well drained, nearly level to strongly sloping soils.		5.0 - 15	0.10	Limestone Plateaus
Saipan – Dandan	Moderately deep and very deep, well drained, nearly level to gently sloping soils.		1.5 – 5.0	0.15	Limestone Plateaus
Laolao - Akina	Moderately deep, well drained, strongly sloping to steep soils; on volcanic uplands.		1.5 – 5.0	0.15	Uplands
Rock outcrop – Takpochao – Luta	Shallow and very shallow, well drained, strongly sloping to extremely steep soils and rock outcrop; on limestone escarpments.		1.5 – 5.0	0.10	Uplands
Takpochao – Chinen – Rock outcrop	Shallow, well drained, strongly sloping to extremely steep soils and rock outcrop; on limestone escarpments and plateaus.		1.5 – 5.0	0.15	Uplands
Agfayan	Very shallow to very deep, well drained, moderately steep to extremely steep soils; on strongly dissected mountains and plateaus.	Slow	0.5 – 1.5	0.20	Volcanic Uplands
Chacha	Shallow, deep and poorly drained, and found on steep slopes: plateaus and hills.	Medium	0.02 – 0.5	0.15	Limestone Uplands

Source: Young 1989.

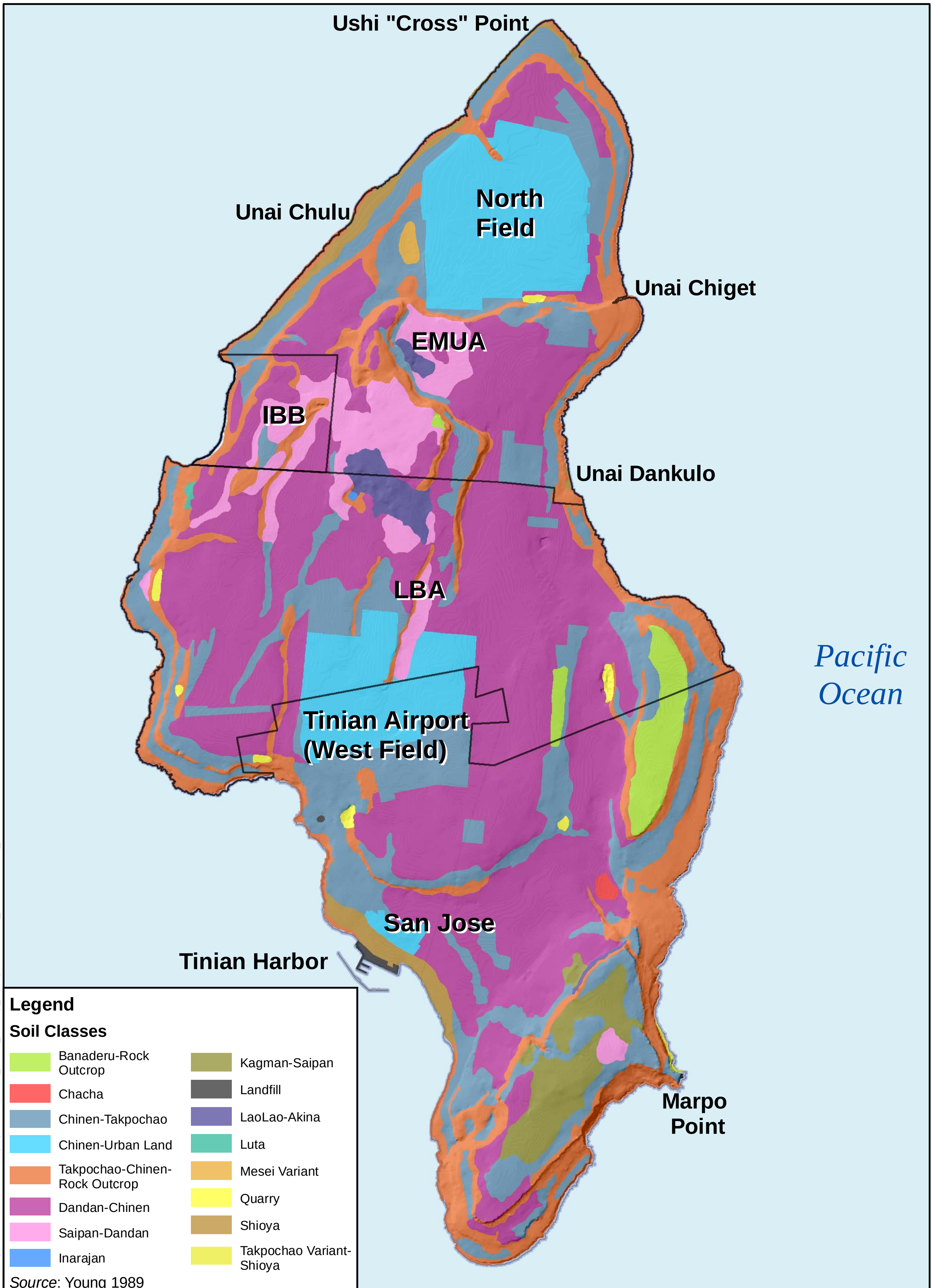

Figure 3.1-3
Tinian Soils Map

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Soil types and characteristics often dictate the potential for soils to erode. The USDA 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 matter vital to plant growth.” Natural causes of erosion include wind and water, but humans can worsen erosion particularly by construction projects (Muckel 2004).

Three prime farmland soils classes were identified on Tinian in the Soil Survey of the Islands of Aguijan, Rota, Saipan, and Tinian , Commonwealth of the Northern Mariana Islands (CNMI) (Young 1989), as follows:

- Dandan-Saipan clays, 0-5% slope
- Kagman clay, 0-5% slopes
- Saipan clay, 0-5% slopes

Dandan-Saipan clays 0-5% and Saipan clay, 0-5% were identified within and adjacent to the Leaseback Area as shown on Figure 3.1-4. The Kagman clay 0-5% prime farmland soils are located outside the Military Lease Area (MLA) in the southern area of Tinian.

During construction, grading and filling are often required; this may reduce soil quality that in turn may affect plant growth and runoff. When topsoil is removed, biological activity decreases, as does the presence of organic matter and plant nutrients, thereby affecting plant nutrition, control of pests and disease, water infiltration, and resistance to erosion. Compaction also typically occurs at construction sites and can also increase erosion potential. Compaction occurs when vehicles drive on and off a construction site and compact the soil beneath it. Compaction can lower rates of water infiltration and inhibit plant growth, both increasing runoff. Typically, construction vehicle tires track mud onto streets and roadways, thereby increasing runoff. It has been reported that erosion potential on construction sites are approximately 100 times greater than on agricultural land (Muckel 2004).

Although construction activities are confined to a particular area, the effects of soil erosion can extend offsite beyond the construction zone. The eroded soil becomes a major source of sediment and increased water runoff, thus creating nonpoint source pollution problems. Sediment can clog storm drains, reduce the volume of reservoirs, and add sediment and nutrients to various water bodies (Muckel 2004). Once in a water body, the sediment can smother filter feeding organisms of the reef, and drastically reduce light penetration into the water column. Silt often covers the ocean floor with a soft layer unsuitable for some bottom-dwelling plants and animals.

Erosion potential varies with depth from the surface. The erosion potential is divided into K and T (see discussion below) that are factors in the Universal Soil Loss Equation (USLE). Young (1989) uses the USLE to describe physical and chemical properties of soils. The equation was created to predict the long term average annual rate of erosion on a field slope based on rainfall patterns, soil type, topography, crop system, and management practices. USLE predicts the amount of soil loss that results from sheet or rill erosion on a single slope. Sheet erosion describes uniform removal of soil in thin layers, while rill erosion is the removal of soil by condensed water running through small streams.

Table 3.1-1 shows erosion factors denoting the vulnerability of a soil type to erosion. The value is based on percentage of silt, fine sand, sand, and organic matter, soil structure and permeability. The higher the “K” value in the table, the more susceptible the soil is to erosion (Young 1989). The table shows that Banaderu and Agfayan soils have the highest K values (0.20) and are the most vulnerable to erosion.

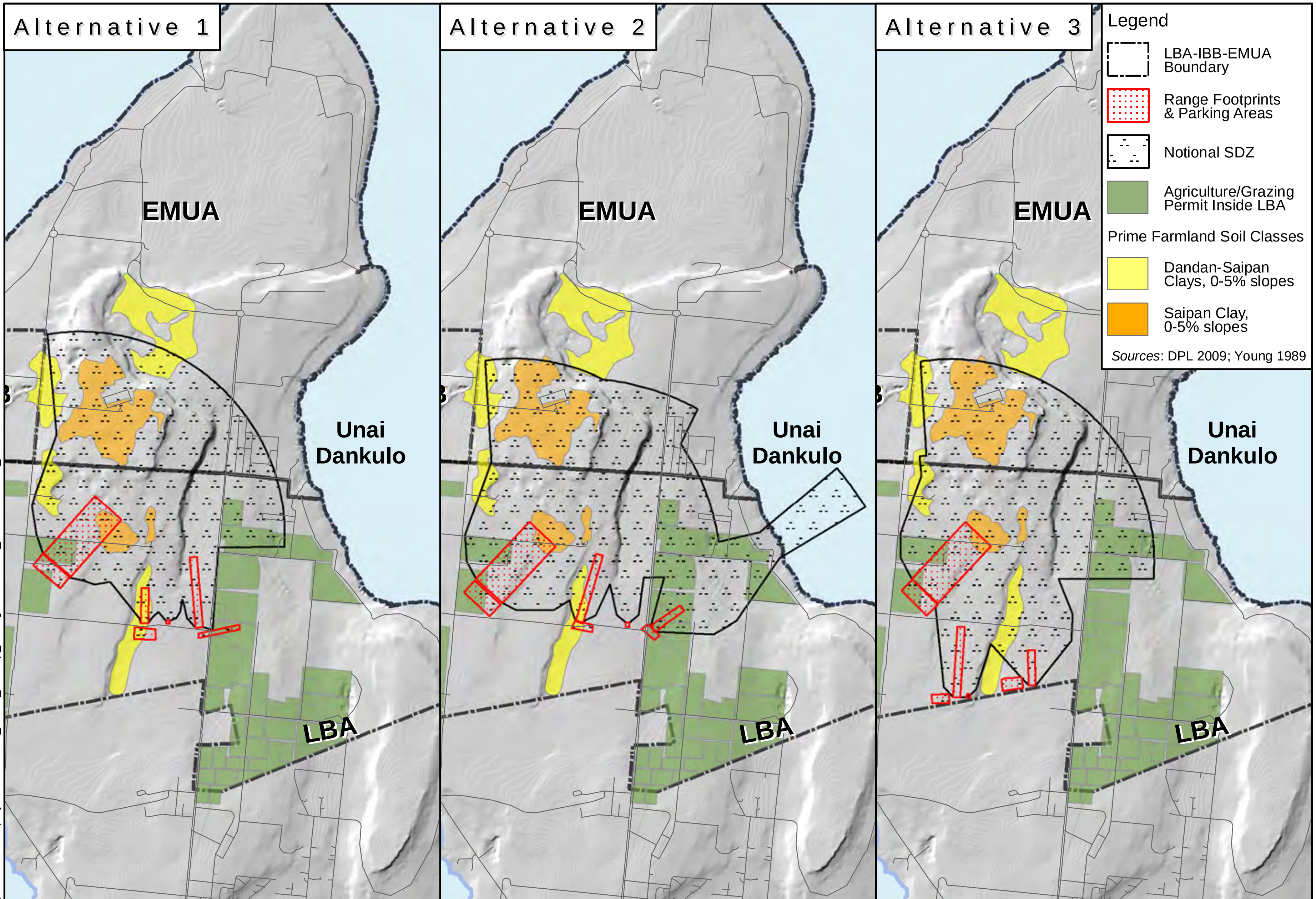

Figure 3.1-4
Prime Farmland Soil Classes on Tinian

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3.1.2.4 Geologic Hazards and Seismicity

Seismic Activity

The Earth is made up of approximately a dozen major tectonic plates and multiple minor plates. Tectonic plates are the large, thin, relatively rigid plates that move next to one another on the outer surface of the Earth. The Earth's tectonic plates are constantly moving; however, not at equal rates. The fastest plate moves 15 centimeters (cm) (6 inches [in]) a year and the slowest at less than 2.5 cm (0.9 in) per year (United States Geological Service [USGS] 2008). Many geological phenomena, such as earthquakes, tsunamis, and volcanic eruptions, originate in areas where plates meet (USGS 2008). Due to movement of these lithospheric plates, Tinian is vulnerable to earthquakes. Between 1849 and 1911, four earthquakes with a magnitude of 7.0 or greater on the Richter Scale occurred in the vicinity of Guam. The most recent large-magnitude earthquake was recorded in 1993 and measured 8.1 on the Richter scale (Pacific Air Force 2006). Earthquake activity is common across the entire Mariana Island chain (Lander et al. 2002). Earthquake is a term used to describe 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 changes in the earth (USGS 2008). Faults, the cause of seismic activity, zigzag across Tinian and are the result of collisional stresses and rock failure, where the Philippine Plate and the Pacific Plate converge (Siegrist et al. 1998). A fault is defined as a bedrock fracture along opposite sides that have moved. Fault activity on Tinian can be inconsistent and unpredictable, and ultimately dependent on the angle that the Philippine Plate collides with the Pacific Plate, the rate of subduction, and the dip in the Benioff Zone (Siegrist et al. 1998). The USGS defines the Benioff Zone as a dipping flat zone of earthquakes produced by the interaction of a down going oceanic crustal plate with a continental plate. These earthquakes can be produced by: (1) a slip along the subduction thrust fault, or (2) a slip on faults within the down going plate as a result of bending and extension as the plate is pulled into the mantle.

Fault types differ across Tinian. Normal faults, or Dip-slip faults, are inclined fractures where the blocks have mostly shifted vertically. If the rock mass above an inclined fault descends, the fault is termed normal; however, if the rock above the fault ascends, the fault is termed reverse (USGS 2008). Strike-slip faults are vertical (or nearly vertical) fractures where the blocks have mostly moved horizontally. If the block opposite an observer looking across the fault moves to the right, the slip style is termed right lateral; if the block moves to the left, the motion is termed left lateral. Tinian can be separated into five areas based on the locations of the high-angle faults: Northern Lowland, North-Central Highland, Central Plateau, Median Valley, and Southeastern Ridge (Stafford et al. 2005).

Landslides

The effects of an earthquake are typically local, but can also affect areas beyond its origin. Local effects can include slope failures and landslides, predominantly in limestone terrain. The weather on Tinian, mainly tropical, rapidly weathers and easily erodes the volcanic rock found on the island. Slope destabilization and landslides often occur from a combination of natural events, and seismic activity usually destabilizes a slope. When destabilization is followed by heavy rainfall, the destabilized slope is saturated, and mudflows result (GovGuam 2008).

Potential landslide occurrence depends on local geology, the angle of a slope, groundwater elevations, rainfall, and local geologic structures (e.g., faults and joints). The most appropriate approach to defining landslide hazard risks on Tinian involves determining the vulnerability of an area based on geologic units mapped at the surface. Such vulnerability has been determined by the geology and the slope angle of the various specific areas on the island. Tinian does not have a Hazard Mitigation Plan. However, the Guam

Hazard Mitigation Plan uses these two factors to develop a qualitative rating of the potential of an area for a landslide to occur. The potential ratings in the Guam Hazard Mitigation Plan are expressed as high, moderate to high to moderate and low (Table 3.1-2).

Table 3.1-2. Risk Potential for Landslides to Occur

Slope Angle	*Potential Risk of Landslide*
Less than 5%	Low potential regardless of geologic deposits
30% or more	Moderate to high

The overall likelihood for landslides to occur on Tinian is generally low. The consolidated nature of the limestone and volcanic units reduce the potential for slope failure. Steep slopes can be found on the sea cliffs and cliff faces at the coastline along the perimeter of the island, and along the northeastern flanks of Mount Lasso. The remainder of northern Tinian is primarily flat.

Liquefaction

Another effect of seismic activity is liquefaction, a process where water-saturated sediment temporarily loses strength and acts as a fluid (USGS 2008).

Certain conditions and geological units are more susceptible to liquefaction than others. Geologic information and historical occurrences are the only data available to determine susceptibility to liquefaction. The limestone and volcanic geologic units are not usually susceptible to liquefaction as they are consolidated. There is no fill on the island of Tinian.

Tsunamis

Earthquakes and landslides can cause big wave events called tsunamis. A tsunami is a sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or exploding volcanic islands (USGS 2008). Tinian is susceptible to tsunamis because of the volcanoes to the north and the Marianas Trench to the east, which has a history of large seismic events. Three tsunamis, in 1849, 1892, and 1993 have caused damage. According to Lander et al. (2002), the impacts of a local tsunami would most likely occur on Guam's east coast, due to the eastern location of the Mariana Trench, the origin of many local earthquakes. Because of the proximity, one can assume the same is true of Tinian. If a tsunami has a southern origin it can impact both the west and east coast of Tinian (Lander el al. 2002). There are no published probability statistics for tsunamis occurrences on Tinian.

The band of coral reef that surrounds Tinian provides protection from tsunamis, and the steep slope of the ocean floor surrounding the island lowers the risk of significant wave run-up.

The Pacific Tsunami Warning Center considers the tsunami evacuation safety zone to be above 30 ft (9 m) elevation and over 100 ft (30 m) inland. Tinian is recognized as Tsunami Ready and Storm Ready by the National Weather Service. To qualify as a Tsunami Ready community, a community must:

- Establish a 24-hour warning point and emergency operations center
- Create a system that monitors local weather and ocean conditions
- Develop multiple ways to receive tsunami and severe weather warnings, and alert the public in a timely manner
- Develop a formal hazard plan and conduct emergency exercises
- Promote public readiness through community education

3.2 ENVIRONMENTAL CONSEQUENCES

3.2.1 Approach to Analysis

3.2.1.1 Methodology

The methodology for identifying, evaluating, and mitigating impacts to geology and soil resources has been established through geologic and soil studies and reports, along with federal statutes and regulations, including state and local building codes and grading ordinances. This assessment of geology was conducted by reviewing available literature including previously published National Environmental Policy Act (NEPA) documents for actions in the Mariana Islands Range Complex (MIRC) and surrounding area. A site-specific geotechnical investigation was not undertaken for this Environmental Impact Statement (EIS). Geologic and soil impacts would include any resulting effects that the proposed action would have on the geology and soils of each geographic area as described in the previous affected environment section. Geology and soils may affect the placement or location of a land use as well; the geological and soil characteristics of an area would have an impact on the proposed action rather than the proposed action impacting the geology.

Activities associated with construction and operation may include:

<u>Construction</u>

- Cut and fill activities leading to soil erosion
- Removal of vegetation and landscaping leading to soil erosion
- Use of heavy equipment resulting in soil compaction
- Impacts to karst topography
- Increased risk of damage from liquefaction, landslides, seismic activity, and tsunamis

<u>Operation</u>

- Impervious surface increase resulting in increased soil erosion
- Vehicle movements on unpaved surfaces resulting in increased soil erosion and compaction
- Troop movements resulting in increased soil erosion
- Munitions impacts resulting in soil and subsurface contamination
- Explosive detonations resulting in soil and subsurface contamination
- Fires resulting in reduced vegetation and increased soil erosion

The potential effects of these activities and their significance within the areas of occurrence under the alternative actions are described below. The analysis of potential impacts to geology and soils considers both direct and indirect impacts. Such disturbance may cause increased erosion and loss of productive soil. Direct impacts result from physical soil disturbances or topographic alterations, while indirect impacts include risks to individuals from geologic hazards, as well as impacts to water or marine biological resources away from the construction/operation site. Factors considered in determining whether an impact would be significant include the potential for substantial change in soil or slope stability. An impact to geological resources would be considered significant if the action would have the potential to disrupt geologic features, or if actions were to be affected by potential geologic hazards.

Many effects are associated with the training operations activities. Increases in runoff due to the removal of ground cover may increase sedimentation. Siltation and formation of sediment plumes and heavy metals and hazardous materials may be leached from munitions and explosives of concern.

Indirect groundwater impacts associated with the construction and operational activities include direct contamination of groundwater resources through percolation for surface runoff. Stormwater runoff can contribute to groundwater contamination. Water impacts are addressed in Chapter 4.

Construction activities are major sources of karst collapse, which can occur as a result of excavation, change of drainage patterns, or lowering the groundwater table (Islam 2005). Soil disturbance from construction can cause deposits to form in openings near the bedrock surface, which get heavier when saturated causing the underlying structure to collapse.

Potential geology and soil impacts addressed in this chapter are limited to elements of the proposed actions that could affect onshore land forms or that could be affected by geologic hazards. Potential soil contamination issues are addressed in Chapter 17 (Hazardous Materials and Waste). Increased soil erosion also may indirectly impact water quality and aquatic ecosystems. Potential impacts to these resources are described in Chapter 4, Water Resources and Chapter 10, Terrestrial Biological Resources.

Applicable Regulatory Standards

CNMI Earthmoving and Erosion Control Regulations (CR Vol. 15, No. 10, October 15, 1993) (CNMI Environmental Protection Act, Public Law 3-23, 2 CMC §§ 3101 to 3134, and 1 CMC §§ 2601 to 2605) establish a permit process for construction activities, identify investigations and studies that are required prior to construction and design, and standards for grading, filling, and clearing.

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 that currently transmits, or is believed capable of transmitting water to supply pumping wells or springs." It is inferred from mapping of the freshwater lens, that most of the proposed project area lies within a Class I Aquifer Recharge Area. Groundwater aquifers on Tinian are vulnerable to contamination by substances introduced onto the soil surface because the porous soil and underlying limestone do not significantly impede the passage of contaminants to the shallow aquifers. Seismic, liquefaction, and ground shaking are reduced by following Unified Facility Code (UFC) 3-31-04, that provides the Department of Defense (DoD) requirements for:

- Earthquake-resistant design for new buildings
- Evaluating and rehabilitating existing buildings for earthquake resistance
- Guidance on applying seismic design principles to specialized structural and non-structural elements

The new UFC adopts the seismic design provisions of the 2003 *International Building Code* for use in DoD building design.

3.2.1.2 Determination of Significance

For geology and soils, the significance of potential project impacts is determined by subjective criteria, as well as by regulatory standards. An impact to geologic resources would be considered significant if the action would have the potential to disrupt geologic features, or if actions were to be affected by potential geologic hazards. To be considered a significant impact, the following factors are considered for each project area:

- Increased rate of erosion and soil loss from physical disturbance
- Loss of vegetation
- Alteration of surrounding landscape and affect on important geologic features (including soil or rock removal and filling of sinkholes that would adversely affect site drainage)

- Diminished slope stability
- Increased vulnerability to a geologic hazard (e.g., seismic activity, tsunami, liquefaction), and the probability that such an event could result in injury

3.2.1.3 Issues Identified During Public Scoping Process

As part of the analysis, concerns relating to geology and soils resources that were mentioned by the public, including regulatory stakeholders, during scoping meetings were addressed. These include:

- Implementing erosion control measures for construction and post construction phases
- Ensuring the proper permitting and local government clearances are sought where applicable

3.2.2 Alternative 1 (Preferred Alternative)

3.2.2.1 Tinian

<u>Construction</u>

On Tinian, site development and construction of the ranges would occur within the MLA. The MLA encompasses 15,353 acres (ac) (6,213 hectares [ha]). In order to streamline development of a construction estimate for the training ranges and supporting activities, each individual item was assigned to a "prototype" element, with complete construction estimates developed for a representative sample of each of the prototypes.

Construction of ranges and berms would change the landscape and disturb and compact topsoil in the developed areas. The total area of disturbance for the four proposed ranges is 225 ac (91 ha). Although construction footprints would be minimal, it is assumed the full area would be graded or cleared of vegetation. These disturbances would temporarily increase localized erosion during the construction phase, but would not be likely to have a long-term impact on soil resources. Very limited areas of Prime Farmland Soil would be disturbed refer to Figure 3.1-4). Vegetation that is lost during the construction phase would return to the ranges upon completion of construction. None of the proposed range locations lie over the Takapochao Limestone that holds the main drinking water supply for Tinian; therefore, compaction of soils would not affect infiltration of surface water into the groundwater. The proposed ranges lie over Mariana Limestone that would be disturbed in areas during the construction process, but are unlikely to have long-term significant impacts to underlying limestone. Topography is flat, thus slope stability would not be diminished. Therefore, Alternative 1 would result in less than significant impacts to unique geologic resources and would not result in significant soil erosion or compaction, or loss of productive soils.

The action area is located in an area with karst geologic features that are of concern for the construction and operation of ranges. Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion. As a result of mitigation, the sinkholes would not be affected by construction activities. A survey by a licensed geologist is required prior to construction to ensure that all sinkholes have been identified. If additional sinkholes are discovered, significant impacts to these sinkholes would be determined and projects would be designed in consideration of these sinkholes as appropriate. Any known sinkholes, along with any others found, that are deemed hazardous would be fenced off and signs put in place to warn of the potential danger. With mitigation, less than significant impacts to sinkholes would occur and Alternative 1 would result in less than significant impacts to unique geologic resources.

Although Tinian is located in a potentially active seismic zone, the hazards associated with earthquakes, fault rupture, slope instability and liquefaction would be minimal. The proposed ranges would be located on a relatively flat area that would not be subject to slope instability. Because there are no proposed buildings or permanent structures associated with the proposed range development, there would be no seismic hazard.

Standard Operating Procedures (SOPs) and a Storm Water Pollution Prevention Plan (SWPPP) as required by the National Pollutant Discharge Elimination System permit would be implemented to minimize impacts. The construction SOPs would include requirements for stormwater compliance with stormwater Best Management Practices (BMPs), including the SWPPP, to ensure that all aspects of the project construction would be performed in a manner to minimize impacts during construction activity. A description of the standard BMPs and resource protection measures required by regulatory mandates can be found in Volume 7. Implementation of measures noted in the geology and soils column would prevent erosion; therefore impacts from soil erosion would be less than significant. A more detailed explanation of regulatory permitting requirements may also be found in Volume 8.

Indirect impacts to geological resources, water resources, and marine biological resources from soil erosion during construction would be prevented by implementation of BMPs.

Operation

The ranges would not contain additional impervious surfaces such as facilities or concrete pads, so the surface water would still be able to infiltrate into the ground during rain events. None of the proposed range locations lie over the Takapochao Limestone that holds the main drinking water supply for Tinian, so compaction of soils during training activities would not affect infiltration of surface water into the groundwater. Also, training activities would be conducted with established procedures aimed at minimizing topsoil loss, soil compaction and erosion. Very limited areas of Prime Farmland Soil would be disturbed (refer to Figure 3.1-4). Therefore, Alternative 1 would result in less than significant impacts to unique geologic resources and would not result in significant soil erosion. Erosion potentials for soil found in north Tinian are all slight and can be found in Table 3.2-1.

Table 3.2-1. Tinian Soil Erosion Potential at Proposed Sites

Soil Type	*Location*	*Erosion Potential*
Saipan Clay, 0-5% slope	Platoon Battle Course	Slight
Dandan-Chinen Complex, 0-5% slope	Platoon Battle Course	Slight
Dandan-Chinen Complex, 5-15% slope	Platoon Battle Course	Slight
Dandan-Chinen-Pits Complex, 0-5% slope	Platoon Battle Course	Slight
Dandan-Chinen-Pits Complex, 5-15% slope	Platoon Battle Course	Slight
Dandan-Chinen Complex, 0-5% slope	Automated Field Fire Range	Slight
Dandan-Chinen-Pits Complex, 5-15% slope	Automated Field Fire Range	Slight
Chinen-Urban Land Complex, 0-5% slope	Automated Combat Pistol Fire	Slight
Chinen-Urban Land Complex, 0-5% slope	Rifle Known Distance	Slight
Chinen-Clay Loam, 0-5% slope	Rifle Known Distance	Slight
Chinen-Clay Loam, 5-15% slope	Rifle Known Distance	Slight
Chinen-Rock Outcrop Complex, 15-30% slope	Rifle Known Distance	Moderate
Dandan-Saipan Clay, 0-5% slope	Rifle Known Distance	Slight
Takpochao-Rock Outcrop Complex, 30-60% slope	Rifle Known Distance	Slight

Source: Young 1989.

Firing Range operations could potentially result in soil contamination from munitions; however, ordnance would be handled and stored in accordance with Marine Corps explosive safety directives (*Marine Corps Order P8020.10A, Marine Corps Ammunition Management and Explosives Safety Policy Manual*), and all munitions handling would be carried out by trained, qualified personnel. Therefore, no impacts related to explosives safety are anticipated.

Fire potential would be increased from firing range operations. Fire can directly affect soil as a result of increased erosion from loss of vegetation. Grass fires are regular occurrences on Tinian, and there is greater danger during the dry season. Data cited in the 1997 Tinian INRMP (NAVFAC Pacific 1997) shows that the worst fire hazard exists during the driest months (May through July) of the dry season and during this short time 200 or more acres may get scorched each year. Information presented for 1991 showed that 33 fires burned, the largest occurring in the month of March, and two-thirds of the fires burned between 1 and 8 ac (0.4 and 3 ha), while approximately one-third burned 9 to 20 ac (4 to 8 ha). The reduction in ground cover caused by fire could increase rates of erosion.

As a BMP, a fire management plan would be developed as part of a Range Training Area Management Plan. The plan would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system. With the implementation of this BMP, impacts would be less than significant.

Topography or landscape features would not be changed substantively by the proposed action. Topography is flat, thus slope stability would not be diminished. The action area is located in an area with karst geologic features that are of concern for the construction and operation of the ranges. Operations would not occur over unstable karst features. Any sinkholes found in the area that are deemed hazardous would be fenced off and signs put in place to warn of the potential danger. There would be no loss of productive soils or vegetation. Therefore, Alternative 1 would result in less than significant impacts to unique geologic resources and would not result in significant soil contamination, erosion or compaction.

Although Tinian is located in a potentially active seismic zone, the hazards associated with earthquakes, fault rupture, slope instability and liquefaction would be minimal because there would be no buildings or permanent structures associated with use of the proposed ranges. The Alternative 1 proposed ranges are to be located on a relatively flat area that would not be subject to slope instability. The predominant limestone bedrock is not vulnerable to liquefaction. Due to the limited duration of operational activities (1 week per month on average), exposure potential to seismic ground shaking and fault rupture would be minimal. Therefore, Alternative 1 would result in less than significant impacts associated with geologic hazards.

Indirect impacts to geological resources, water resources, and marine biological resources from soil erosion during operation would be prevented by implementation of BMPs (refer to analysis in Chapters 4 and 10).

3.2.2.2 Summary of Alternative 1 Impacts

Table 3.2-2 summarizes Alternative 1 impacts.

Table 3.2-2. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	• Changes in landscape under Alternative 1 would result in less than significant impacts to topography on Tinian. • Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion at any sinkholes found. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. With mitigation, there would be less than significant impact to sinkholes under Alternative 1. • Soil disturbances and loss of vegetation would cause increased rate of erosion and soil loss from physical disturbance at all proposed construction areas under Alternative 1. Less than significant impacts would occur with the use of BMPs.
	Operation	• As a BMP, a fire management plan would be developed as part of a Range Training Area Management Plan. The plan would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system. With the implementation of this BMP, impacts to soil and geological resources would be less than significant.

3.2.2.3 Alternative 1 Proposed Mitigation Measures

Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion. As a result of mitigation, the sinkholes would not be affected by construction activities. A survey by a licensed geologist is required prior to construction to ensure that all sinkholes have been identified. If additional sinkholes are discovered, significant impacts to these sinkholes would be determined and projects would be designed in consideration of these sinkholes as appropriate. Any known sinkholes, along with any others found, that are deemed hazardous would be fenced off and signs put in place to warn of the potential danger. With mitigation, less than significant impacts to sinkholes would occur.

3.2.3 Alternative 2

3.2.3.1 Tinian

Alternative 2 involves a different configuration of the proposed ranges than Alternative 1. However, geological resources conditions (topography, geologic units, erosion potential, and geological hazards) are similar.

<u>Construction</u>

Impacts to soil and geological resources during construction would not differ from those of Alternative 1.

<u>Operation</u>

Impacts to soil and geological resources during construction would not differ from those of Alternative 1.

3.2.3.2 Summary of Alternative 2 Impacts

Table 3.2-3 summarizes Alternative 2 impacts.

Table 3.2-3. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	• Changes in landscape under Alternative 2 would result in less than significant impacts to topography by on Tinian. • Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion at any sinkholes found. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. With mitigation, there would be less than significant impact to sinkholes under Alternative 2. • Soil disturbances and loss of vegetation would cause increased rate of erosion and soil loss from physical disturbance at all proposed construction areas under Alternative 2. Less than significant impacts would occur with the use of BMPs.
	Operation	• As a BMP, a fire management plan would be developed as part of a Range Training Area Management Plan. The plan would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system. With the implementation of this BMP, impacts to soil and geological resources would be less than significant.

3.2.3.3 Alternative 2 Proposed Mitigation Measures

Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion. As a result of mitigation, the sinkholes would not be affected by construction activities. A survey by a licensed geologist is required prior to construction to ensure that all sinkholes have been identified. If additional sinkholes are discovered, significant impacts to these sinkholes would be determined and projects would be designed in consideration of these sinkholes as appropriate. Any known sinkholes, along with any others found, that are deemed hazardous would be fenced off and signs put in place to warn of the potential danger. With mitigation, less than significant impacts to sinkholes would occur.

3.2.4 Alternative 3

3.2.4.1 Tinian

Alternative 3 differs from Alternative 2 due to relocation of the Platoon Battle Course.

<u>Construction</u>

Impacts to soil and geological resources during construction would not differ from those of Alternative 1.

<u>Operation</u>

Impacts to soil and geological resources during operations would not differ from those of Alternative 1.

3.2.4.2 Summary of Alternative 3 Impacts

Table 3.2-4 summarizes Alternative 3 impacts.

Table 3.2-4. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	• Changes in landscape under Alternative 3 would result in less than significant impacts to topography on Tinian. • Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion at any sinkholes found. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. With mitigation, there would be less than significant impact to sinkholes under Alternative 3. • Soil disturbances and loss of vegetation would cause increased rate of erosion and soil loss from physical disturbance at all proposed construction areas under Alternative 3. Less than significant impacts would occur with the use of BMPs.
	Operation	• As a BMP, a fire management plan would be developed as part of a Range Training Area Management Plan. The plan would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system. With the implementation of this BMP, impacts to soil and geological resources would be less than significant.

3.2.4.3 Alternative 3 Proposed Mitigation Measures

Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion. As a result of mitigation, the sinkholes would not be affected by construction activities. A survey by a licensed geologist is required prior to construction to ensure that all sinkholes have been identified. If additional sinkholes are discovered, significant impacts to these sinkholes would be determined and projects would be designed in consideration of these sinkholes as appropriate. Any known sinkholes, along with any others found, that are deemed hazardous would be fenced off and signs put in place to warn of the potential danger. With mitigation, less than significant impacts to sinkholes would occur.

3.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. Existing operations on Tinian would continue. Therefore, the no-action alternative would have no impacts to geologic resources.

3.2.6 Summary of Impacts

Table 3.2-5 summarizes the potential impacts of each action alternative and the no-action alternative. A text summary is provided below.

Table 3.2-5. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Construction			
Topography			
LSI • Changes in landscape under Alternative 1 would result in less than significant impacts to topography on Tinian.	LSI • Changes in landscape under Alternative 2 would result in less than significant impacts to topography on Tinian.	LSI • Changes in landscape under Alternative 3would result in less than significant impacts to topography on Tinian.	NI • No impacts to geological and soil resources.
Geology			
SI-M • Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion at any sinkholes found. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. With mitigation, there would be less than significant impact to sinkholes under Alternative 1.	SI-M • Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion at any sinkholes found. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. With mitigation, there would be less than significant impact to sinkholes under Alternative 2.	SI-M • Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion at any sinkholes found. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. With mitigation, there would be less than significant impact to sinkholes under Alternative 3.	NI • No impacts to geological and soil resources.
Soil			
LSI • Soil disturbances and loss of vegetation would cause increased rate of erosion and soil loss from physical disturbance at all proposed construction areas under Alternative 1. Less than significant impacts would occur with the use of BMPs.	LSI • Soil disturbances and loss of vegetation would cause increased rate of erosion and soil loss from physical disturbance at all proposed construction areas under Alternative 2. Less than significant impacts would occur with the use of BMPs.	LSI • Soil disturbances and loss of vegetation would cause increased rate of erosion and soil loss from physical disturbance at all proposed construction areas under Alternative 3. Less than significant impacts would occur with the use of BMPs.	NI • No impacts to geological and soil resources.

Table 3.2-5. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Operation			
Geology and Soil			
LSI • As a BMP, a fire management plan would be developed as part of a Range Training Area Management Plan. The plan would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system. With the implementation of this BMP, impacts to soil and geological resources would be less than significant.	LSI • As a BMP, a fire management plan would be developed as part of a Range Training Area Management Plan. The plan would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system. With the implementation of this BMP, impacts to soil and geological resources would be less than significant.	LSI • As a BMP, a fire management plan would be developed as part of a Range Training Area Management Plan. The plan would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system. With the implementation of this BMP, impacts to soil and geological resources would be less than significant.	NI • No impacts to geological and soil resources.
Geologic Hazards			
LSI • Due to the limited duration of operational activities and lack of structures associated with operations, exposure potential to seismic ground shaking and fault rupture would be minimal.	LSI • Due to the limited duration of operational activities and lack of structures associated with operations, exposure potential to seismic ground shaking and fault rupture would be minimal.	LSI • Due to the limited duration of operational activities and lack of structures associated with operations, exposure potential to seismic ground shaking and fault rupture would be minimal.	NI • No impacts from geologic hazards.

Legend: LSI = Less than significant impact, SI-M=Significant impact, mitigable, NI = No impact.

The development of proposed training ranges on Tinian would require construction that would potentially disturb soil, increase erosion, and change the landscape of Tinian in four separate areas of northern Tinian.

Construction of ranges and berms would change the landscape and disturb topsoil in the developed areas. These disturbances would temporarily increase localized erosion during the construction phase, but would not be likely to have a long-term impact on soil resources. Very limited areas of Prime Farmland Soil would be disturbed (refer to Figure 3.1-4). Vegetation that is lost during the construction phase would return to the ranges and berms upon completion of construction. None of the proposed range locations lie over the Takapochao Limestone that holds the main drinking water supply for Tinian. The proposed ranges lie over Mariana Limestone that would be disturbed in areas during the construction process, but are unlikely to have long-term significant impacts to underlying limestone. Topography is flat, thus slope stability would not be diminished.

Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion. As a result of mitigation, the sinkholes would not be affected by construction activities. A survey by a licensed geologist is required prior to construction to ensure that all sinkholes have been identified. If additional sinkholes are discovered, significant impacts to these sinkholes would be determined and projects would be designed in consideration of these sinkholes as appropriate. Any known sinkholes, along with any others found, that are deemed hazardous would be fenced off and signs put in place to warn of the potential danger. With mitigation, less than significant impacts to sinkholes would occur. BMPs and a Stormwater Management Plan would be included in SOPs to ensure that all aspects of the project construction would be performed in a manner to minimize impacts during construction activity. As a BMP, a fire management plan would be developed as part of a Range Training Area Management Plan. The plan would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system. With the implementation of this BMP, impacts to soil and geological resources would be less than significant.

Although Tinian is located in a potentially active seismic zone, the hazards associated with earthquakes, fault rupture, slope instability and liquefaction would be minimal because there would be no buildings or permanent structures associated with the proposed range. The proposed ranges would be located on a relatively flat area that would not be subject to slope instability.

The construction SOPs would include requirements for stormwater compliance with stormwater BMPs, including the SWPPP, to ensure that all aspects of the project construction would be performed in a manner to minimize impacts during construction activity. A description of the standard BMPs and resource protection measures required by regulatory mandates can be found in Volume 7. Implementation of measures noted in the geology and soils column would prevent erosion; therefore, impacts from soil erosion would be less than significant. Indirect impacts to geological resources, water resources, and marine biological resources from soil erosion during construction and operation would be prevented by implementation of BMPs.

3.2.7 Summary of Proposed Mitigation Measures

Table 3.2-6 summarizes the proposed mitigation measures.

Table 3.2-6. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Topography		
• None	• None	• None
Geology		
• Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion at any sinkholes found. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. With mitigation, there would be less than significant impact to sinkholes under Alternative 1.	• Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion at any sinkholes found. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. With mitigation, there would be less than significant impact to sinkholes under Alternative 2.	• Known sinkholes would be avoided and a buffer zone of vegetation would be left around them as a mitigation measure to prevent further erosion or expansion at any sinkholes found. Any sinkholes discovered would be evaluated to determine significant impacts and projects would be designed in consideration of these sinkholes as appropriate. With mitigation, there would be less than significant impact to sinkholes under Alternative 3.
Soil		
• None	• None	• None
Geologic Hazards		
• None	• None	• None

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CHAPTER 4.
WATER RESOURCES

4.1 AFFECTED ENVIRONMENT

4.1.1 Definition of Resource

Water resources as defined in this Environmental Impact Statement (EIS) are sources of water available for use by humans, flora, or fauna, including surface water, groundwater, nearshore waters, and wetlands. Surface water resources, including but not limited to stormwater, lakes, streams, and rivers, are important for economic, ecological, recreational, and human health reasons. Groundwater may be used for potable water, agricultural irrigation, and industrial applications. Groundwater is classified as any source of water beneath the ground surface, and is the primary source of potable water used to support human consumption. Nearshore waters are defined as waters extending from the shoreline to the offshore zone, usually waters up to 33 feet (ft) (10 meter [m]) deep. Nearshore waters can be directly affected by human activity, and are important for human recreation and subsistence. Wetlands are habitats that are subject to permanent or periodic inundation or prolonged soil saturation, and include marshes, swamps, and similar areas. Areas described and mapped as wetland communities may also contain small streams or shallow ponds, or pond or lake edges. Surface water, groundwater, nearshore waters, and wetlands on the island of Tinian in the Commonwealth of the Northern Mariana Islands (CNMI) are discussed below.

4.1.2 Tinian

4.1.2.1 Surface Water/Stormwater

Surface Water Availability

Rainfall for Tinian averages 82 inches (in) (208 centimeters [cm]) per year, runoff averages 6 in (15 cm) per year, groundwater recharge averages 30 in (76 cm) per year, and the balance (46 in [117 cm]) is evapotranspired. Thus, most of the precipitation on Tinian either evaporates or percolates into the limestone substrata (Gingerich 2002).

Figure 4.1-1 depicts the surface water features on Tinian. Lake Hagoi is 36.3 acres (ac) (14.7 hectares [ha]) of open water/wetland area located in the northern end of the island. Other than Lake Hagoi, there are no perennial or intermittent streams or lakes on Tinian. Most precipitation either evaporates or percolates into the highly permeable limestone substrata. During periods of intense rainfall, runoff approximates 6-12% of total rainfall and flows toward the low-lying coastal areas (Gingerich 2002).

Surface Water Quality

Overall surface water quality data are limited on Tinian. In general terms, stormwater runoff is a factor in the disposal of sewage overflows, animal wastes, and sediment into streams during periods of heavy rainfall.

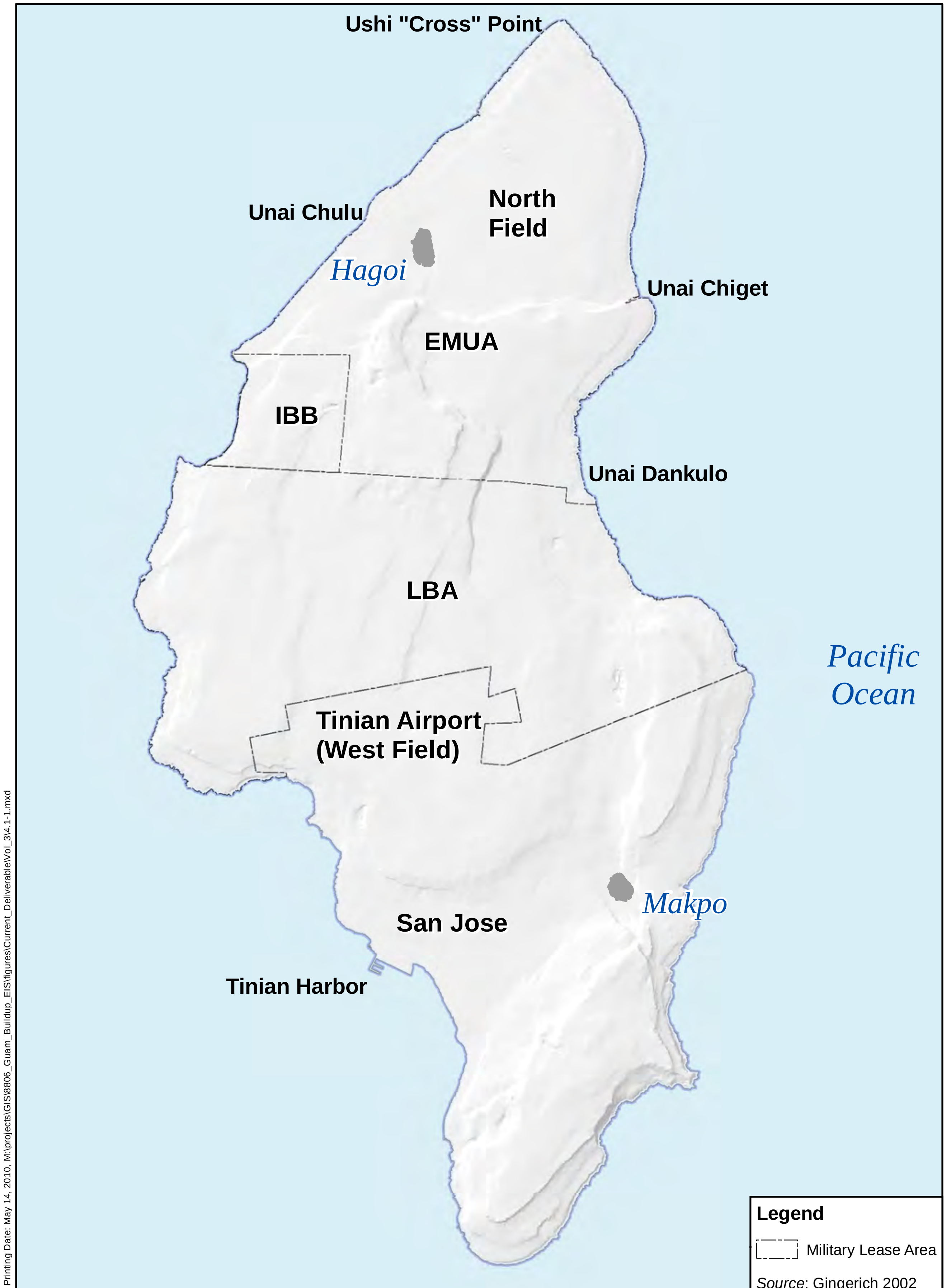


Figure 4.1-1
Surface Waters of Tinian

Federal Regulations

The Clean Water Act (CWA) of 1972 is the primary federal law that protects the nation's waters, including lakes, rivers, and coastal areas. The primary objective of the CWA is to restore and maintain the integrity of the nation's waters. The United States (U.S.) Environmental Protection Agency (USEPA) Region 9 regulates discharges to surface waters through the issuance of National Pollutant Discharge Elimination System (NPDES) permits that are based on applicable federal standards and policies.

Governing procedures for the use of training areas, ranges, and airspace operated and controlled by the Commander U.S. Naval Forces, Marianas is included in Commander Navy Region (COMNAV) Marianas Instruction 3500.4 (COMNAV Marianas 2000). This guidance identifies specific land use constraints to enable protection of environmental resources during military training.

Local Regulations

The CNMI Division of Environmental Quality (DEQ) is the administrative authority for CWA Section 401 Water Quality Certifications required for validation of CWA Section 402 NPDES permits.

CNMI DEQ Earthmoving and Erosion Control Regulation requires permits for all mechanized earth moving activities as part of their non-point source pollution program.

The CNMI DEQ provides the following classifications to surface waters of Tinian (Bearden et al. 2004):

(a) Class 1 - It is the objective of this class that these waters remain in their natural state as nearly as possible with an absolute minimum of pollution from any human-caused source. To the extent possible, the wilderness character of such areas shall be protected. Wastewater discharges and zone of mixing into these waters are prohibited.

The uses to be protected in this class of water are for domestic water supplies, food processing, the support and propagation of aquatic life, groundwater recharge, compatible recreation and aesthetic enjoyment including water contact recreation with risk of water ingestion by either children or adults.

(b) Class 2 - It is the objective of this class that use of these waters for recreational purposes, propagation of fish and other aquatic life, and agricultural and industrial water supply not be limited in any way. The uses protected in this class of waters are all compatible with the protection and propagation of fish and other aquatic life, groundwater recharge, and recreation. Compatible recreation shall include limited body contact activities. Such waters shall not act as receiving waters for any discharge that has not received the best degree of treatment or control practical under technological and economic conditions and compatible with the standards established for this class. A zone of mixing is permissible in these waters.

Flood Zones

Floodplains are low-lying areas subject to flooding. Nineteen isolated areas are designated as Flood Zone A that are areas likely to be inundated in a 100-year flood event. These zones are located in unpopulated areas including Hagoi, portions of North Field, Tinian International Airport, and Makpo (COMNAV Marianas 2004) (Figure 4.1-2).

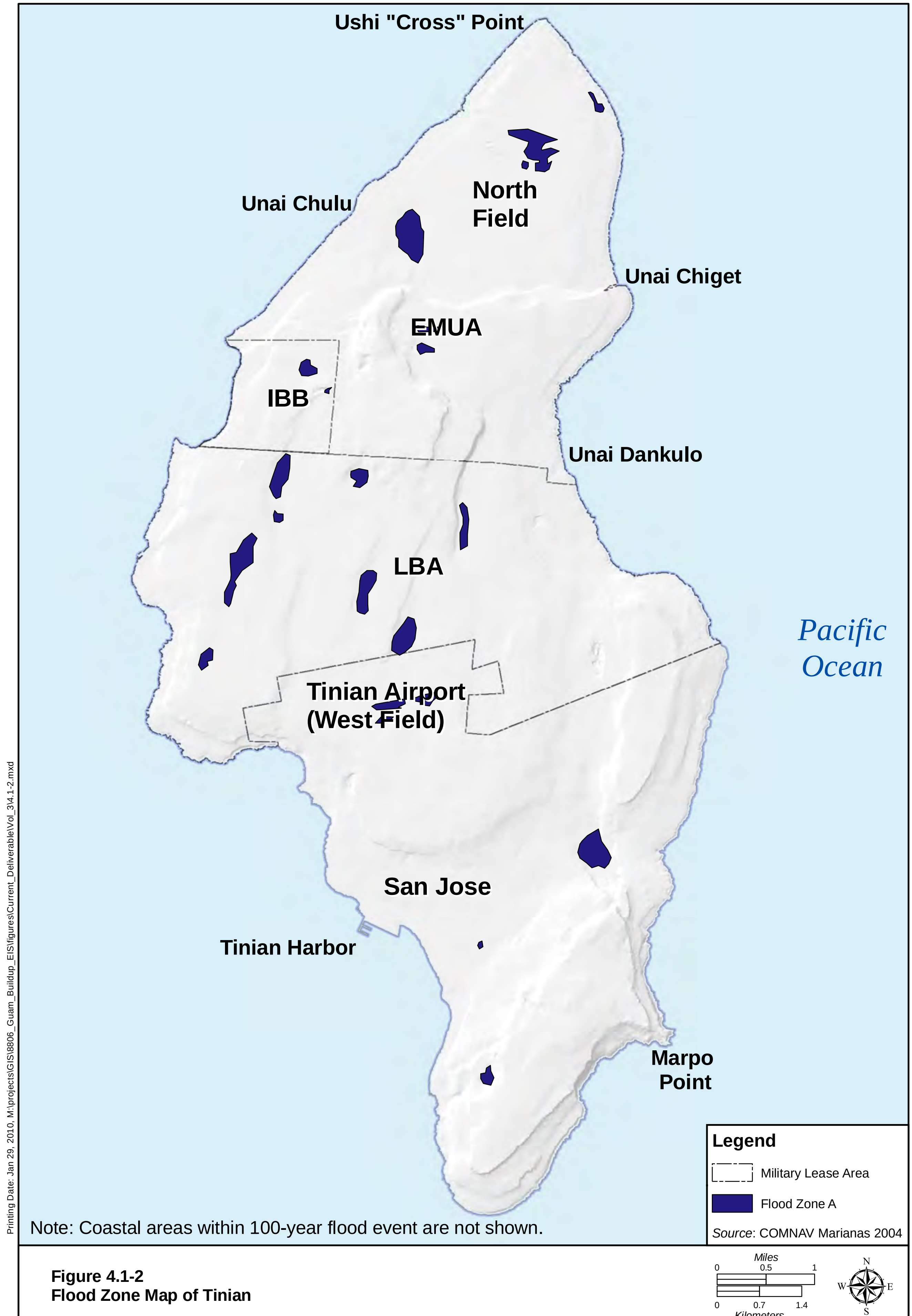


Figure 4.1-2
Flood Zone Map of Tinian

4.1.2.2 Groundwater

Groundwater Availability

Tinian's groundwater supply is a lens of fresh water floating on saltwater that forms as a result of percolation of precipitation through the rock formations. On Tinian, the surface of the basal fresh water lens, which is not underlain by volcanic material, ranges from about 0.8 to 1.6 ft (0.24 to 0.39 m) above mean sea level. As measured in 1997, the vertical distance to the mid-point of the fresh-water/saltwater transition zone is approximately 60 ft (18 m) at well TH4X, located adjacent to production well TH04 (Figure 4.1-3). The water table elevation at the well was about 0.8 ft (0.24 m) (Gingerich 2002).

The primary aquifer on Tinian is in the coralliferous Mariana limestone. This rock formation is very permeable and covers over 80% of the land. In the central plateau of the island, this limestone extends down approximately 200 ft (61 m) below sea level, deeper than the bottom of the freshwater lens. The thickness of the Mariana Limestone increases toward the coast, but is thinnest or not present in small areas of the north-central and south-central parts of the island (Gingerich 2002).

The Natural Resources Conservation Service has mapped the known and probable extent of the freshwater lens from well development data (U.S. Department of Agriculture [USDA] Soil Conservation Service [SCS] 1994). The area of known freshwater lens includes most of the Central Plateau, inland portions of the Median Valley, and the Northern Lowland. The SCS also mapped "watersheds" for Tinian. However these designations were primarily for dividing the island into natural resource study areas and do have a sound hydrogeological basis for groundwater resource planning. Figure 4.1-3 shows these watersheds and the generalized groundwater flow direction based on modeling done by the USGS (Gingerich, 2002). Groundwater flow on Tinian is controlled primarily by:

- The position on the island relative to the coast (i.e. groundwater will flow from the center of the island to coastal discharge zones); and
- The intrusion of the low permeability volcanic into the freshwater lens causing the water to flow away from or around these areas.

The main source of drinking water on Tinian is the freshwater lens aquifer in the high-permeability limestone overlying low-permeability volcanic rock (Gingerich 2002). USEPA Region 9 has not identified a sole source aquifer on Tinian. Historically, approximately 40 wells were drilled at an average depth of 229.7 ft (70 m); however, most of these have been abandoned. Currently, there are nine production wells on Tinian. The municipal and agricultural wells are located in or near the Makpo wetland area, and the potable water is stored in tanks at Makpo Heights and Carolinas Heights (Navy 2009). Figure 4.1-3 shows the location of the production wells and the abandoned wells. It is not known at this time whether or not the abandoned wells have been properly destroyed in accordance with CNMI Well Drilling and Well Operation Regulations (CNMI DEQ 2005). The name and location of the abandoned wells was taken from a map provided by the CNMI Combined Utilities Commission (CUC) (CNMI CUC 2009). The source of the map could not be verified and further information requests have not been answered.

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." It is inferred from mapping of the freshwater lens that most of the proposed project area lies within a Class I Aquifer Recharge Area. Coastal areas are likely underlain by brackish channeled groundwater (U.S. Department of the Interior [USDOI] 2008).

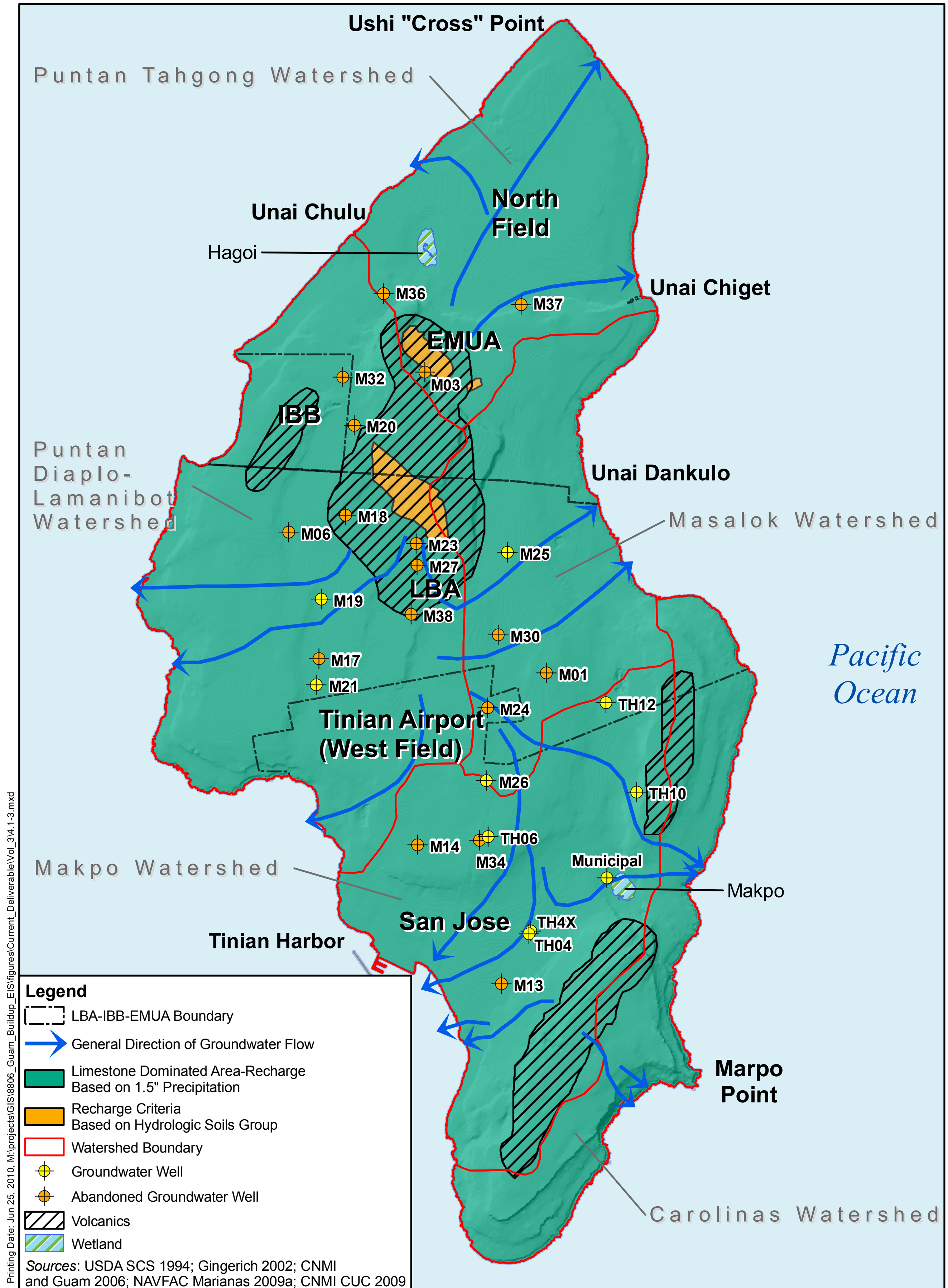


Figure 4.1-3
Groundwater Resources

Groundwater Quality

The potential for high chloride levels resulting from saltwater intrusion into the freshwater lens due to excessive pumping of the freshwater aquifer is of concern on Tinian. While it is not currently a problem, it may be in the future if groundwater pumping rates exceed the sustainable yield of the aquifer. The two "Maui Type" municipal wells draw water from an aquifer located beneath the Makpo Wetland. This groundwater is considered to be under the direct influence of surface water and thus it must meet the same drinking water treatment technologies standards as surface water (Bearden et al. 2004, 2008).

Groundwater aquifers on Tinian are also vulnerable to contamination by substances introduced onto the soil surface because the thin soils and underlying permeable limestone does not significantly impede the passage of contaminants to the shallow aquifer.

Federal Regulations

Safe Drinking Water Act

The Safe Drinking Water Act regulates the nation's drinking water supplies by establishing standards for drinking water to protect against both naturally–occurring and man-made contaminants. This act also seeks to prevent contamination of drinking water resources by establishing requirements under programs such as the underground injection control program. This relates directly to groundwater resources on Tinian since this resource provides a majority of the drinking water.

Groundwater Rule

The Groundwater Rule (40 Code of Federal Regulations [CFR] Parts 9, 141 and 142) provides for increased protection against microbial contamination. This is a risk based rule that mandates groundwater in the public drinking water system be disinfected if indicator bacteria are detected in this water.

Technical Standards and Corrective Action Requirements for Owners and Operator of Underground Storage Tanks

This regulation (40 CFR Chapter 1, Part 280) protects groundwater by establishing regulations and procedures for underground storage tanks that contain regulated substances such as petroleum products. Owners and operators are required to take specific action when investigating releases from their tanks.

Local Regulations

CNMI Drinking Water Regulations

The Drinking Water Regulations establish standards for drinking water to protect against both naturally–occurring and man-made contaminants. These regulations sets forth testing requirements and standards required to ensure groundwater does not pose a risk to human health. This relates directly to groundwater resources on Tinian since this resource provides a majority of the drinking water.

CNMI Well Drilling and Well Operation Regulations

The CNMI Well Drilling and Well Operation Regulations establish well-related regulations to ensure the long-term availability of reliable and potable groundwater to the public.

CNMI Water Quality Standards

The CNMI Water Quality Standards establish standards for all of CNMI's waters, including groundwater. These standards promulgate procedures to follow when disposing of wastewater over groundwater recharges zones. Primary recharge zones are areas that contribute recharge to groundwater capable of supplying water to public water supply; are areas with an active or future public water supply well field; discharge water to a stream or spring in sufficient quantity to support a public water supply, or are 400 ft (122 m) up gradient or 200 ft (61 m) down gradient from a public supply well. A secondary recharge zone overlies groundwater with a total dissolved solids concentration less than 500 parts per million that is currently capable of transmitting quantities of water sufficient to support a public water supply well.

Underground and Aboveground Storage Tank Regulations

This regulation (Northern Mariana Islands Administrative Code Chapter 65-100) protects groundwater by establishing a system of control and enforcement over the permitting installation, compliance use, and monitoring for underground and aboveground storage tanks that contain regulated substances such as petroleum products. Owners and operators are required to take specific action when investigating releases for their tanks.

Wastewater Treatment and Disposal Rules and Regulations

This regulation (Northern Mariana Islands Administrative Code Chapter 65-120) protects groundwater by establishing regulations and procedures for treatment and disposal of wastewater, in particular, wastewater that is discharged from individual wastewater systems.

4.1.2.3 Nearshore Waters

Definition

Nearshore waters of Tinian are defined as those areas under the jurisdiction of the CNMI Coastal Resources Management Program. This includes all areas extending seaward to the extent of the territorial waters (§ 1513 of the CNMI Coastal Resources Management Act).

Oceanography

Tinian is one of the 15 islands of the Mariana Archipelago. The Philippine Sea borders its western shores and the Pacific Ocean the east. The island is located on the frontal, southern arc and is capped or surrounded by limestone terraces. The majority of shoreline consists of low to high limestone cliffs with sea-level caverns, cuts, notches and or slumped boulders, commonly bordered by intertidal benches (Kolinski 2001).

The north, east, and south coasts of Tinian have very limited fringing or apron reef development that is most conspicuous at Unai Dankulo. Submarine topography appears mainly characterized by limestone pavement with interspersed coral colonies and occasional zones of submerged boulders. Coral reef development is more prevalent at various west coast locations, with fringing coral reef habitats present inside Lamanibot and Peipeinigul Bays, and a patch and small barrier reef system (altered as a breakwater for the harbor) located within the Tinian Harbor area (Kolinski 2001).

The water column of the Mariana Islands contains a well-mixed surface layer ranging from approximately 300 to 410 ft (90 to 125 m). Immediately below the mixed layer is a rapid decline in temperature to the cold deeper waters.

Nearshore Water Quality

The CNMI has two classifications (AA and A) for marine water use. The majority of the coastal marine waters are Class AA, meaning that these waters should remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-related source or actions. The uses protected in these waters are the support and propagation of marine life, conservation of coral reefs and wilderness areas, oceanographic research, and aesthetic enjoyment and compatible recreation inclusive of whole body contact (e.g. swimming and snorkeling) and related activities. Class A waters are protected for their recreational use and aesthetic enjoyment; other uses are allowed as long as they are compatible with the protection and propagation of fish, shellfish, and wildlife, and recreation in and on these waters of a limited body contact nature (Bearden et. al. 2004).

All the nearshore waters surrounding Tinian are designated Class AA, except for the nearshore waters of San Jose Harbor that are designated Class A. Sewage outfalls, sewer collection overflows, sedimentation from unpaved roads and development, urban runoff, reverse osmosis discharges, and nutrients from golf courses and agriculture are the most significant stressors on the CNMI’s marine water quality (Bearden et. al. 2004).

Only one nearshore area on Tinian, Unai Chulu, did not support its designated use classification due to exceedances in enterococci bacteria violations. This beach is classified as being only partially supportive of its designated uses (Bearden et. al. 2004). Orthophosphate levels exceeded the water quality standards at all tested water bodies on Tinian (Bearden et. al. 2004).

Federal Regulations

CWA or Federal Water Pollution Control Act

The purpose of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Under Section 404 of the CWA the U.S. Army Corps of Engineers (USACE) has regulatory jurisdictions over the discharge of dredged or fill material into waters of the U.S., including wetlands.

Coastal Zone Management Act and Amendments

The Coastal Zone Management Act establishes a federal-state partnership to provide for the comprehensive management of coastal resources. Coastal states and territories develop management programs based on enforceable policies and mechanisms to balance resource protection and coastal development needs.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act ensures that water resources development programs must consider wildlife conservation. Under this act, federal agencies proposing actions, including issuance of permits, that would affect any body of water, must consult with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the affected state or territory's fish and wildlife management agency.

Merchant Marine Act

This law empowers the Maritime Administration to investigate causes of congestion at ports; to investigate the practicability and advantage of harbor, river, and port improvements in connection with foreign and coastwise trade; and to investigate any other matter that may tend to promote use by vessels of ports.

Rivers and Harbors Act

The original purpose of the Rivers and Harbor Act (RHA) was to establish the federal interest in interstate navigation. Section 10 of the RHA requires approval from the USACE prior to undertaking any work with the potential to affect the course, capacity, use, or quality of navigable waters.

Water Resources Development Act

Dredging projects are authorized by Congress through the Water Resources Development Act that is reauthorized biennially. Water Resources Development Act 86 introduced cost sharing for construction projects whereby the local sponsor pays between 20 and 60% of the construction cost based on the depth of the navigation channel. The Water Resources Development Act cost sharing provisions apply to federal dredging projects implemented by the USACE Civil Works Program, and are not applicable to dredging undertaken by other agencies.

Local Regulations

The CNMI DEQ is the administrative authority for CWA Section 401 Water Quality Certifications required for validation of CWA Section 404, Rivers and Harbors Act (RHA) Section 10. CNMI coastal waters are divided into Class A and Class AA waters by CNMI DEQ. Water quality criteria specific to Class AA and Class A waters are presented in Table 4.1-1 (USDOI 2008). Class A waters are designated for recreational purposes and aesthetic enjoyment and are to be protected. Any use shall be allowed as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife. Class A waters shall be kept clean of solid waste, oil and grease, and shall not act as receiving waters for any effluent that has not received the best degree of treatment or control practicable under existing technology and economic conditions and compatible with standards established for this class. A mixing zone is approvable in Class A waters (Bearden et. al. 2004).

Table 4.1-1. Specific Water Quality Criteria for Class AA and Class A

Parameter	*Unit*	*Class AA*	*Class A*
Total Nitrogen	mg/L	0.4	0.75
Nitrate-Nitrogen	mg/L	0.20	0.50
Ammonia (un-ionized)	mg/L	0.02	0.02
Total Phosphorous	mg/L	0.025	0.05
Orthophosphate	mg/L	0.025	0.05
Fecal Coliform	CFU per 100 ml	200[a]	200[a]
Enterococci	Per 100 ml	35[b]	35[c]
Dissolved Oxygen	% saturation	$\geq$ 75%	$\geq$ 75%
TSS	mg/L	5[d]	40[d]
Turbidity [a]	NTU	0.5	1.0
Temperature[e]	°C	1.0	1.0
pH	-	7.6 – 8.6	7.6 – 8.6

Legend: °C= degrees Celsius; ml= million liters; CFU= Colony Forming Units; NTU =nephelometric turbidity units
Notes: [a] Fecal coliform concentration shall not exceed a geometric mean of 200 CFU per 100 ml based on samples taken over a 30-day period nor shall any single sample exceed 400 CFU per 100 ml at any time.
[b] Enterococci concentration shall not exceed a geometric mean of 35 per 100 ml based on samples taken over a 30-day period nor shall any single sample exceed 104 per 100 ml at any time.
[c] Enterococci concentration shall not exceed a geometric mean of 35 per 100 ml based on samples taken over a 30-day period nor shall any single sample exceed 276 per 100 ml at any time.
[d] Concentrations of suspended matter shall not be increased from ambient conditions at any time, and should not exceed the criteria when due to natural conditions.
[e] Shall not exceed ambient more than stated value.
Source: Bearden et. al. 2004.

Class AA waters should remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-related source or actions. To the extent practicable, the wilderness character of such areas must be protected as well as for the support and propagation of shellfish and other marine life, conservation of coral reefs and wilderness areas, oceanographic research, and aesthetic enjoyment and compatible recreation with risk of water ingestion by people. Mixing zones for dredging and the discharge of dredged or fill material may be permitted in Class AA waters; mixing zones for any other discharge are not permitted.

4.1.2.4 Wetlands

Definition

Wetlands are habitats that are subject to permanent or periodic inundation or prolonged soil saturation including marshes, swamps, and similar areas. The recurrent excess of water in wetlands imposes controlling influences on all biota (plants, animals, and microbes). Areas described and mapped as wetland communities may also contain small streams or shallow ponds or pond or lake edges.

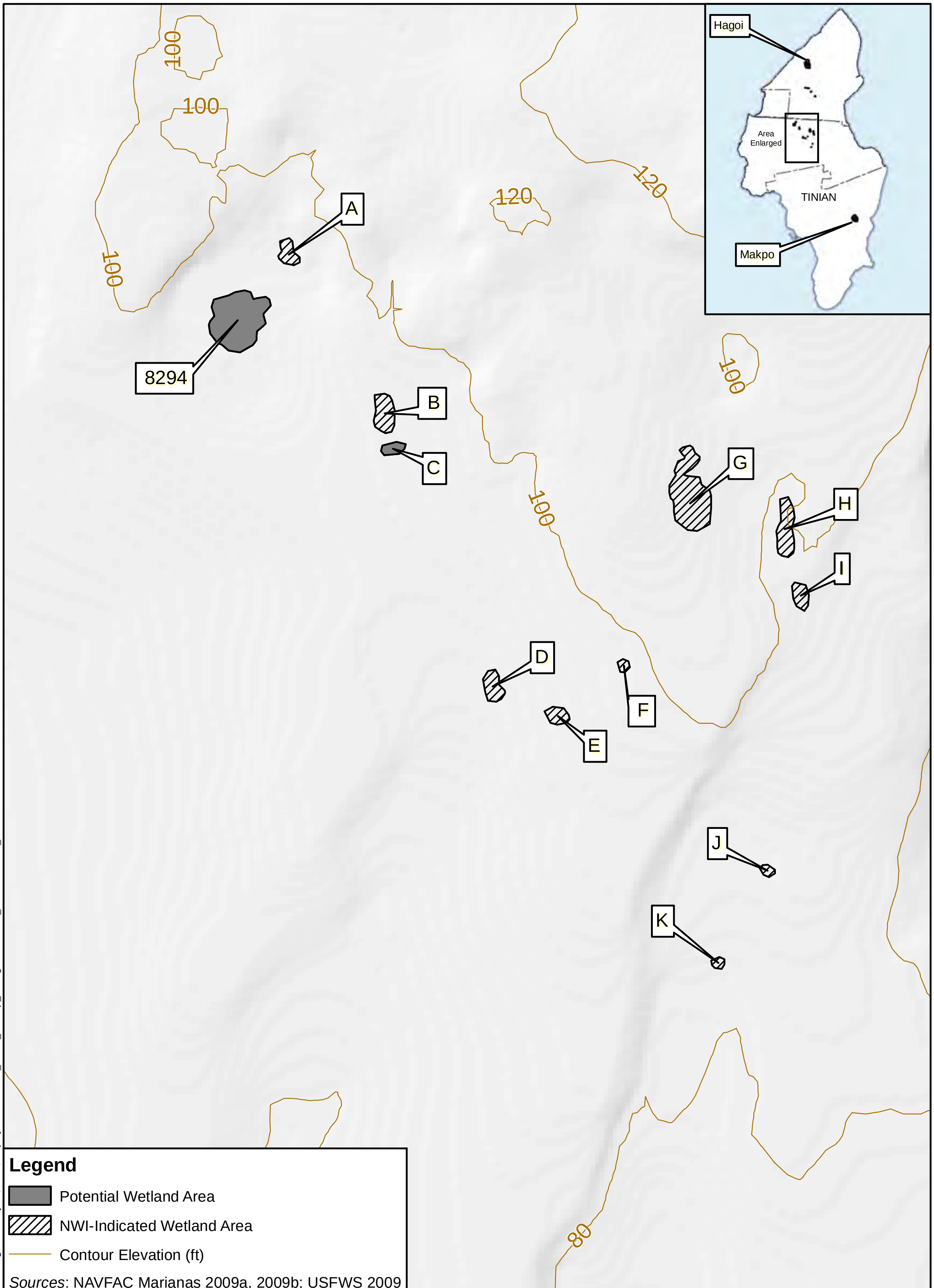
Marshes are generally located in low places along the coast, along streams, in depressions and sinkholes with argillaceous (of or resembling clay) limestone, or in poorly drained areas with volcanic soils. Marshes may be inundated with freshwater or brackish water if near the ocean. Swamps are generally located along rivers, especially near the coast or near sea level along river valleys if inland, and are usually designated as ravine communities rather than as wetland communities.

Wetlands are considered waters of the U.S. under the CWA. Impacts to jurisdictional wetlands as well as waters of the U.S. require permitting from the USACE; the USACE issues permits for the discharge of dredged or fill material to jurisdictional wetlands or waters of the U.S. under Section 404 of the CWA.

Wetland Areas and Quality

The limestone plateaus of Tinian are generally far too porous to support stream or wetland development. Thus, the few wetlands on Tinian constitute discrete areas where impermeable materials such as clay impounds rainwater and are entirely dependent on direct precipitation as a water source. No mangrove or coastal wetlands are found on Tinian as the entire shoreline is either limestone cliffs and blocks or sand beach. The two largest wetland areas, Hagoi and Makpo, are located in the Northern Lowland and Median Valley, respectively (NAVFAC Marianas 2009a). These are the only two wetland areas identified in a wetland assessment completed in 1977 (University of Guam 1977).

Hagoi (which means “lake” in Chamorro) is a 38.5 ac (15.5 ha) marsh wetland with areas of open water located within the Exclusive Military Use Area approximately 2.5 mi (4 km) north of the project area. It is classified as palustrine, emergent herbaceous wetland, water persistent but intermittently exposed and brackish or mixohaline. Hagoi is situated either on an impervious layer or over a perched water table. As the basin fills in with sediment, the open water of the lake is slowly transforming to a marsh with a more or less complete covering of emergent vegetation (NAVFAC Marianas 2009a). Hagoi is dependent entirely on direct precipitation as a water sources; in periods of drought the water level drops and the coverage of open water dramatically decreases (NAVFAC Pacific 2004). The Makpo wetland area is an approximately 28 ac (11.33 ha) wetland located east of the village of San Jose, approximately 3.0 mi (4.9 km) south southeast of the project area (NAVFAC Marianas 2007a). The Makpo wetland area once supported open water, but municipal groundwater pumping significantly altered the water levels (NAVFAC Marianas 2004). As shown on Figure 4.1-4, both of these wetland areas are located well north and south of the project area, respectively.



Printing Date: May 14, 2009, M:\projects\GIS\8806_Guam_Buildup_EIS\figures\Current_Deliverable\Vol_3\4.1-4.mxd

Figure 4.1-4
Potential Wetland and NWI-Indicated Wetland Areas

Feet 0 500 1,000
Meters 0 100 200

N W E S

In 2007, a wetland survey evaluated several of the 12 National Wetland Inventory (NWI)-indicated wetland areas in and around the project area using satellite data verified by field inspections (refer to Figure 4.1-4). These 12 NWI-indicated wetland areas are traditionally and collectively referred to as the "Bateha Area" (NAVFAC Marianas 2009a). The "Bateha Wetlands" are been historically described as broad depressions or "moats" that have evolved as eroded clay and silt from the upland volcanic rock have filled depressions in limestone bedrock (NAVFAC Marianas 1997). These areas are considered ephemeral because they are not large enough to sustain periods of low rainfall (NAVFAC Marianas 2004); the 1997 INRMP classified these areas as palustrine system (temporarily flooded), emergent wetland class, and non-persistent (NAVFAC Marianas 1997).

The majority of the NWI-indicated wetland areas are located in an area formerly used for farming (and with some evidence of either continuing or recently abandoned occupation). There is no or minimal evidence of distinguishable hydrology; that is, while the areas may be distinguishable from surrounding area by vegetation, they appear not to represent depressions that would accumulate runoff, even temporarily.

To verify the NWI-indicated wetland areas and findings of the 2007 survey (NAVFAC Marianas 2009a), and previous studies, a biologist conducted a field investigation of several of these areas in September 2009 (NAVFAC Marianas 2009b). Table 4.1-2 summarizes the NWI-indicated wetland areas in and near the project area based on available data (NAVFAC 2009a, b; USFWS 2009). The following paragraphs described the areas and their potential wetland status.

Table 4.1-2. NWI-Indicated Wetland Areas in the Tinian Project Area

Area	*Size (ac/ha)*
8294	3.5/1.41[a]
A	0.5/0.20
B	0.9/0.36
C	0.3/0.12[a]
D	0.6/0.24
E	0.4/0.16
F	0.1/0.04
G	3.0/1.21
H	1.1/0.44
I	0.5/0.20
J	0.2/0.08
K	0.2/0.08

Legend: [a] = potential jurisdictional wetland.
Sources: NAVFAC Marianas 2009a, 2009b; USFWS 2009.

Water accumulates at Area 8294, although not for very long periods; outflow is via seepage into the ground. Wetland indicators (soil and vegetation) are weak, but perhaps sufficient to claim wetland status as the flooding appears to control the vegetation (NAVFAC Marianas 2009a). Area A was not investigated in September 2009 (NAVFAC Marianas 2009b).While Area 8294 has not been evaluated by the USACE for jurisdictional status, for the purposes of this analysis, it is considered to be a potential jurisdictional wetland, and is treated as such in the following impact analysis.

Areas B and D - G were field investigated by a biologist in September 2009 shortly after a major rain event (NAVFAC Marianas 2009b). Areas D, E and F were old farm fields and had no hydrology, plants, or hydric soils. Areas B, G, and H had identical conditions as D, E, and F and were also most likely farmed in the past. Areas A, I, J, and K were not investigated in September 2009; however, based on their location and the findings of the field evaluation for adjacent areas, these NWI-indicated wetland areas are likely not wetlands. The underlying factor appears to be that none of these NWI-indicated areas (Areas A-B and D-K) are sufficiently permanent, primarily due to the underlying porous limestone geology of Tinian.

Area C was also investigated by the same biologist in September 2009 (NAVFAC Marianas 2009b). Area C is a large sink-hole type area. The land in the area slopes gently towards it from all directions and the last few meters are steep, descending into the pan. At the time of the investigation, it had a few inches of water in the pan. No hydric soils were observed; however, if one were to dig in the center of the area, where the water is deepest, it is likely one would find hydric soils at depth. There were no facultative obligate wetland plant species, possibly because the area is totally surrounded by bamboo, even into higher areas of the pan (NAVFAC Marianas 2009b). While Area C has not been evaluated by the USACE for jurisdictional status, for the purpose of this analysis, Area C is considered to be a potential jurisdictional wetland and is treated as such in the following impact analysis.

There are 12 NWI-indicated wetland areas in and adjacent to the project area (refer to Figure 4.1-4). Based on recent field investigations and a consideration for prior investigations, only the 3.5 ac (1.41 ha) Area 8294 and the 0.3 ac (0.12 ha) Area C are wetland areas. Areas 8294 and C are classified as palustrine, non-persistent emergent herbaceous vegetation, intermittently flooded.

Wetlands on Tinian are subject to siltation that can reduce their size and functionality. In addition, wetlands are threatened by groundwater wells located adjacent to wetlands and the use of the wetlands for aquaculture in some areas (Scott 1993). Of note, groundwater pumping wells located adjacent to the Makpo wetland area present a threat to the wetland area when pumping occurs during dry periods (NAVFAC Marianas 2009a).

<u>Federal Regulations</u>

Federal Water Pollution Control Act (CWA 33 U.S. Code [USC] §1251 et seq.)

Regulates dredging and filling of wetlands and establishes procedures for identifying and regulating nonpoint sources of polluted discharge into waterways. Actions require federal consistency with State Nonpoint Source Pollution Control Plans.

Statement of Procedures on Floodplain Management and Wetlands Protection; 40 CFR Part 6, Appendix A

These procedures set forth USEPA policy and guidance for carrying out Executive Order 11990 and 11988.

Endangered Species Act (ESA), 16 USC §1531 et seq.; 50 CFR Parts 17, Subpart I, and 50 CFR Part 402

The ESA of 1973 and subsequent amendments provide for the conservation of threatened and endangered species of animals and plants, and the habitats that they are found. The act requires federal agencies, in consultation with the Secretary of the Interior, to verify that any agency supported action is not likely to jeopardize the continued existence of any endangered or threatened species or its critical habitat, or result in the destruction or adverse modification of a critical habitat of such species. Exemptions may be granted by the Endangered Species Committee.

Fish and Wildlife Coordination Act (16 USC § 662)

The Fish and Wildlife Coordination Act requires consideration of the effects of a proposed action on wetlands and areas affecting streams (including floodplains), as well as other protected habitats. Federal agencies must consult with the U.S. Fish and Wildlife Service and the appropriate state agency with jurisdiction over wildlife resources prior to issuing permits or undertaking actions involving the modification of any body of water (including impoundment, diversion, deepening, or otherwise controlled or modified for any purpose). The requirements of this act are applicable for alternatives involving remediation activities in wetlands or floodplains.

National Wildlife Refuge System Administration Act of 1966 (16 USC §§ 668dd-668ee)

The Act provides for the administration and management of the national wildlife refuge system, including wildlife refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, game ranges, wildlife management areas and waterfowl production areas.

4.2 ENVIRONMENTAL CONSEQUENCES

This chapter contains the discussion of the potential environmental consequences associated with implementation of the alternatives within the region of influence (ROI) for water resources. For a description of the affected environment, refer to Section 4.1.

4.2.1 Approach to Analysis

4.2.1.1 Methodology

The environmental consequences of each alternative and the no-action alternative are presented in this section. Available data and literature were used to assess existing conditions and to establish a baseline for the assessment, as described in the Affected Environment section (Section 4.1). The methodology for identifying, evaluating, and mitigating impacts to water resources has been established based on federal and local laws and regulations as described in Section 4.1.

The environmental consequences evaluation for water resources includes a qualitative and quantitative analysis of surface water, groundwater, nearshore waters, and wetlands to the extent possible given available project data. Environmental impact assessments were made and compared to baseline conditions, items of public concern, and significance criteria to determine the magnitude of potential impacts to water resources.

The proposed action analysis is separated into two main activities: construction and operation (consisting of non-training and training operations). Each of these activities has potential impacts to water resources. The analysis of potential impacts considers both direct and indirect impacts. Direct impacts are those that may occur during the construction phase of the project and cease when the project is complete or those that may occur as a result of project operations following the completion of construction. Indirect impacts are those that may occur as a result of the completed project or those that may occur during operations but not as a direct result of the construction or operational action.

Surface Water/Stormwater

Surface water issues include:

- Water quality
- Flooding
- Flow path alterations

Surface water quality impacts are evaluated by examining the potential increase of contamination, including chemicals, heavy metals, nutrients, and/or sediments in the surface water as a result of the proposed action. The analysis is performed by comparing existing water quality data with possible increases in water quality contaminants in the surface water. Potential impacts to surface water quantity and velocity are analyzed by examining changes in drainage volumes and patterns associated with the proposed action. For construction activities, some of the key effects include stormwater discharges that may contain elevated sediment concentrations, and spills and leaks of chemicals such as lubricants, fuels, or other construction materials that may increase pollutant loading into surface waters. In addition, direct construction or alteration of stream channels or reservoirs may cause increased contamination by sedimentation or chemical constituents.

For construction activities, some of the key effects include stormwater discharges that may contain elevated sediment concentrations and spills and leaks of chemicals such as lubricants, fuels, or other construction materials that may increase pollutant loading in the surface water. In addition, direct construction or alteration of stream channels or reservoirs may cause increased contamination by sedimentation or chemical constituents. If flow paths or patterns are altered, additional studies, such as instream flow analysis, would be conducted to ensure that human uses and/or biological services are preserved.

For non-training operation activities, effects include stormwater discharges that may increase the volume of sediment loading to the surface water and/or increase contaminants from vehicle maintenance, household discharge, privately-owned vehicles, and animal waste. Contamination of surface water from leaks or spills of hazardous, or otherwise regulated materials, is also a potential impact. Increased water use may reduce the water availability in the reservoirs and/or reduce instream flows. Increased impervious areas may increase the runoff and increase the potential for flooding. Development in the floodplain may result in potential damage from flooding. Diversion of water courses for municipal water consumption may impact the ecological services that the resource provides. Training operation activities include potential contaminants from range and course training activities. For example, vehicle traffic could result in an increase in runoff due to the removal of ground cover. The storage of hazardous materials and fuels poses a continued risk of contamination for surface water from leaks or spills.

<u>Groundwater</u>

Groundwater impact concerns include water quality and water quantity. Groundwater quality was assessed by examining the potential risk of a hazardous or regulated waste release, as well as approximating the amount of additional stormwater and associated non-point source pollution that enter the groundwater.

Groundwater quality was assessed by examining the potential risk of a hazardous or regulated waste release, as well as approximating the amount of additional stormwater and associated non-point source pollution that would enter the groundwater. Water availability is addressed in Volume 6, Chapter 3, Section 3.1.2.

Potential groundwater impacts associated with construction activities include spills, leaks, and sedimentation having direct impacts to stormwater runoff that can contribute to groundwater contamination, as well as to direct contamination of groundwater resources through percolation.

Potential impacts resulting from non-training operation activities include increases in impervious surfaces, waste generating activities, storage of potential contaminants, and landfill leaching. The direct impacts include an increase in polluted stormwater runoff and contamination from leaks or spills of hazardous or regulated materials. Indirect impacts include decreases in groundwater recharge from increased impervious areas and saltwater intrusion from increased aquifer pumping.

The effects related to training operations include contamination from expended training materials, discharges from latrines, and leaks or spills from hazardous materials. These training activities can pose both short-term and long-term effects.

Nearshore Water

The nearshore water impact analysis focuses on water quality. Recreational nearshore issues are addressed in Chapter 9, Recreational Resources. The potential increases of contamination of nearshore waters by chemicals, heavy metals, nutrients, and/or sediments as a result of the proposed action are assessed by comparing existing water quality data with the projected changes in water quality.

Potential impacts associated with construction activities include construction spills and leaks that may discharge to nearshore waters and an increase in stormwater discharge that may increase non-point source pollution.

Operations effects include potential non-point source from chemicals, nutrients, and/or sediments that may run off from bivouac sites. Training operation activity effects include direct contamination from training materials that are used and not recovered.

Wetlands

The wetland impacts of concern include:

- Pollutants
- Loss of area
- Loss of functionality

The potential for pollutants to impact a wetland is evaluated by examining the risk of hazardous materials leaking or spilling and their proximity to the wetlands. The loss of area is assessed by the total amount of delineated wetland area that would be directly removed either in loss of area or function as a result of the proposed action. The wetland functionality refers to the ability of the wetland to trap sediment and nutrients, receive and retain water, maintain wildlife habitat (both flora and fauna), and provide recreational uses. The impacts to wildlife habitat associated with wetlands are addressed in Chapter 10, Terrestrial Biological Resources.

For construction activities, the effects associated with activities in close proximity to any designated wetland or activities in the wetlands themselves are considered. Runoff from nearby construction sites may contain increased chemicals, heavy metals, nutrients, and/or sediment that could adversely affect those wetlands. Wetland impacts could result from changes in land uses and/or spills or leaks from construction operations and equipment. Loss of functionality can also occur if construction operations occur directly within the designated wetlands. Loss of wetland area would occur if the proposed action involves the direct removal of wetlands.

The effects associated with operations include an increase in potential spills and leaks from hazardous materials that may be stored in close proximity to designated wetlands. An indirect impact to existing wetlands may occur by altering (i.e., diverting or restricting) the surface water flowing into the wetlands. Indirect impacts to wetlands could also occur as a result of altered sedimentation of watercourses or drainage conveyances connected to wetland areas.

4.2.1.2 Determination of Significance

The following factors are considered in evaluating impacts to groundwater and surface waters:

- Long-term increased inundation, sedimentation, and/or damage to water resources in the ROI caused by project activities, including impervious surfacing that increases and/or diverts rainfall runoff and/or affects its collection and conveyance and implementation of mitigation measures.
- Depletion, recharge, or contamination of a usable groundwater aquifer for municipal, private, or agricultural purposes.
- Increases in soil settlement or ground swelling that damages structures, utilities, or other facilities caused by inundation and/or changes in groundwater levels.
- Noncompliance with applicable water quality standards, laws, and regulations.
- Increasing risk associated with environmental hazards or human health.
- Decreasing existing and/or future beneficial use.
- Reducing the amount of water or wetlands available for human use or ecological services.
- Reducing availability or accessibility of water resources.
- Long-term increased inundation, sedimentation, and/or damage to water resources.

If an activity is deemed to have an impact, the activity then can be evaluated to determine if the impact is significant or insignificant. For significant impacts, a determination is made as to whether they can be mitigated to less than significant impacts.

4.2.1.3 Issues Identified During Public Scoping Process

The following analysis focuses on the effects to water resources: surface water, groundwater, nearshore water, and wetlands that could be impacted by the proposed action. As part of the analysis, concerns relating to water resources that were identified by the public, including regulatory stakeholders, during the scoping meetings are addressed. These include:

- Describe water quality with respect to public health requirements, drinking water regulations, and applicable water quality standards.
- Estimate quality and quantity of storm water runoff to be generated by increased impervious surface, methods of contaminant removal, methods of runoff redirection to recharge the aquifer, and groundwater under the direct influence of surface water.
- Accidental or intentional contamination of groundwater.
- Capacity of water resources to meet agricultural needs.
- Stormwater management controls to prevent pollution during construction and subsequent operations.
- Construction and vegetation clearing that potentially cause runoff, pollute the beaches, and destroy marine life.
- Effects of training and dredging on sedimentation stress for the coral reefs and other marine life.
- Identify ways to monitor and mitigate indirect impacts from sediments on coral reefs.

4.2.2 Alternative 1 (Preferred Alternative)

The analysis of potential impacts to water quality under Alternative 1 focuses on proposed weapons firing training. This involves construction and operation of the proposed firing ranges as configured for the alternative.

4.2.2.1 Tinian

Construction

Surface Water/Stormwater

Under Alternative 1, proposed firing range and supporting areas (parking areas, roads, and bivouac areas) construction activities would result in the potential for a temporary increase in stormwater runoff, erosion, and sedimentation. To minimize these potential temporary increases in stormwater runoff, erosion, and sedimentation, an EPA Construction General Permit (CGP) would be obtained and a Storm Water Pollution Prevention Plan (SWPPP) would be prepared and implemented. The SWPPP would identify construction-specific Best Management Practices (BMPs) (Volume 2, Chapter 4, Table 4.2-1) would be implemented as part of Alternative 1 to reduce the potential for erosion, runoff, sedimentation, and subsequent water quality impacts. Furthermore, an Earthmoving and Erosion Control Permit would be obtained from CNMI DEQ for any type of mechanized earthmoving activities.

No buildings/structures would be constructed in the 100-year flood zone. Therefore, construction activities associated with Alternative 1 would result in less than significant impacts to surface water.

Groundwater

Under Alternative 1, range construction activities would include surface water protection measures (identified above) that would also serve to protect groundwater quality. By adhering to the provisions of the CGP and implementing BMPs associated with addressing site- and activity-specific water resource protection needs, there would be a reduction in stormwater pollutant loading potential and thus a reduction in pollution loading potential to the underlying groundwater subbasins. Therefore, construction activities associated with Alternative 1 would result in less than significant impacts to groundwater.

Nearshore Waters

Range construction activities associated with Alternative 1 would occur more than 1 mile (mi) (1.6 km) from the coastline. As a result, construction activities would not result in direct impacts to the nearshore water. However, by adhering to the provisions of the CGP and implementing BMPs associated with addressing site- and activity-specific water resource protection needs, pollutant loading to surface runoff would be reduced and potential indirect impacts to nearshore waters would be subsequently lessened. Therefore, construction activities associated with Alternative 1 would result in less than significant impacts to nearshore waters.

Wetlands

The Hagoi and Makpo Wetlands are located 2.5 mi (4 km) north and 3.0 mi (4.9 km) south, respectively of the project area associated with Alternative 1; these wetlands would not be impacted. Area 8294 is located approximately 1,000 ft (305 m) west of the proposed Platoon Battle Course (Figure 4.2-1); no direct impacts would occur. As Area 8294 is located up-gradient from the proposed range footprints, no indirect impacts to this wetland area would occur during construction. As shown on Figure 4.2-1, there is one potential wetland area (Area C) located within the initial Platoon Battle Course footprint. Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to Area C. In addition, to minimize potential indirect impacts to Area C during construction, the Marine Corps would implement site-specific BMPs as necessary (depending on the final design location with respect to Area C). Therefore, Alternative 1 would result in less than significant impacts to wetlands.

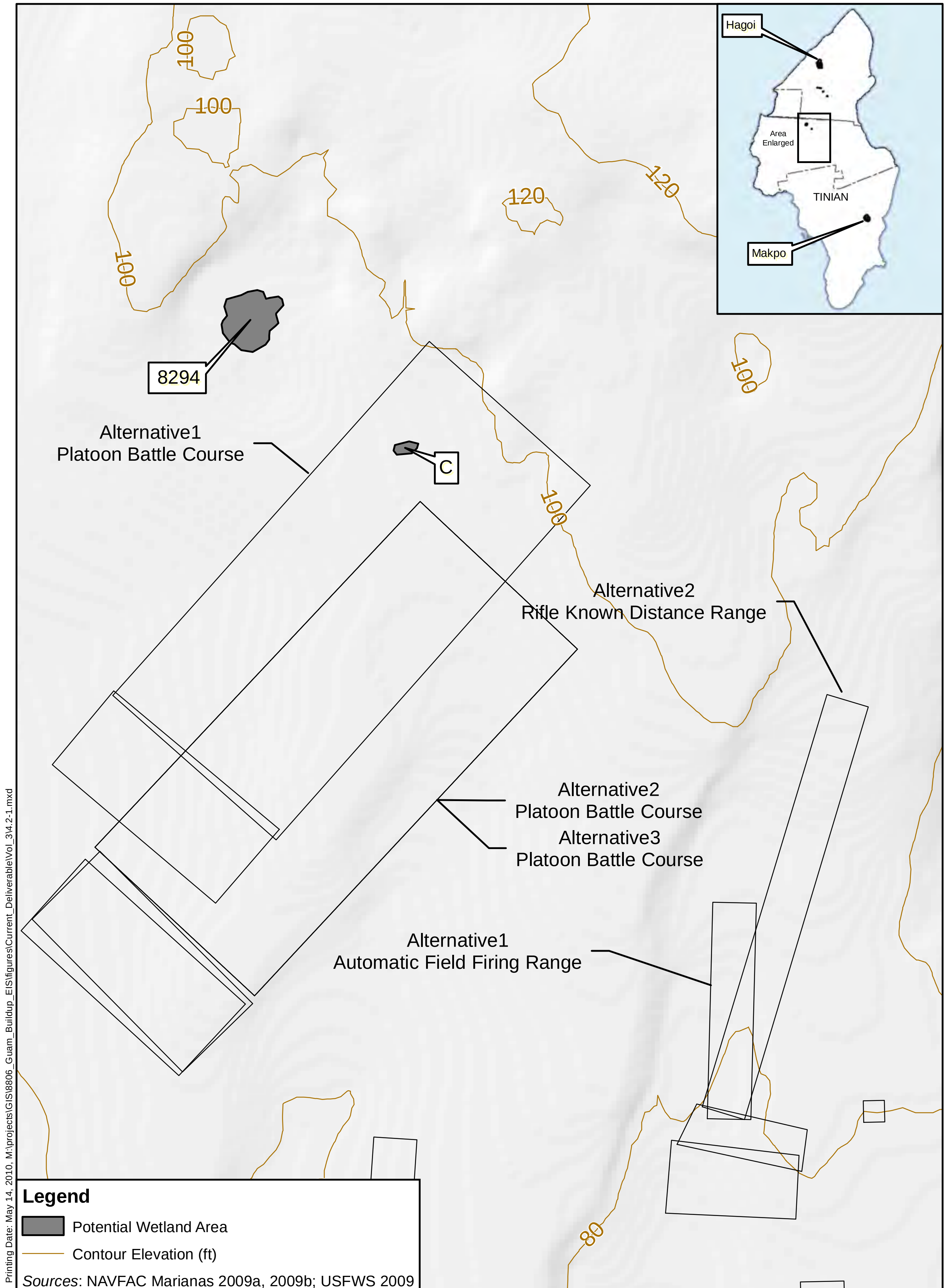


Figure 4.2-1
Potential Wetland Areas and Range Footprints, All Alternatives

Operation

Surface Water/Stormwater

The operational phase would result in a minor increase in the area of impervious surface as a result of new range training buildings and courses that would result in an associated relatively minor increase in stormwater discharge intensities and volume. However, stormwater infrastructure included as part of the proposed action would incorporate Low Impact Development (LID) measures and BMPs to ensure that stormwater retention would be consistent with local and federal requirements, and thus minimizing potential impacts to surface water quality. Stormwater flow paths would continue to mimic area topography.

To address this potential increase in stormwater runoff, Alternative 1 would incorporate the concept of LID in the final planning, design, and permitting of the ranges and courses. The goals of LID are to closely match the post-development topography and stormwater runoff hydrology to the pre-development status. The intent of LID is to control non-point source runoff through the implementation of plant-soil-water and man-made (where appropriate) mechanisms that protect and sustain the ecological integrity of the receiving water bodies and wetlands. LID technologies are well suited to reduce stormwater runoff loadings for a variety of potential contaminants including sediment, nutrients, and heavy metals. LID practices at the planning level are in conformance with USEPA non-structural Pollution Prevention strategies. The range-specific LID measures for Tinian would reduce stormwater runoff using a combination of retention devices and vegetation. For example, grassy vegetation would be maintained on berms to help reduce erosion and minimize stormwater runoff, thereby reducing the potential for negative water quality impacts. With the implementation of LID measures such as these to reduce runoff volume and stormwater pollutants, no impacts are anticipated.

Proposed range training activities would have the potential to release contaminants into receiving waters. To minimize these potential impacts, Alternative 1 would be implemented in accordance with all applicable orders, laws, and regulations, including preparation of and compliance with an SWPPP, Stormwater Management Plan, and Spill Prevention, Control, and Countermeasure Plan that would minimize potential water quality impacts from runoff, leaks, spills, and range training activities. For example, munitions expended at the ranges would be entrapped in soil impact berms that would be maintained to remove expended rounds from the soil. The rounds would be removed and transported for recycling, and the soils would be returned to the range. A monitoring program would be implemented to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts. Thus, implementation of these range-specific water quality protective measures would minimize potential impacts of runoff, spills, leaks, and training activities to water resources.

Implementation of Alternative 1 would be in compliance with all federal, local, and military orders, laws, and regulations, including COMNAV Marianas Instruction 3500.4 (refer to Volume 8, Chapter 3). In addition, BMPs, LID, and monitoring would be part of the implementation plan. Regulatory compliance and implementation of protective measures and plans would minimize potential impacts to surface water resources. Therefore, operations associated with Alternative 1 would result in less than significant impacts to surface water.

Groundwater

Implementation of Alternative 1 would not increase groundwater pumping rates. The proposed range locations generally lie over groundwater in the low permeability pyroclastic rocks and the Toagpochau Limestone. Figure 4.2.2 shows the proposed range locations, the production wells and abandoned wells in the area, the low permeability zones, and the groundwater flow lines as modeled by Gingerich (2002). Generally, groundwater would flow radially out from the major low permeability zones, around any minor low permeability zones, then toward the coast. Groundwater can carry leachate from the low permeability zones to the Marianas Limestone. Based on the general groundwater flow pattern, production wells M19 and M25 would be the wells closest to the ranges. Abandoned well M23 is near a live fire range proposed under this alternative. If improperly abandoned the well could provide a preferential flow path for runoff from the range.

Proposed range training operations have the potential to leach ammunition to groundwater. The primary contaminant of concern is lead. A combination of natural geology and implementation of BMPs can minimize the risk. It is recognized that any leachate reaching the water table is undesirable. Military Handbook 1027/3B contains procedures for reducing potential impacts from ranges through the implementation of BMPs. These include adding soil amendments to maintain the soil pH between 6 and 8, maintaining vegetation on berms and drainage ways and turf on the range, contaminant monitoring, and reclamation and recycling of spent ammunition. To minimize the potential for groundwater leachate to affect the production wells, proposed range maintenance activities and training operations would be in compliance with water protection measures and Military Handbook 1027/3B (NAVFAC 1992). These would include the same measures that are described in the Surface Water/Stormwater section such as removal of expended rounds to the extent practicable, diverting any runoff to on-site vegetated detention basins, and other measures that include not using nitrate fertilizers, and removal of dead or dying vegetation.

Prior to establishment of the proposed training ranges, a range management plan would be created and updated every 5 years in accordance with DD 4715.11. The plan would address long-term sustainable use, hydrology and hydrogeology, management procedures, record keeping, standards, monitoring, public outreach and public participation programs, technology requirements for sustainable range management, and integration with other installation planning processes and resources.

In addition, a monitoring program would be implemented as part of Alternative 1 to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts. This monitoring would be conducted in accordance with Military Handbook 1027/3B (NAVFAC 1992). Established procedures would be followed for identifying contaminant levels above action thresholds. Procedures would include testing pH of soils to ensure it stays within the acceptable range and sampling soil at a depth from below the root zone to detect the presence of lead leachate. A soil sample that has a lead concentration greater than the USEPA Region 9 Preliminary Remediation Goal of 800 mg/kg would indicate a problem severe enough to warrant a proactive approach. This could include adding lead stabilization soil amendments such as phosphate to immobilize the lead or a more aggressive lead removal action (e.g., direct removal of lead fragments). The use of phosphate soil amendments will necessitate increased frequency of soil pH testing.

Wastewater from personnel using the ranges would be collected in portable sanitary facilities provided and maintained by a contractor. This contract would require that collected wastewater be disposed of in compliance with both local and federal regulations and such compliance be monitored by DoD inspectors. The preferred method of disposal would be the use of an existing DoD septic tank and leach field system (Figure 4.2-2).

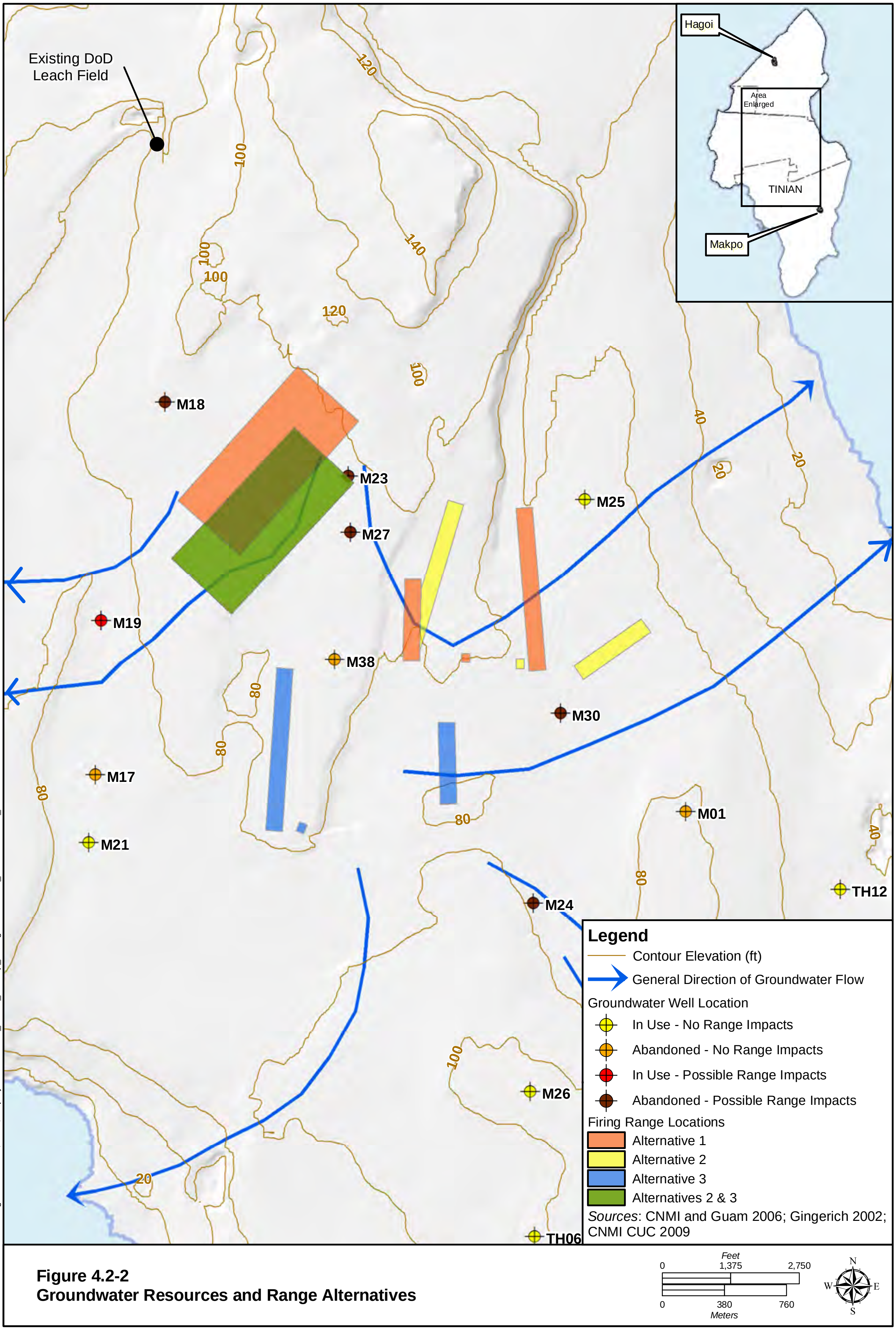


Figure 4.2-2
Groundwater Resources and Range Alternatives

To prevent deodorizing and disinfecting chemicals from interfering with the natural degradation processes, DoD would use leach field friendly odor chemicals (refer to Section 15.2.2.1 for more detail on wastewater disposal). DoD would do further research and contact other agencies to identify a nontoxic, non-hazardous, and biodegradable disinfectant that is more environmentally friendly and less taxing on waste water treatment systems. The location of the existing septic tank and leach field system is not near any production wells. The low through flow (2,000 gallons per day [7,529 liters per day] for 12 to 16 weeks per year), primary treatment by the septic system, and high dilution rate once the leach field effluent reaches the water table would result in less than significant impact to groundwater. Therefore, operations associated with Alternative 1 would result in less than significant impacts to groundwater.

Nearshore Waters

While alterations to the watershed have the potential to result in indirect impacts that could alter the nearshore water quality, these potential effects would be minimized by complying with all applicable orders, laws and regulations presented in Volume 8, Chapter 3, Section 3.1. In addition, the aforementioned training surface water resource protection measures would minimize potential indirect impacts to nearshore waters. Therefore, operations associated with Alternative 1 would result in less than significant impacts to nearshore water.

Wetlands

No direct impacts to the wetland areas are anticipated as no wetland areas would be located within the proposed ranges or courses. Range operations would not alter surface water flow to wetland areas as wetland areas are located at higher elevations than the proposed ranges (i.e., any changes to surface hydrology would occur down-gradient from wetland areas) (refer to Figure 4.2-1) and, direct precipitation is the water source for wetlands on Tinian. In addition, due to the underlying porous limestone and siting of ranges down-gradient from the potential wetland areas, any residual lead or other potential range contaminants would not reach wetland areas via stormwater runoff. There is a possibility of an expended round landing in Areas 8294 or C as they are located within the Surface Danger Zone (SDZ) associated with each of the ranges. Assuming that 0.01% of ammunition falls outside the range and in the SDZ, the estimated number of bullets is approximately 328 over the course of a year. Only a portion of these rounds would potentially enter the wetland, as Areas 8294 and C (4.0 ac [1.6 ha]) are only a small fraction of the 3,700-ac (1,500-ha) area of the proposed SDZ. Therefore, the number of rounds that would enter the wetland would be minimal, so it is unlikely that these rounds would negatively impact the wetland functionality. Therefore, operations associated with Alternative 1 would result in less than significant impacts to wetlands.

4.2.2.2 Summary of Alternative 1 Impacts

Table 4.2-1 summarizes the potential construction and operational impacts associated with implementation of Alternative 1.

Table 4.2-1. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	SW: Temporary increase in stormwater runoff, erosion, and sedimentation GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: Less than significant impacts
	Operation	SW: Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: Minor increase in pollutant loading potential from expended rounds

Legend: SW = Surface water/stormwater, GW = Groundwater, NW = Nearshore waters, WL = Wetlands.

Under Alternative 1, there would be no reduction in the amount of wetlands on Tinian, and there would be no reduction in the availability or accessibility of water resources. There is one potential wetland area (Area C) located within the initial Platoon Battle Course footprint. Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to Area C. Increases in stormwater would be managed by site-specific BMPs in accordance with the SWPPP and LID measures, stormwater flow paths would continue to mimic area topography, range operations and maintenance activities would not alter surface water flow to wetland areas, and no buildings/structures would be constructed in the 100-year flood zone; therefore, there would be no increase in flooding risk. To minimize the potential for groundwater leachate to affect production wells, proposed range maintenance activities and training operations would be in compliance with water protection measures and Military Handbook 1027/3B (NAVFAC 1992). In addition, a monitoring program would be implemented as part of Alternative 1 to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts.

Through the development and implementation of site specific BMPs and LID measures appropriate for site conditions, as well as range and course-specific plans and procedures, there would no increased risk from environmental hazards or to human health. Furthermore, all actions associated with Alternative 1 would be implemented in accordance with all applicable federal, local, and military orders, laws, and regulations (refer to Volume 8, Chapter 3, Table 3.1-1), including COMNAV Marianas Instruction 3500.4. Therefore, Alternative 1 would result in less than significant impacts to water resources.

4.2.2.3 Alternative 1 Proposed Mitigation Measures

No proposed mitigation measures have been identified for Alternative 1.

4.2.3 Alternative 2

The analysis of potential impacts to water quality under Alternative 2 focuses on proposed firing training. Alternative 2 is general similar to Alternative 1; the orientation of the ranges and courses would be slightly different under Alternative 2.

4.2.3.1 Tinian

Construction

Surface Water/Stormwater

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to surface water resources resulting from implementation of Alternative 2 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1.

Therefore, construction activities associated with Alternative 2 would result in less than significant impacts to surface water.

Groundwater

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to groundwater resources resulting from implementation of Alternative 2 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 2 would result in less than significant impacts to groundwater.

Nearshore Waters

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to nearshore water resources resulting from implementation of Alternative 2 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 2 would result in less than significant impacts to nearshore waters.

Wetlands

Based on a recent investigation (refer to Section 4.1.2.4), there are no wetlands located within the range footprints associated with Alternative 2. No direct impacts to wetlands would occur during construction activities. The nearest potential wetland area to proposed construction under Alternative 2 is Area C, located approximately 400 ft (122 m) north of the Platoon Battle Course. The next nearest area is Area 8294, located approximately 1,750 ft (305 m) west of the proposed Platoon Battle Course (refer to Figure 4.2-1). Both of these potential wetland areas are located up-gradient from the proposed range footprints; no indirect impacts to these wetland areas would occur during construction. The recognized Hagoi and Makpo Wetlands are located 2.5 mi (4 km) north and 3.0 mi (4.9 km) south, respectively of the project area associated with Alternative 2; these wetlands would not be impacted. Therefore, construction activities associated with Alternative 2 would result in no impacts to wetlands.

<u>Operation</u>

Surface Water/Stormwater

The proposed range training operations on Tinian are the same for all action alternatives; therefore, the potential operational impacts to surface water resources resulting from implementation of Alternative 2 would be the same as the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, operations associated with Alternative 2 would result in less than significant impacts to surface water.

Groundwater

The proposed range training operations on Tinian are the same for all action alternatives except that under this alternative, abandoned wells M23 and M27 could be impacted; therefore, the potential operational impacts to groundwater resources resulting from implementation of Alternative 1 would be the same as the potential impacts discussed under Alternative 2. Refer to Section 4.2.2.1. Therefore, operations associated with Alternative 2 would result in less than significant impacts to groundwater.

Nearshore Waters

The proposed range training operations on Tinian are the same for all action alternatives; however, as shown in Chapter 2, Figure 2.5-2, a portion of the notational SDZ associated with Alternative 2 would overlap nearshore waters. As discussed in Volume 3, Chapter 2, Section 2.3.1.1, there is a very small chance an expended projectile to fall outside of the range footprint, within the SDZ. There would be an even smaller chance for an expended projectile to fall within the nearshore water portion of the SDZ. Due to the small number of potential projectiles that could fall into the nearshore SDZ and the relatively small size of the projectile. However, the chances of having enough rounds to fall within the Areas C or 8294 to impact potential wetland functionality is negligible. The potential impacts to nearshore water quality from these projectiles would be negligible. In addition, the same range and course management measures as identified in Section 4.2.2.1 would be implemented to minimize potential operational impacts to nearshore waters. Therefore, operations associated with Alternative 2 would result in less than significant impacts to nearshore waters.

Wetlands

Post-construction, range operations would not alter surface water flow to wetland areas as wetland areas are located at higher elevations than the proposed ranges (i.e., any changes to surface hydrology would occur down-gradient from wetland areas) (refer to Figure 4.2-1) and, direct precipitation is the water source for wetlands on Tinian. In addition, due to the underlying porous limestone and siting of ranges down-gradient from the potential wetland areas, any residual lead or other potential range contaminants would not reach wetland areas via stormwater runoff. There is a possibility of an expended round landing in Areas 8294 or C as they are located within the Surface Danger Zone (SDZ) associated with each of the ranges. Assuming that 0.01% of ammunition falls outside the range and in the SDZ, the estimated number of bullets is approximately 328 over the course of a year. Only a portion of these rounds would potentially enter the wetland, as Areas 8294 and C (4.0 ac [1.6 ha]) are only a small fraction of the 3,700-ac (1,500-ha) area of the proposed SDZ. Therefore, the number of rounds that would enter the wetland would be minimal, so it is unlikely that these rounds would negatively impact the wetland functionality. Therefore, operations associated with Alternative 2 would result in less than significant impacts to wetlands.

4.2.3.2 Summary of Alternative 2 Impacts

Table 4.2-2 summarizes the potential construction and operational impacts associated with implementation of Alternative 2.

Table 4.2-2. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	SW: Temporary increase in stormwater runoff, erosion, and sedimentation GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: No impacts
	Operation	SW: Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential; increase in training-related residual contaminants WL: Minor increase in pollutant loading potential from expended rounds

Legend: SW = Surface water/stormwater, GW = Groundwater, NW = Nearshore waters, WL = Wetlands.

Under Alternative 2, there would be no reduction in the area of wetlands on Tinian and there would be no reduction in the availability or accessibility of water resources. Increases in stormwater would be managed by BMPs and LID measures, stormwater flow paths would continue to mimic area topography, range operations and maintenance activities would not alter surface water flow to wetland areas, and no buildings/structures would be constructed in the 100-year flood zone; therefore, there would be no increase in flooding risk. To minimize the potential for groundwater leachate to affect production wells, proposed range maintenance activities and training operations would be in compliance with water protection measures and Military Handbook 1027/3B (NAVFAC 1992). In addition, a monitoring program would be implemented as part of Alternative 2 to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts. Through the development and implementation of BMPs appropriate for site-specific conditions (refer to Volume 2, Chapter 4, Table 4.2-1) and LID measures, and range and course-specific plans and procedures, there would no increased risk from environmental hazards or to human health. Any potential projectiles landing in the nearshore water portion of the SDZ would have a negligible impact on nearshore water quality. Furthermore, all actions associated with Alternative 2 would be implemented in accordance with all applicable federal, local, and military orders, laws, and regulations (refer to Volume 8, Chapter 3, Table 3.1-1), including COMNAV Marianas Instruction 3500.4. Therefore, Alternative 2 would result in less than significant impacts to water resources.

4.2.3.3 Alternative 2 Proposed Mitigation Measures

No proposed mitigation measures have been identified for Alternative 2.

4.2.4 Alternative 3

The analysis of potential impacts to water quality under Alternative 3 focuses on proposed firing training. Alternative 3 is general similar to Alternative 1; the orientation of the ranges and courses would be slightly different under Alternative 3.

4.2.4.1 Tinian

<u>Construction</u>

Surface Water/Stormwater

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to surface water resources resulting from implementation of Alternative 3 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 3 would result in less than significant impacts to surface water.

Groundwater

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to groundwater resources resulting from implementation of Alternative 3 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 3 would result in less than significant impacts to groundwater.

Nearshore Waters

The proposed range and course construction activities are similar for all action alternatives; therefore, potential construction impacts to nearshore water resources resulting from implementation of Alternative 3 would be similar to the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, construction activities associated with Alternative 3 would result in less than significant impacts to nearshore waters.

Wetlands

Based on a recent investigation (refer to Section 4.1.2.4), there are no wetlands located within the range footprints associated with Alternative 3. No direct impacts to wetlands would occur during construction activities. The nearest potential wetland area to proposed construction under Alternative 3 is Area C, located approximately 400 ft (122 m) north of the Platoon Battle Course. The next nearest potential wetland area is Area 8294, located approximately 1,750 ft (305 m) west of the proposed Platoon Battle Course (refer to Figure 4.2-1). Both of these potential wetland areas are located up-gradient from the proposed range footprints; no indirect impacts to these wetland areas would occur during construction. The recognized Hagoi and Makpo Wetlands are located 2.5 mi (4 km) north and 3.0 mi (4.9 km) south, respectively of the project area associated with Alternative 3; these wetlands would not be impacted. Therefore, construction activities associated with Alternative 3 would result in no impacts to wetlands.

<u>Operation</u>

Surface Water/Stormwater

The proposed range training operations on Tinian are the same for all action alternatives; therefore, the potential operational impacts to surface water resources resulting from implementation of Alternative 3 would be the same as the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, operations associated with Alternative 3 would result in less than significant impacts to surface water.

Groundwater

The proposed range training operations on Tinian are similar for all action alternatives; however, the proposed locations place two ranges over the Mariana Limestone (refer to Figure 4.2-2). The potential operational impacts to groundwater resources resulting from implementation of Alternative 3 would be slightly different from the potential impacts discussed under Alternative 1 in that production well M21 could be affected by any leachate from the southwest range. Also, like Alternative 2, abandoned wells M23 and M27 could be potentially impacted by runoff from the ranges. Actions taken to prevent any adverse impact to groundwater are identical to those identified under Alternative 1. Therefore, operations associated with Alternative 3 would result in less than significant impacts to groundwater.

Nearshore Waters

The proposed range training operations on Tinian are the same for action alternatives; therefore, the potential operational impacts to nearshore water resources resulting from implementation of Alternative 3 would be the same as the potential impacts discussed under Alternative 1. Refer to Section 4.2.2.1. Therefore, operations associated with Alternative 3 would result in less than significant impacts to nearshore waters.

Wetlands

Post-construction, range operations would not alter surface water flow to wetland areas as wetland areas are located at higher elevations than the proposed ranges (i.e., any changes to surface hydrology would occur down-gradient from wetland areas) (refer to Figure 4.2-1) and, direct precipitation is the water source for wetlands on Tinian. In addition, due to the underlying porous limestone and siting of ranges down-gradient from the potential wetland areas, any residual lead or other potential range contaminants would not reach wetland areas via stormwater runoff. There is a possibility of an expended round landing in Areas 8294 or C as they are located within the Surface Danger Zone (SDZ) associated with each of the ranges. Assuming that 0.01% of ammunition falls outside the range and in the SDZ, the estimated number of bullets is approximately 328 over the course of a year. Only a portion of these rounds would potentially enter the wetland, as Areas 8294 and C (4.0 ac [1.6 ha]) are only a small fraction of the 3,700-ac (1,500-ha) area of the proposed SDZ. Therefore, the number of rounds that would enter the wetland would be minimal, so it is unlikely that these rounds would negatively impact the wetland functionality. Therefore, operations associated with Alternative 3 would result in less than significant impacts to wetlands.

4.2.4.2 Summary of Alternative 3 Impacts

Table 4.2-3 summarizes the potential construction and operational impacts associated with implementation of Alternative 3.

Table 4.2-3. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	SW: Temporary increase in stormwater runoff, erosion, and sedimentation GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: No impacts
	Operation	SW: Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: Increased potential for local groundwater contamination NW: Minor increase in runoff volume and pollutant loading potential WL: Minor increase in pollutant loading potential from expended rounds

Legend: SW = Surface water/stormwater, GW = Groundwater, NW = Nearshore waters, WL = Wetlands.

Under Alternative 3, there would be no reduction in the area of wetlands on Tinian and there would be no reduction in the availability or accessibility of water resources. Increases in stormwater would be managed by BMPs and LID measures, stormwater flow paths would continue to mimic area topography, range operations and maintenance activities would not alter surface water flow to wetland areas, and no buildings/structures would be constructed in the 100-year flood zone; therefore, there would be no increase in flooding risk. To minimize the potential for groundwater leachate to affect production wells, proposed range maintenance activities and training operations would be in compliance with water protection measures and Military Handbook 1027/3B (NAVFAC 1992). In addition, a monitoring program would be implemented as part of Alternative 3 to identify any early indications of lead movement so that action could be taken to address any potential water quality impacts. Through the development and implementation of BMPs appropriate for site-specific conditions (refer to Volume 2, Chapter 4, Table 4.2-1) and LID measures, and range and course-specific plans and procedures, there would no increased risk from environmental hazards or to human health. Furthermore, all actions associated with Alternative 3 would be implemented in accordance with all applicable federal, local, and military orders, laws, and regulations (refer to Volume 8, Chapter 3, Table 3.1-1), including COMNAV

Marianas Instruction 3500.4. Therefore, Alternative 3 would result in less than significant impacts to water resources.

4.2.4.3 Alternative 3 Proposed Mitigation Measures

No proposed mitigation measures have been identified for Alternative 3.

4.2.5 No-Action Alternative

4.2.5.1 Surface Water/Stormwater

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur on Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met. No construction or operations would occur; therefore, existing surface water conditions as presented in Section 4.1 would remain.

The identified surface water availability and quality concerns for Tinian (e.g., construction-related discharges, sewage overflows, animal waste, and sediment erosion) would continue to exist. These threats to surface water would continue to be monitored by federal and Tinian agencies, and appropriate regulatory action would continue to occur in order to maximize surface water quality and availability. In time, surface water quality is expected to slowly improve as point and non-point sources of pollution are identified and pollution loading to surface waters is reduced. Not increasing the amount of training on Tinian would not change the ongoing water quality concerns or protection actions for surface waters; these conditions and actions would continue to persist. Therefore, implementation of the no-action alternative would result in no impacts to surface water.

4.2.5.2 Groundwater

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur on Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met. No construction or operations would occur; therefore, existing groundwater conditions as presented in Section 4.1 would remain.

The identified groundwater availability and quality concerns for Tinian (e.g., saltwater intrusion, leaky septic systems) would continue to exist. These threats to groundwater availability and quality would continue to be monitored by federal and Tinian agencies to minimize potential impacts, and appropriate regulatory action would continue to occur in order to protect groundwater resources. Monitoring for saltwater intrusion and coordination amongst water users, as well as potential designations for groundwater resources is expected to ensure there is a dependable, safe supply of groundwater for Tinian users. Not increasing the amount of training on Tinian would not change the on-going groundwater availability and quality concerns or the protection actions for Tinian nearshore waters; these conditions and actions would continue to persist. Therefore, implementation of the no-action alternative would result in no impacts to groundwater.

4.2.5.3 Nearshore Waters

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur on Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met. No construction or operations would occur; therefore, existing nearshore conditions as presented in Section 4.1 would remain.

The identified nearshore water quality concerns for the marine waters of Tinian (sewage outfalls, sewer collection overflows, sedimentation from unpaved roads and development, urban runoff, reverse osmosis discharges, and enterococci bacteria,) would continue to persist. These threats to nearshore water quality would continue to be monitored by federal and Tinian agencies to minimize potential impacts, and appropriate regulatory action would continue to occur to protect nearshore waters. In time, nearshore water quality is expected to slowly improve as point and non-point sources of pollution are identified and pollution loading to nearshore waters is reduced. Not increasing the amount of training on Tinian would not change the on-going nearshore water quality concerns or the protection actions for Tinian nearshore waters; these conditions and actions would continue to persist. Therefore, implementation of the no-action alternative would result in no impacts to nearshore waters.

4.2.5.4 Wetlands

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur on Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met. No construction or operations would occur; therefore, existing wetland conditions as presented in Section 4.1 would remain.

The identified primary threats to wetlands on Tinian (feral ungulates, human disturbance, non-native plants species, sedimentation, and erosion) would continue to occur. These threats to wetland areas and function are of concern and are therefore monitored by federal and Tinian agencies to protect wetland areas. Not increasing the amount of training on Tinian would not change the on-going threats or protection actions for wetlands on Tinian; these conditions and actions would continue to persist. Therefore, implementation of the no-action alternative would result in no impacts to wetlands.

4.2.6 Summary of Impacts

Table 4.2-4 summarizes the potential impacts. A text summary is provided below.

Table 4.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Construction Impacts			
SW: LSI • Temporary increase in stormwater runoff, erosion, and sedimentation GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: LSI	SW: LSI • Temporary increase in stormwater runoff, erosion, and sedimentation GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: NI	SW: LSI • Temporary increase in stormwater runoff, erosion, and sedimentation GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: NI	Water Resources: NI
Operation Impacts			
SW: LSI • Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: LSI • Minor increase in pollutant loading potential from expended rounds	SW: LSI • Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential; • increase in training-related residual contaminants WL: LSI • Minor increase in pollutant loading potential from expended rounds	SW: LSI • Increase in stormwater volume and intensity; increase in training-related residual contaminants GW: LSI • Increased potential for local groundwater contamination NW: LSI • Minor increase in runoff volume and pollutant loading potential WL: LSI • Minor increase in pollutant loading potential from expended rounds	Water Resources: NI

Legend: SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact, SW = Surface water/stormwater; GW = Groundwater.

Implementation of the alternatives would have the potential to impact the quality and quantity of stormwater runoff, during both the construction and operational phases of the project. Construction and operation would have the potential to cause erosion and sedimentation that could degrade surface water quality. In addition, the action alternatives would increase the potential for leaks and spills from contaminants. However, a combination of BMPs (refer to Volume 2, Chapter 4, Table 4.2-1), LID measures, and monitoring programs would be implemented as a part of the proposed action to reduce the potential for erosion, runoff, sedimentation, and subsequent water quality impacts. Furthermore, the action alternatives would be implemented in compliance with all federal, local, and military orders, laws, and regulations (refer to Volume 8, Chapter 3, Table 3.1-1) including COMNAV Marianas Instruction 3500.4 and would include the implementation of BMPs, LID, and pollutant monitoring. No buildings/structures would be constructed in the 100-year flood zone.

Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to Area C. No direct wetland impacts would occur under Action Alternatives 2 or 3. Alternative 2 has the potential to result in a negligible impact to nearshore water quality due to expended projectiles falling in the nearshore water portion of the SDZ. Under Alternatives 1 and 3, the SDZs would not overlap nearshore waters.

4.2.7 Summary of Proposed Mitigation Measures

No proposed mitigation measures have been identified for Alternatives 1, 2, or 3.

Table 4.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Construction		
• None	• None	• None
Operation		
• None	• None	• None

4.3 LEAST ENVIRONMENTALLY DAMAGING PRACTICABLE ALTERNATIVE (LEDPA)

This section focuses on compliance with the Section 404(b)(1) guidelines of the CWA. Specifically, Section 404(b)(1) of the CWA stipulates that no discharge of dredged or fill material into waters of the U.S., which include wetlands, shall be permitted if there is a practicable alternative which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant environmental consequences. Furthermore, an alternative is considered practicable if it is available and capable of being implemented after taking into consideration cost, existing technology, and logistics in light of overall project purposes. Section 404 permitting is applicable to the proposed training actions on Tinian. Permitting decisions are based on guidelines ("404(b)(1) Guidelines") developed jointly with the USEPA that are now part of the Code of Federal Regulations (40 CFR 230). This analysis is to show that the screening and selection process used in the development of this EIS has identified the *least environmentally damaging practicable alternative* (LEDPA) consistent with the Section 404(b)(1) guidelines.

The discussion below provides a brief comparative summary of the three alternatives carried forward for analysis in this EIS and highlights the reasons why Alternative 1 is considered the LEDPA. The Marine Corps has determined that Alternative 1 is the preferred alternative for the proposed action. Alternative 1 is preferred because it consolidates the ranges in a central location, is located on the terrain that requires the least amount of earthmoving for construction, makes best use of the existing road network to get to and to service the ranges, provides the most flexibility for future expansion, has the least impact on airspace due to centralized/overlapping SDZs, and only closes Broadway access when Platoon Battle Course is being used.

Options for a Range Training Area (RTA) that could accommodate the four proposed ranges (Rifle Known Distance (KD) Range, Automated Combat Pistol Range, Platoon Battle Course, and Field Firing Range) were evaluated on Tinian. Based on planning limitations and constraints at Tinian and the purpose and need for the proposed action at Tinian, this process identified that the RTA would:

- Be located within the MLA
- Compliment, but not conflict with or infringe on, other training activities within the MLA (to the extent practicable)
- Compliment, but not conflict with, other non training activities within MLA including the International Broadcasting Bureau (IBB) property
- Provide controlled access to and through the range areas for safety prior to and during firing
- Be suitable for company level training of approximately 200, but possibly up to 400, personnel that would periodically bivouac (i.e., a temporary camp under little or no shelter) at the RTA

Sections 2.1-2.5 of this Volume provide an overview of the background, planning criteria, proposed action elements, and alternatives. The overall purpose of the proposed actions is to relocate and site military forces within the Western Pacific Region based on U.S. policy, international agreements, and treaties. The rationale for siting the ranges on Tinian is that this is within the MIRC, provides close proximity to Marine Corps units based on Guam, and provides reliable access to training resources.

4.3.1 Alternatives Comparison Summary

4.3.1.1 Alternative 1 (Preferred)

Wetlands Differences

Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to wetlands. To minimize potential indirect impacts to Area C during construction, the Marine Corps would implement site-specific BMPs. Therefore, construction activities associated with Alternative 1 would result in less than significant impacts to wetlands.

Terrestrial Biological Resources Differences

Project construction would impact 1.0% of the current Tinian monarch population. The Tinian monarch is a CNMI-listed endangered species. Based on territory densities estimated by USFWS (2009), the number of Tinian monarch territories that would be lost through construction would be 204. Approximately 70 ac (28 ha) of the 936 ac (379 ha) Airport Mitigation Conservation Area would be removed. Direct impacts to the Tinian monarch would be significant. Vegetation that would be removed includes 173 ac (70 ha) of mixed introduced forest and smaller amounts of tangantangan (*Leucaena leucocephala*) and shrub/grassland. About 193 ac (78 ha) of forested habitat would be indirectly impacted.

Cultural Resources Differences

Alternative 1 would have significant adverse direct impacts to 10 NRHP-eligible archaeological resources, indirect impacts to 55 NRHP-eligible archaeological sites in the SDZ and the National Historic Landmark (NHL), and indirect impacts to two NRHP-eligible traditional cultural properties.

Operational Differences

There are no operational differences between the three alternatives.

4.3.1.2 Alternative 2 (LEDPA)

Wetlands Differences

Alternative 2 would not impact any wetland areas.

Terrestrial Biological Resources Differences

Project construction would impact 0.7% of the current Tinian monarch population. Based on territory densities estimated by USFWS (2009), the number of Tinian monarch territories that would be lost through construction would be 149. Approximately 108 ac (44 ha) of the 936 ac (379 ha) Airport Mitigation Conservation Area would be removed. Direct impacts to the Tinian monarch would be significant. Vegetation that would be removed includes 121 ac (49 ha) of mixed introduced forest and smaller amounts of tangantangan (*Leucaena leucocephala*) and shrub/grassland. About 178 ac (72 ha) of forested habitat would be indirectly impacted.

Cultural Resources Differences

Alternative 2 would have significant adverse direct impacts to 10 NRHP-eligible archaeological resources, indirect impacts to 52 NRHP-eligible archaeological sites in the SDZ and the NHL, and indirect impacts to one NRHP-eligible traditional cultural property.

Operational Differences

There are no operational differences between the three alternatives.

4.3.1.3 Alternative 3

Wetlands Differences

Alternative 3 would not impact any wetland areas.

Terrestrial Biological Resources Differences

Project construction would impact 0.9% of the current Tinian monarch population. Based on territory densities estimated by USFWS (2009), the number of Tinian monarch territories that would be lost through construction would be 190. Approximately 82 ac (33 ha) of the 936 ac (379 ha) Airport Mitigation Conservation Area would be removed. Direct impacts to the Tinian monarch would be significant. Vegetation that would be removed includes 155 ac (63 ha) of mixed introduced forest and smaller amounts of tangantangan (*Leucaena leucocephala*) and shrub/grassland. About 213 ac (86 ha) of forested habitat would be indirectly impacted.

Cultural Resources Differences

Alternative 3 would have significant adverse direct impacts to 7 NRHP-eligible archaeological resources, indirect impacts to 55 NRHP-eligible archaeological sites in the SDZ and the NHL, and indirect impacts to two NRHP-eligible traditional cultural properties.

Operational Differences

There are no operational differences between the three alternatives.

4.3.2 Conclusion

Based on the above discussion, Alternative 1 is considered the LEDPA and as previously noted, Alternative 1 is the Marine Corps' preferred alternative. The environmental differences between all three alternatives are small, with the greatest difference being due to potential wetland impacts and impacts to the CNMI-listed endangered Tinian monarch. Under Alternative 1, the Marine Corps would design the proposed Platoon Battle Course to avoid direct impacts to wetlands. Alternatives 2 and 3 would result in no impacts to the aquatic ecosystem including wetlands. Alternative 2 has fewer impacts to cultural resources, but the differences are small. Alternative 2 has fewer impacts to terrestrial biological resources; however, these differences also are small. Alternative 1 would have less impact to the Airport Mitigation Conservation Area than either Alternatives 2 or 3. Consequently, by adjustment of the Platoon Battle Course, if necessary, to avoid jurisdictional wetlands, Alternative 1 is the LEDPA.

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CHAPTER 5.
AIR QUALITY

5.1 AFFECTED ENVIRONMENT

5.1.1 Definition of Resource

Air quality is defined by ambient air concentrations of specific pollutants of concern with respect to the health and welfare of the general public. 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. Potential air quality effects on Tinian would occur from both construction and operational activities associated with implementation of the proposed actions and associated alternatives.

Under the requirements of the 1970 Clean Air Act (CAA) as amended in 1977 and 1990 (CAA Amendments), the United States (U.S.) Environmental Protection Agency (USEPA) has established National Ambient Air Quality Standards (NAAQS) for six contaminants, referred to as criteria pollutants (40 Code of Federal Regulations [CFR] 50): carbon monoxide (CO), nitrogen dioxides, ozone (with nitrogen oxides [NO_x] and volatile organic compounds [VOCs] as precursors), particulate matter (PM_{10}—less than 10 microns in particle diameter; $PM_{2.5}$—less than 2.5 microns in particle diameter), lead, and sulfur dioxide (SO_2).

The NAAQS include primary and secondary standards, as listed in Table 5.1-1. The primary standards were established to protect human public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Typical sensitive land uses protected by the primary standards are public accessible areas used by these populations, such as residences, hospitals, libraries, churches, parks, playgrounds, schools, etc. The secondary standards were established to protect the environment, including plants and animals, from the adverse effects associated with pollutants in the ambient air.

Areas where concentration levels are below the NAAQS for criteria pollutants are designated as being in "attainment." Areas where criteria pollutant levels equal or exceed the NAAQS are designated as being in "nonattainment." Based on the severity of the pollution problem, nonattainment areas are categorized as marginal, moderate, serious, severe, or extreme. Where insufficient data exist to determine an area's attainment status, it is designated as either unclassifiable or in attainment.

The CNMI Air Pollution Control Regulations require compliance with NAAQS and permitting for stationary sources of air emissions. The CNMI Division of Environmental Quality reviews air permit applications and issues air permits for stationary sources.

Table 5.1-1. U.S. National and CNMI Ambient Air Quality Standards

Pollutant and Averaging Time	*Primary Standard*[1]	*Secondary Standard*[1]
Carbon Monoxide		
1-Hour Maximum[2]	35 ppm	None
8-Hour Maximum[2]	9 ppm	
Nitrogen Dioxide		
Annual Arithmetic Mean[3]	100	100
Ozone		
8-Hour Average[4]	0.075 ppm	0.075 ppm
Particulate Matter[5]		
PM_{10}		
24-Hour Average[6]	150	150
$PM_{2.5}$		
Annual Arithmetic Mean[3]	15	15
24-Hour Average[7]	35	35
Lead		
Quarterly Arithmetic Mean[8]	1.5	1.5
Rolling 3-Month Average[9]	0.15	0.15
Sulfur Dioxide		
Annual Arithmetic Mean[3]	0.03 ppm ($80\ \mu g/m^3$)	NA
3-Hour Maximum[2]	NA	0.5 ppm ($1300\ \mu g/m^3$)
24-Hour Maximum[2]	0.14 ppm ($365\ \mu g/m^3$)	NA

Legend: NA= not available; ppm = parts per million.
Notes:
1 All concentrations in micrograms per cubic meter of air ($\mu g/m^3$), except where noted.
2 Not to be exceeded more than once a year.
3 Not to be exceeded during any calendar year.
4 Standard attained when 3-year average of annual 4th-highest daily maximum 8-hour concentration is below 0.075 ppm.
5 PM_{10}: particulate matter diameter of 10 microns or less; $PM_{2.5}$: particulate matter diameter of 2.5 microns or less.
6 Not to be exceeded more than once per year on average over 3 years.
7 Standard attained when the annual highest 98th percentile of 24-hour concentration over 3 years is below 35 µg/m3.
8 The quarterly lead standard is not to be exceeded during any calendar quarter.
9 Any three-month average exceeding $0.15\ \mu g/m^3$ within a three-year period would be considered a violation of the NAAQS. Final rule signed October 15, 2008.
Sources: 40 CFR 50 and Guam Environmental Protection Agency (GEPA) (2004).

5.1.2 Tinian

Except for power generating facilities, there are no significant sources of air emissions on Tinian. However, military training vessels, on-road vehicles, and open burnings are sources of emissions that contribute to the existing ambient air quality background conditions at Tinian. While there are no air monitoring stations on Tinian, it can be assumed that ambient air quality is good and in compliance with air quality standards given the small number of emission sources on the island and that the island is currently designated as an attainment area for all criteria pollutants.

5.1.3 Greenhouse Gas Emissions

Greenhouse gases (GHGs) are compounds that contribute to the greenhouse effect. The greenhouse effect is a natural phenomenon where gases trap heat within the surface-troposphere (lowest portion of the earth's atmosphere) system, causing heating (radiative forcing) at the surface of the earth. The primary long-lived GHGs directly emitted by human activities are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Although CO_2, CH_4, and N_2O occur naturally in the atmosphere, their concentrations have increased by 38%, 149%, and 23%, respectively, from the preindustrial era (1750) to 2007/2008 (USEPA 2009a). These gases influence the global climate by trapping heat in the atmosphere that would otherwise escape to space. The heating effect from these gases is considered the probable cause of the global warming observed over the last 50 years (USEPA 2009a). Global warming and climate change can affect many aspects of the environment. Not all effects of GHGs are related to climate, for example, elevated concentrations of CO_2 can lead to ocean acidification and stimulate terrestrial plant growth, and CH_4 emissions can contribute to ozone levels.

The USEPA Administrator has recognized potential risks to public health or welfare and on December 7, 2009 (USEPA 2009b) signed an endangerment finding regarding greenhouse gases under section 202(a) of the CAA, which finds that the current and projected concentrations of the six key well-mixed greenhouse gases – CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6 – in the atmosphere threaten the public health and welfare of current and future generations.

To estimate global warming potential (GWP), the U.S. quantifies GHG emissions using the 100-year timeframe values for GWP established in the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report (IPCC 1996) in accordance with *United Nations Framework Convention on Climate Change* (1995) reporting procedures. All GWPs are expressed relative to a reference gas, CO2, which is assigned a GWP equal to 1. The five other GHGs have a greater GWP than CO_2, ranging from 21 for CH_4, 310 for N_2O, 140 to 6,300 for HFCs, 6,500 to 9,200 for PFCs, and up to 23,900 for SF_6. To estimate the CO_2 equivalency of a non-CO_2 GHG, the appropriate GWP of that gas is multiplied by the amount of the gas emitted. All six GHGs are multiplied by their GWP and the results are added to calculate the total equivalent emissions of CO_2 (CO_2 Eq). The dominant GHG gas emitted is CO_2, mostly from fossil fuel combustion (85.4%) (USEPA 2009c). Weighted by GWP, CH_4 is the second largest component of emissions, followed by N_2O. GWP-weighted emissions are presented in terms of equivalent emissions of CO_2, using units of teragrams (1 million metric tons or 1 billion kilograms) of carbon dioxide equivalents (Tg CO_2 Eq).

In 2007, the U.S. generated about 7,150 Tg CO_2 Eq. (USEPA 2009c). Emissions for CNMI are included in the U.S. total, but account for a minuscule amount of the GHG emissions. The proposed action is anticipated to release GHGs to the atmosphere. Since, the change in climate conditions caused by the burning of fossil fuels is a global effect, requiring that the air quality impact analysis be assessed on a global or regional scale, not at the local scale such as for a city or an island, the cumulative impact of CO_2 Eq emissions is discussed in Volume 7, Section 4.4. The CO_2 Eq emissions would be similar for all alternatives, as most project components that would affect potential air quality conditions remain the same for every alternative including the scale of construction, waterfront operations, and the scale of ground training.

5.2 ENVIRONMENTAL CONSEQUENCES

Since the proposed training activity on Tinian would not affect the operation and capacity of existing utility systems, no adverse stationary source air quality impacts (i.e., from fixed or immobile facilities) would occur. The air quality consequences analysis performed and presented in this section includes:

- An incremental emissions analysis of criteria pollutants and GHG in terms of carbon dioxide (CO_2) emissions (total CO_2 Eq emissions are only predicted and summarized in Volume 7, Chapter 4 to assess overall impacts from the combined preferred alternatives) with the potential to emit from additional training activity operations including the following sources:
- Firing training, inclusive of associated vehicle usage
- Barge operations for transporting military training personnel
- An incremental emissions analysis of criteria pollutants and CO_2 with the potential to emit from construction equipment and hauling truck emissions during the construction period.

5.2.1 Approach to Analysis

5.2.1.1 Methodology

This section describes the analytical approach used to address potential impacts from the proposed Marine Corps training operations on Tinian. The training operations proposed on Tinian would involve the development of live-fire weapons ranges for the sustainment training necessary for individuals, crews, and small units of Marine Corps forces.

Among the three action alternatives (Alternatives 1, 2, and 3), the principal differences are the location and orientation of the firing ranges and the associated surface danger zones (SDZs). The majority of project components that would affect potential air quality conditions would remain the same for each action alternative including the scale of construction and the scale of ground training.

Therefore, it is anticipated that the potential air quality impact from the three alternatives would be the same with respect to the overall pollutant emissions resulting from the proposed action. The air emission sources associated with the proposed operations can be characterized as mobile sources for which the criteria pollutant and CO_2 emissions are quantified.

<u>Construction</u>

Construction activities such as the operation of construction equipment and trucks may have short-term air quality impacts. Although the emissions from construction workers' commuting vehicles are considered part of the overall construction emissions, it is anticipated they are negligible given the scale of construction activities and the relatively low level of emissions as compared to trucks. As such, the emission component from workers' commuting vehicles was not considered here, as it is relatively small and cannot be reasonably forecasted.

In estimating construction-related criteria pollutants and CO_2 emissions, the usage of equipment, the likely duration of each activity, and manpower estimates for the construction were based on the information described in Chapter 2 for the future project-associated construction activities.

Estimates of construction crew and equipment requirements and productivity were based on the data contained in *RSMeans Facilities Construction Cost Data* (RSMeans 2003) and *RSMeans Heavy Construction Cost Data* (RSMeans 2006). It is assumed for emissions estimates purposes that the majority of construction activities would occur from 2011 through 2014 with minimal effort occurring during 2010.

Estimates of construction equipment operational emissions were calculated based on projected hours of equipment use and the emission factors for each type of equipment, as provided by USEPA in the NONROAD emission factor model (USEPA 2008). National default model inputs for non-road engines, equipment, and vehicles of interest were also in the USEPA model (USEPA 2008), as were average equipment horsepower values and equipment power load factors.

A maximum sulfur content of 0.5% was used based on USEPA's Heavy-Duty Standards/Diesel Fuel Regulatory Impact Analysis (RIA) (USEPA 2000). Based on the RIA, data observed in 1992 on Guam shows that No. 2 diesel fuel imports actually had sulfur content ranging from 0.39% to 0.5%. Although the sulfur content data were only observed on Guam, it is assumed that the fuel sources on Tinian and Guam would be the same. Therefore, using the actual highest sulfur content observed in 1992 (0.5%) on Guam for vehicles in this analysis is considered appropriate and conservative and is also coincident with the highest sulfur content fuel input available in the NONROAD model. It should also be noted that with the introduction of the Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements (40 CFR Parts 69, 80, and 86) in 2006, refiners were required to start producing diesel fuel for use in highway vehicles with a sulfur content of no more than 15 ppm (i.e., 0.0015% content).

Since the operational activity data presented in RSMeans' cost data books are generated based on the overall length of equipment presence duration on site, an equipment actual running time factor (i.e., actual usage factor) was further employed to determine actual equipment usage hours for the purpose of estimating equipment emissions. The usage factor for each equipment type was obtained from Federal Highway Administration's (FHWA) Roadway Construction Noise Model User's Guide (FHWA 2006). Emission factors related to construction-associated delivery trucks were estimated using USEPA Mobile6 emission factor model (USEPA 2003) that provides specific emission factor data base for various truck classifications.

<u>Operation</u>

Operational elements that have potential to impact air quality include:

- Use of barges for transport of equipment from Guam to Tinian for training evolutions
- Ground vehicle operations at various ranges

The emissions from potential barge trips were calculated using emission factors and load factors related to diesel marine vessels obtained from *Current Methodologies and Best Practices in Preparing Port Emission Inventories* (USEPA 2006). Emission factors were multiplied by the estimated running hours for the barge to predict annual total barge emissions.

Ground training vehicle exhaust emissions from trucks, high mobility multipurpose wheeled vehicles, and buses during training exercises were estimated with the same method used to predict construction vehicle emissions. The USEPA Mobile6 emission factor model (USEPA 2003) was used to predict emissions factors associated with each type of training vehicles defined based on the average weight and fuel type. The emission factors were then multiplied by the annual vehicle running hours for each type of vehicle during the training periods on Tinian. Moreover, since majority of these training vehicles would maneuver on unpaved roads with potential to generate a great amount of fugitive dust, USEPA AP-42 (USEPA 1995) was used to predict additional unpaved road fugitive dust emissions from training vehicles.

The detailed methodologies used to calculate both construction and operation emissions are presented in Volume 9, Appendix I (Sections 3.3.4 Marine Vessel Training Emissions, 3.3.5 Training Vehicles Emissions, and 3.4 Construction Activity Emissions).

5.2.1.2 Determination of Significance

Under the CAA, barges, motor vehicles, and construction equipment are exempt from air permitting requirements. Since the emissions from these sources associated with the proposed project would occur in areas that are in attainment of the NAAQS for all criteria pollutants, the CAA General Conformity Rule (GCR) is not applicable. Nonetheless, the National Environmental Policy Act (NEPA) and its implementing regulations require analysis of the significance of air quality impacts from these sources as well as non-major stationary sources. However, neither NEPA nor its implementing regulations have established criteria for determining the significance of air quality impacts from such sources in CAA attainment areas.

In the GCR applicable to nonattainment areas, USEPA uses the “major stationary source” definition under the New Source Review program as the *de minimis* levels to separate presumably exempt actions from those requiring a positive conformity determination. Since the proposed action and alternatives would occur in areas that have always been in attainment, the “major stationary source” definition (250 tons per year [TPY] or more of any air pollutant subject to regulations under the CAA) from the Prevention of Significant Deterioration (PSD) program was used for the air quality impact assessment. The PSD major source threshold of 250 TPY is used for locations that are in attainment for determining the potential significance of air quality impacts from these sources. CO_2 is not a criteria pollutant, and therefore the 250 TPY threshold is not applicable to it.

The analysis of construction and operational incremental emissions from these sources in attainment areas and the significance threshold selected (250 TPY) are solely for the purpose of informing the public and decision makers about the relative air quality impacts from the proposed action and other alternatives under NEPA requirements.

5.2.1.3 Issues Identified During Public Scoping Process

As part of the analyses, concerns relating to air quality effects that were raised by the public, including regulatory stakeholders, during scoping meetings were addressed, if sufficient project data and available impact criteria were available. These include:

- Increases in vehicle and vessel emissions and disclosure of available information of health risks associated with vehicle emissions and other mobile source emissions.
- Increases in construction-related emissions and impacts including emissions estimates of criteria pollutants and diesel PM from construction of alternatives.

5.2.2 Alternative 1 (Preferred Alternative)

5.2.2.1 Tinian

The Range Training Area (RTA) under Alternative 1 would consist of four proposed firing ranges: Rifle Known Distance (KD) Range, Automated Combat Pistol/Military Police (MP) Firearms Qualification Course, Platoon Battle Course, and Field Firing Range. They would be oriented north, with the exception of the Platoon Battle Course that would be oriented northeast. Total area of disturbance for all ranges combined would be 225 acres (ac) (91 hectares [ha]). SDZs would encompass the Broadway and the Mount Lasso areas but would not extend over ocean waters.

Construction

In Tinian, construction of the ranges would occur within the Military Lease Area (MLA). In order to streamline development of a construction estimate for the live-fire range training facilities and supporting facilities, each individual item was assigned to a "prototype" element with complete construction estimates developed for a representative sample of each of the prototypes.

The total annual air emissions resulting from potential construction equipment, vehicle, and paving activities occurring from 2011 through 2014 for live-fire range training facilities and supporting facilities construction in Tinian are summarized in Table 5.2-1 and detailed in Volume 9, Appendix I, Section 3.4.2 Construction Emissions Marine Corps Relocation – CNMI.

Table 5.2-1. Annual Construction Emissions - Alternative 1

Pollutant (TPY)						
SO_2	*CO*	*PM_{10}*	*$PM_{2.5}$*	*NO_x*	*VOC*	*CO_2*
0.3	1.1	0.1	0.1	0.7	0.3	108.7

Operation

Military training-related barge and vehicle emissions during training exercises are summarized in Table 5.2-2 and detailed in Volume 9, Appendix I, Section 3.3.5 Training Vehicles Emissions.

Table 5.2-2. Training Activity Annual Emissions- Alternative 1

Pollutant (TPY)						
SO_2	*CO*	*PM_{10}*	*$PM_{2.5}$*	*NO_x*	*VOC*	*CO_2*
Barge						
0.2	0.8	0.1	0.1	4.2	0.1	N/A
Vehicle						
0.0	0.0	0.1	0.0	0.0	0.0	2.0
Total						
0.2	0.8	0.2	0.1	4.2	0.1	2.0

The construction emissions and operational training emissions for Alternative 1 shown in Table 5.2-1 and Table 5.2-2 are all well below the significance threshold of 250 TPY for criteria pollutants, as described in Section 5.2.1.2.

5.2.2.2 Summary of Alternative 1 Impacts

Table 5.2-3 provides a summary of air emissions associated with both construction and operational components of Alternative 1. All air emissions would be well below the significance threshold of 250 TPY for air pollutants subject to regulations under the CAA. Therefore, all project specific air quality impacts are considered less than significant for all areas under Alternative 1.

Table 5.2-3. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Air Quality Impacts*
Tinian	Construction	Less than significant impacts to air quality. Construction emissions from all components would be well below significance thresholds.
	Operation	Less than significant impacts to air quality. Operational emissions from all components would be well below significance thresholds.

5.2.2.3 Alternative 1 Proposed Mitigation Measures

The predicted construction emissions (2011 through 2014) and operational emissions (2015 and after) for criteria pollutants are all below the 250 TPY threshold. Therefore, potential air quality impacts under Alternative 1 are considered less than significant and emissions mitigation measures are not warranted.

5.2.3 Alternative 2

5.2.3.1 Tinian

The RTA under Alternative 2 would consist of the same four proposed firing ranges as Alternative 1. They would be oriented north, with the exception of the Platoon Battle Course that would be oriented northeast. Total area of disturbance for all ranges combined would be 225 ac (91 ha). SDZs would encompass the Broadway and the Mount Lasso areas, and the Field Firing Range SDZ would extend over ocean waters.

Construction

The construction emissions that would result from the proposed construction live-fire range training facilities and supporting facilities on Tinian for Alternative 2 are assumed to be the same as those for Alternative 1, based the similar components of each alternative. Air emissions during construction that apply to this alternative are discussed in Section 5.2.2 and are presented in Table 5.2-1.

Operation

The operational emissions associated with military training related emissions including those from barge, and training vehicle operations at or around Tinian are also assumed to be the same as those for Alternative 1, and are summarized in Table 5.2-2.

5.2.3.2 Summary of Alternative 2 Impacts

Table 5.2-4 provides a summary of air emissions associated with both construction and operational components of Alternative 2. All air emissions would be well below the significance threshold of 250 TPY for air pollutants subject to regulations under the CAA. Therefore, all project specific air quality impacts are considered less than significant for all areas for this action.

Table 5.2-4. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Air Quality Impacts*
Tinian	Construction	Less than significant impacts to air quality. Construction emissions from all components would be well below significance thresholds.
	Operation	Less than significant impacts to air quality. Operational emissions from all components would be well below significance thresholds.

5.2.3.3 Alternative 2 Proposed Mitigation Measures

The predicted construction emissions (2011 through 2014) and operational emissions (2015 and after) for criteria pollutants within each ROI are all below the 250 TPY threshold. Therefore, potential air quality impacts under Alternative 2 are considered less than significant and emissions mitigation measures are not warranted.

5.2.4 Alternative 3

5.2.4.1 Tinian

The RTA under Alternative 3 would consist of the same four proposed firing ranges as Alternative 1. Three ranges (Field Firing Range, Automated Combat Pistol/MP Firearms Qualification Course, and the Rifle KD Range) would be located farther to the south than under Alternative 1. They would be oriented north. The Platoon Battle Course that would be in the same location as Alternative 1 and would be oriented northeast. Total area of disturbance for all ranges combined would be 225 ac (91 ha). SDZs would encompass the Broadway and the Mount Lasso areas but would not extend over ocean waters.

Construction

Construction emissions that would result from the proposed construction of live-fire range training facilities and supporting facilities in Tinian for Alternative 3 are assumed to be the same as those for Alternative 1 based on the similar components of each alternative. Air emissions that apply to this alternative are discussed in Section 5.2.2 and are presented in Table 5.2-1.

Operation

The operational emissions associated with military training-related emissions including those from barge and training vehicle operations at or around Tinian are also assumed to be the same as those for Alternative 1 and are summarized in Table 5.2-2.

5.2.4.2 Summary of Alternative 3 Impacts

Table 5.2-5 provides a summary of air emissions associated with both construction and operational components of Alternative 3. All air emissions would be well below the significance threshold of 250 TPY for air pollutants subject to regulations under the CAA. Therefore, all project specific air quality impacts are considered less than significant for all areas for this action.

Table 5.2-5. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Air Quality Impacts*
Tinian	Construction	Less than significant impacts to air quality. Construction emissions from all components would be well below significance thresholds.
	Operation	Less than significant impacts to air quality. Operational emissions from all components would be well below significance thresholds.

5.2.4.3 Alternative 3 Proposed Mitigation Measures

The predicted construction emissions (2011 through 2014) and operational emissions (2015 and after) for criteria pollutants within each ROI are all below the 250 TPY threshold. Therefore, potential air quality impacts under Alternative 3 are considered less than significant and emissions mitigation measures are not warranted.

5.2.5 No-Action Alternative

Under the no-action alternative, Marine Corps units would not move to Guam and there would be no additional training conducted in the CNMI. No construction and training operations associated with the military relocation would occur. Existing operations on Tinian would continue. Therefore, the no-action alternative would have no air quality impacts.

5.2.6 Summary of Impacts

Table 5.2-6 summarizes the potential impacts of the three action alternatives and the no-action alternative. As noted in this section, this evaluation assumed that the construction effort for all live-fire weapons ranges would be the same, regardless of location or orientation. Therefore, the estimate of air emissions calculated for all action alternatives (Alternatives 1, 2, and 3) are equal. The operational components of military training related emissions for all three action alternatives are also considered to be the same, and therefore predicted emissions for all action alternatives are also the same.

Table 5.2-6. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Construction Impacts			
LSI • Construction emissions from all components would be well below significance thresholds.	LSI • Construction emissions from all components would be well below significance thresholds.	LSI • Construction emissions from all components would be well below significance thresholds.	NI
Operation Impacts			
LSI • Training operation emissions from all components would be well below significance thresholds.	LSI • Training operation emissions from all components would be well below significance thresholds.	LSI • Training operation emissions from all components would be well below significance thresholds.	NI

Legend: LSI = Less than significant impact; NI = No impact.

The potential air emissions for Alternatives 1, 2, and 3 associated with construction and operational activities are well below the significance threshold of 250 TPY. Therefore, Alternatives 1, 2, and 3 would result in less than significant impacts to air quality resources. The no-action alternative would result in no impacts to air quality resources.

5.2.7 Summary of Proposed Mitigation Measures

As the predicted air emissions would result in less than significant impacts for all alternatives for both construction and operation components of the proposed action, no mitigation measures are warranted, as summarized in Table 5.2-7.

Table 5.2-7. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Construction		
• None	• None	• None
Operation		
• None	• None	• None

CHAPTER 6.
NOISE

6.1 AFFECTED ENVIRONMENT

The main sources of noise within the affected environment on Tinian addressed in this Environmental Impact Statement (EIS) are related to military operations (airfield operations, ground training, construction noise and ground vehicular traffic). Ground training encompasses many types of activities, but live-fire activities are emphasized in analyzing the noise environment because they generate more noise than other ground-based activities. Heavy equipment used during construction activities is the primary source of construction noise. Traffic noise relates to vehicle movements on roadways around the island. The following sections discuss the baseline noise environment to assess the potential effects of noise that may be generated in each geographical area of interest on Tinian should the proposed action be implemented.

6.1.1 Definition of Resource

Sound is the stimulation of auditory organs produced by sound waves transmitted through the air or other medium. Sound waves are small pressure fluctuation waves caused by vibrations. Human hearing generally covers fluctuations between frequencies of 20 and 20,000 hertz, with higher frequencies interpreted as having a higher pitch. Frequency is a measure of wave cycles per unit of time. Cycles per second is the standard unit of measurement for sound wave frequency and is expressed as hertz. Sound waves move outward in all directions from the vibration source, dissipating as the distance from the source increases (inversely proportional to the square of the distance to the source). High frequency sounds dissipate more quickly. Dissipation also occurs due to wind, ground cover, and temperature.

Loudness is the relative measure of the magnitude of a sound and is typically measured in decibels (dB). Decibels are the ratio of the intensity of the sound to a reference intensity based on atmospheric pressure. The dB is a logarithmic unit of measurement that expresses the magnitude of a physical quantity, like sound, relative to a specified or implied reference level. Since it expresses a ratio of two quantities with the same unit, it is a dimensionless unit.

Noise is unwanted or annoying sound and is not necessarily based on loudness. It comes from both natural and manmade sources. Noise can have deleterious effects on physical and psychological health, affect workplace productivity, and degrade quality of life. Military activities often involve the use of specialized equipment that cause noise, including aircraft, artillery, heavy vehicles, and ships. The degree that a sound is perceived to be noise may be influenced by the following factors:

- Frequency spectrum (300 – 4,800 hertz range has the highest potential for deleterious effects on humans)
- Intensity (loudness and frequency)
- Modulation (level of distortion)
- Time and place of occurrence
- Duration
- The individual's background

Table 6.1-1 shows typical intensity levels for common sounds. Since sound level intensity is logarithmic, the decibel levels of multiple sources of sound are not additive. In fact, doubling a noise source would only generate a 3 dB increase. For example, a receptor under a flight path with one jet airliner 500 feet (ft)

(152 meters [m]) overhead would experience 115 dB; if two jetliners passed side-by-side, the receptor would experience 118 dB not 230 dB.

Table 6.1-1. Intensity Levels for Common Sounds

Levels	*dB*
Pain threshold	140
Discomfort threshold (pure tones)	120
Jet airliner (500 ft [152 m] overhead)	115
Loud shout (1 ft [.3 m] away)	110
Discomfort for speech threshold	100
Residential lawn mower	98
Heavy city traffic	92
Loud speech	80
Conversation	60
Window air conditioning unit	55
Faint speech (3 ft away[1 m])	40
Whisper	30
Very quiet speech	20
Hearing threshold (young adult)	0

Source: Newman and Beatty 1985.

6.1.1.1 Frequency Weighting

A number of factors affect sound as the human ear perceives it. These include the actual level of noise, the frequencies involved, the period of exposure to the noise, and changes or fluctuations in noise levels during exposure. In order to correlate the frequency characteristics from typical noise sources to the perception of human ears, several noise frequency weighting measures have been developed. The most common frequency measures include the following:

- *A-weighted Scale.* Since the human ear cannot perceive all pitches or frequencies equally well, these measures are adjusted or weighted to compensate for the human lack of sensitivity to low-pitched and high-pitched sounds. This adjusted unit is known as the A-weighted decibel, or dBA. The dBA is used to evaluate noise sources related to transportation (e.g., traffic and aircraft) and to small arms firing (up to .50-caliber).
- *C-weighted Scale.* The C-weighted scale measures more of the low-frequency components of noise than does the A-weighted scale. It is used for evaluating impulsive noise and vibrations generated by explosive charges and large-caliber weapons (such as artillery, mortars). C-weighted noise levels are indicated by dBC.

Noise levels from one scale cannot be added or converted mathematically to levels in another weighting scale.

6.1.1.2 Noise Metrics

Because of continuous versus impulsive types of noise, variations in frequency and period of noise exposure, and the fact that the human ear cannot perceive all pitches and frequencies equally well, noise from military operations is measured using noise metrics that reflect different noise characteristics. Common metrics used in this EIS noise analysis are as follows:

- Day-night Sound Level (DNL). This metric cannot be measured directly; rather, it is calculated as the average sound level in decibels with a 10 dB penalty added to the nighttime levels (10 p.m. to 7 a.m.). This penalty accounts for the fact that noises at night sound louder because there are usually fewer noises occurring at night so generally nighttime noises are more noticeable. The DNL noise metric may be further defined, as appropriate, with a specific, designated time period (e.g., annual average DNL, average busy month DNL). This metric is recommended by USEPA, used by most federal agencies when defining their noise environment, and applied as a land-use planning tool for predicting areas potentially impacted by noise exposure.

- Maximum Sound Level (L_{max}). The highest A-weighted integrated sound level measured during a single event in that the sound level changes value with time (e.g., an aircraft overflight) is called the maximum A-weighted sound level or L_{max}. L_{max} is given in units of dBA. The L_{max} is important in judging the interference caused by a noise event such as participating in conversation, TV or radio listening, sleep, or other common activities. Although it provides some measure of the intrusiveness of the event, it does not completely describe the total event because it does not account for the length of time that the sound is heard.
- Sound Exposure Level (SEL). This metric is a measure of the total sound energy and is a sum of the sound intensity over the duration of exposure. The SEL provides a convenient single number that adds the total acoustic energy in a transient event and it has proven to be effective in assessing the relative annoyance of different transient sounds.
- Equivalent Sound Level (L_{eq}). Another way of describing fluctuating sound is to describe the fluctuating sound heard over specific periods as if it had been a steady, unchanging sound. For this condition, a descriptor called the L_{eq}, can be computed. L_{eq} is the constant sound level that, in a given situation and period (e.g., 1 hour, denoted by $L_{eq}(1)$, or 24 hours, denoted as $L_{eq}(24)$), conveys the same sound energy as the actual time-varying sound.
- Peak Sound Level. The metric Peak 15 is the single event peak level exceeded by 15% of event. This metric account for statistical variation in received single event peak noise level that is due to weather. It is the calculated without frequency weighting (i.e., unweighted as opposed to A- or C-weighted).

6.1.1.3 Noise Standards and Guidelines

The Marine Corps employs three programs that address adherence to the Noise Control Act of 1972 and United States (U.S.) Environmental Protection Agency (USEPA) Guidance: the Range Air Installation Compatible Use Zone (Office of the Chief of Naval Operations Instruction [OPNAVINST] 3550.1) for air-to-ground operations at training areas, and the Air Installation Compatible Use Zone (OPNAVINST 11010.36A) for airfield operations. The Range Air Installation Compatible Use Zone and Air Installation Compatible Use Zone programs: 1) help military installations in determining noise generated by military training and operations, 2) evaluate how the noise from these operations may impact adjacent communities and associated activities, and 3) assist military planners assess existing and proposed land uses on an Installation. For ground training noise, the Marine Corps adheres to a guidance memo dated June 29, 2005 (Marine Corps 2005). In addition, Army Regulation 200-1 (Environmental Protection and Enhancement), Chapter 14 (Operational Noise) provides the guidance for evaluation of ground training noise at Marine Corps installations (Army 2007). Noise zones are used in land use planning around Marine Corps installations. The following (and Table 6.1-2) describes these zones and the types of land use that are considered compatible within these zones (USCHPPM 2009, Army 2007).

- **Zone I** – includes all areas around a noise source that DNL is less than 65 dBA or 62 dBC, or the Peak 15(met) exceeds 87 dB. This area is usually suitable for all types of land use activities (e.g., homes, schools, and hospitals). Zone I on maps are simply areas that are neither Zone II nor Zone III.
- **Zone II** – consists of an area where the DNL is between 65 and 75 dBA or 62 and 70 dBC, or the Peak 15(met) is between 87 to 104. Exposure to noise within this zone is normally considered incompatible with noise-sensitive land uses and use of the land within the zone should normally be limited to activities such as industrial, manufacturing, transportation, and resource production (e.g., industrial parks, factories, and highways).
- **Zone III** – is an area around the noise source that the DNL is greater than 75 dBA or 70 dBC, or the Peak 15(met) exceeds 104. The noise level within this zone is considered incompatible with noise-sensitive land uses such as churches, schools, parks, and playgrounds.

Table 6.1-2. Noise Zones and Compatibility Levels

Zone	*Small Arms/Aviation A-weighted DNL*	*Explosives Day Night Average C-weighted DNL*	*Small Arms PK-15 (met) Peak Unweighted*	*Compatibility with Residential/Noise-Sensitive Land Uses*
I	<65 dBA	<62 dBC	87 dB	Compatible
II	65 to 75 dBA	62 to 70 dBC	87 to 104 dB	Normally Incompatible
III	>75 dBA	>70 dBC	>104 dB	Incompatible

Legend: DNL = Day Night Average Level; PK-15 = Unweighted Peak, 15% Metric
Sources: USCHPPM 2009, Army 2007.

Construction Noise

Construction noise is generated by the use of heavy equipment on job sites and is short-term in duration (i.e., the duration of the construction period). Commonly, use of heavy equipment occurs sporadically throughout daytime hours. Table 6.1-3 provides a list of representative samples of construction equipment and associated noise levels, adjusted for the percentage of time equipment would typically be operated at full power at a construction site. Construction noise varies greatly depending on the construction process, type and condition of equipment used, and layout of the construction site. Overall, construction noise levels are governed primarily by the noisiest pieces of equipment, impact devices (e.g., jackhammers, pile drivers).

The dB 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 dBs for each doubling of distance from the source. Sound that originates from a linear, or 'line' source, such as a passing aircraft, attenuates by about 3 dBs for each doubling of distance where no other features such as vegetation, topography, or walls absorb or deflect the sound. Depending upon their nature, such features ability to reduce noise levels may range from minimally to substantially.

With the exception of safety standards for construction workers, the Marine Corps does not have a formal policy for management of construction noise. Construction noise is typically confined within an installation boundary, occurs during daylight hours, and is only present during the period of construction. There are no local requirements for construction noise that would apply to the proposed construction activities.

Table 6.1-3. Samples of Construction Noise Equipment

Equipment Description	*Impact Device*[1]	*Acoustical Usage Factor*[2] *(%)*	*Actual Measured* L_{max} *@ 50 feet*[3] *(dBA, slow) (Samples Averaged)*	*Number of Actual Data Samples*[4] *(Count)*
All Other Equipment > 5 HP	No	50	NA	0
Backhoe	No	40	78	372
Clam Shovel (dropping)	Yes	20	87	4
Compactor (ground)	No	20	83	57
Compressor (air)	No	40	78	18
Concrete Mixer Truck	No	40	79	40
Concrete Saw	No	20	90	55
Crane	No	16	81	405
Dozer	No	40	82	55
Dump Truck	No	40	76	31
Excavator	No	40	81	170
Front End Loader	No	40	79	96
Generator	No	50	81	19
Grader	No	40	NA	0
Impact Pile Driver	Yes	20	101	11
Jackhammer	Yes	20	89	133
Pavement Scarifier	No	20	90	2
Paver	No	50	77	9
Roller	No	20	80	16
Scraper	No	40	84	12
Tractor	No	40	NA	0
Vibratory Pile Driver	No	20	101	44

Legend: NA - Not Applicable

Notes:

1. Indication whether or not the equipment is an impact device.
2. The acoustical usage factor refers to the percentage of time the equipment is running at full power on the job site and is assumed at a typical construction site for modeling purposes.
3. The measured "Actual" emission level at 50 ft for each piece of equipment based on hundreds of emission measurements performed on Central Artery/Tunnel, Boston MA work sites.
4. The number of samples that were averaged together to compute the "Actual" emission level.

Source: U.S. Department of Transportation (USDOT) 2006.

6.1.2 Tinian

The noise environment on Tinian stems from the existing aviation and ground training that occur at the Tinian Military Lease Area (MLA). This area encompasses 15,353 acres (ac) (6,213 hectares [ha]) on the island, leased by the Department of Defense (DoD) from the Commonwealth of the Northern Mariana Islands (CNMI). Training on Tinian is conducted on two parcels within the MLA: the Exclusive Military Use Area (EMUA) encompassing 7,574 ac (3,065 ha) on the northern third of Tinian, and the Leaseback Area (LBA) encompassing 7,779 ac (3,148 ha) of the middle third of Tinian. The MLA supports small unit-level through large field exercises and expeditionary warfare training.

The LBA is DoD leased land covering the central portion of the island, and makes up the middle third of Tinian. The LBA is used for ground element training including Military Operations in Urban Terrain-type training, command and control, logistics, bivouac, vehicle land navigation, convoy training, and other field activities. Tinian Airport (West Field) is located south of the southern border of the LBA.

Airfield Operations

North Field in the EMUA is an unimproved expeditionary World War II era airfield used for vertical and short-field landings. North Field is also used for expeditionary airfield training including helicopter insertion and extraction, paratroops training, Military Operations in Urban Terrain, airmobile landings, C-130 cargo drops, night vision goggle training, airfield seizure/defense, forward area refueling, bivouac, command and control, air traffic control, logistics, armament, rapid runway repair, and other airfield-related requirements. Pyrotechnics are authorized for use throughout the main North Field Area.

During World War II, aircraft originating from North Field bombed Japan and the deployed atomic bombs to Hiroshima and Nagasaki and, today, North Field is a National Historic Landmark. The surrounding area is used for force-on-force airfield defense and offensive training. While the activities at North Field and the EMUA create noise, they are located far north on Tinian. Consequently, no sensitive noise receptors are in the vicinity, thus there was no need to develop airfield noise contours to assess potential noise impacts.

The other airfield on Tinian is the Tinian Airport (West Field), the commercial airport on the southern boundary of the LBA. The runway is not instrumented; however, it is capable of landing large aircraft. Currently, Tinian Airport (West Field) averages 67 flight operations a day (62 air taxi, and five general aviation flights). There are four single engine aircraft and two multi-engine aircraft based at the airport. The airport has limited airfield services. No noise contours have been developed for this airfield since sensitive noise receptors associated with San Jose village are located well to the south and east of the airfield.

The instrument landing system approach for Saipan International Airport occurs over the north end of Tinian, resulting in periodic elevated noise levels from low-altitude jet aircraft throughout the day. With 22 aircraft based at Saipan International Airport, daily aircraft operations average 108, consisting of commuter/inter-island flights for Tinian and Rota using single engines, Shorts 360 and ATR 42 aircraft.

Firing Ranges

There are no active live-fire ranges in the EMUA or LBA. Some sniper small arms firing into bullet traps is conducted in association with training at North Field, resulting in discountable and infrequent noise.

6.2 ENVIRONMENTAL CONSEQUENCES

6.2.1 Approach to Analysis

Potential sound-generating events associated with the proposed action were identified and the potential sound levels that could result from these activities were estimated on the basis of published military sound sources information. These estimated sound levels were reviewed to determine if they would represent a significant potential increase from the current ambient sound level, subsequently resulting in an adverse impact on sensitive receptors. In addition, evaluation was conducted to ensure that potential noise would not exceed any relevant or applicable standards.

6.2.1.1 Methodology

To derive the noise level contours, widely applied noise models were used for evaluating small arms ranges, large caliber ranges, construction, and airfields.

Airfield noise was estimated using NOISEMAP, a model which is used to generate noise level contours in DNL around an airfield. The model uses the aircraft type and number; takeoffs, landings, touch and go exercises, as well as closed patterns, and time of operation to depict noise levels at an airfield (USCHPPM 2009).

For live-fire training at the five proposed small arms ranges, noise was calculated using the Small Arms Range Noise Assessment Model (SARNAM) Version 2.6.2003-06-06 for both PK-15 and ADNL noise contours. The SARNAM model analyzed various inputs for range configuration options. These inputs included the location and configuration of each range (including number of lanes, distance between firing point and target), approximate number of days the range is utilized annually, weapons to be fired at each of the ranges, percent of night firing, and information on range physical features (e.g., absorption material, backstop height, and distance parameters for barriers, baffles, etc.). In addition, land and water data were entered into the model to account for greater sound reflection as sound propagates over water versus over land.

The Federal Highway Administration Construction Noise Handbook and the Roadway Construction Noise Model (USDOT 2008) was used for predicting potential construction noise impacts. This model applies known noise levels for most common construction activities at a reference distance of 50 ft (15 m) and calculates the noise levels at user designated distances.

6.2.1.2 Determination of Significance

Noise impacts result from perceptible changes in the overall noise environment that increases annoyance or affects human health. Annoyance is a subjective impression of noise that may involve both physical and emotional variables. Human health effects such as hearing loss and noise-related awakenings can result from noise. For this EIS, noise is evaluated for both construction and operational activities. It is not anticipated that maintenance activities would noticeably contribute to the noise environment due to their intermittent nature and short duration. The threshold level of significant impacts for noise is:

- The increase of any incompatible sensitive noise receptors (residences, hospitals, libraries, etc.) under noise contours where the effects are immitigable. This threshold is intended to capture areas where there would be "high annoyance" effects from operational noise, alongside health effects and complaints.
- Construction noise resulting in an hourly equivalent sound level of 75 dBA (based on USEPA data for construction noise) at a sensitive receptor (such noise exposure would be equivalent to noise Zone III) or *consistent* exposure to noise levels at 85 dBA, over an 8-hour period, the National Institute of Occupational Safety and Health (NIOSH) recommended exposure limit (NIOSH 1998).

6.2.1.3 Issues Identified During Public Scoping Process

One comment received during the scoping process from the public, including regulatory stakeholders, expressed concern over noise-induced stress from fixed-wing aircraft and helicopters.

6.2.2 Alternative 1 (Preferred Alternative)

6.2.2.1 Tinian

Construction

Construction activities for the above listed projects would require the use of heavy equipment for site preparation and development (e.g., vegetation removal, grading, back fill, etc.) and could potentially generate noise above average ambient noise levels. The construction-related noise levels would be typical of standard construction activities (i.e., 85-100 dBA), and would be scheduled to occur only during normal working hours (i.e., between 7:00 a.m. and 5:00 p.m., Monday through Friday). Temporary increases in truck traffic used to transport materials on- and off-site would also produce greater noise disturbances within and near the construction corridors. These noise disturbances would diminish the farther sensitive noise receptors are from the construction site. The town of San Jose lies about 2 miles (mi) (3 kilometers [km]) south of the Tinian airport and the nearest residence is a least 1 mi (1.5 km) from the proposed construction areas in the LBA north of the airport. Construction noise could be as high as 100 dBA at the site, but would attenuate to about 60 dB L_{max} at the nearest receptor. This is well below threshold for sensitive receptors or continuous exposure and would produce an impact that is less than significant.

Operation

Airfield Operations

Airfield operations associated with the proposed action on Tinian focus on the Tinian Airport where airlifts would be required for transporting troops to and from Guam. The transport of 200-400 Marines to Tinian from Guam for the proposed one week per month company-level training exercises would be via air transport. The estimated sorties associated with the notional airlift requirements are provided in Table 6.2-1. This table summarizes key data such as the number of sorties for the aircraft to transport 200 and 400 Marines respectively and the percentage of operations it would represent at the Tinian Airport if all sorties were to be conducted from the Tinian Airport. The rotary-wing sorties would be between Andersen Air Force Base North Field on Guam to either the bivouac area or Tinian Airport (West Field) on Tinian. The fixed-winged sorties (C-130 and C-17s) would not go between the bivouac areas on Tinian; only the Tinian Airport (West Field) has a runway sufficient to support traffic from these aircraft. No aircraft would be permanently based at Tinian North Field. As a result, noise contours would not be required for the proposed action at Tinian because all of the flights would be transient. Furthermore, North Field is located on the opposite side of the installation from off-base land users such that noise contours, if developed, would remain well inside the boundaries of the military area.

Table 6.2-1. Guam to Tinian Notional Airlift Requirements

Aircraft Type	*Capacity (Marines Transported) per Sortie*	*Sorties for Airlift of 200 Marines*	*Sorties for Airlift of 400 Marines*	*Percentage of operations if all went to Tinian Airport*
CH-53D	37	6	11	5%
CH-53E	55	4	8	3.4%
MV-22	20	10	20	8.5%
C-130	76	3	6	2.6%
C-17	102	2	4	1.7%

Notes: Assumes two operations per sortie and 469 existing flights at Tinian per week.
Sources: Marine Corps 1999, Navy 2004, Air Force 2008.

The bivouac area proposed for the airlift operations is located well within the LBA, and noise generated at the site would emanate off installation boundaries. Airlift operations to Tinian Airport would likely be the C-130 or C-17 operations. The number of operations would be concentrated on Mondays and Saturdays when the Marines are dropped off and picked up from Tinian. The current number of operations at Tinian Airport is 67 operations per day or about 469 operations per week. Table 6.2-1 also shows the percentage of the new military airlift operations compared to the existing operations at Tinian Airport. The largest contributor would be the MV-22 at 8.5%. However, this percentage would represent a small change to the noise environment at Tinian Airport. Under this airlift operations scenario, rather than experiencing an average noise level metric such as DNL, the noise receptors would experience a series of SELs concentrated on the 2 days of the week when Marines are transported to and from Tinian.

For example, if C-17s are used for transportation of 400 Marines, then ground receptor(s) would hear four sorties arriving and four leaving on Monday and not hear anymore C-17s until Saturday when they would hear the same number of planes come back to pick up the Marines at the end of the week. Since the exposure would be brief, with no residences under the flight path, the impacts would be negligible and less than significant.

Table 6.2-2 shows the SEL levels for potential airlift operations. Noise levels around airports are expressed in terms of DNLs because this measurement provides a good average noise level from aircraft travelling to and from a single location, the runways. On the other hand, training operations do not always have centralized destinations. In this case, a better measurement of noise analyses is to use SELs for aircraft traveling overhead or laterally from an observer. Table 6.2-2 lists the aircraft proposed for this action and the associated SELs for cruising speeds at various altitudes. Operations applicable for using this noise metric are those where the aircraft is moving along a route or traversing through airspace such as flying in formation, terrain flights, ground threat reaction, and defensive maneuvers.

While the information is Table 6.2-2 is useful for assessing noise effects of aircraft passing by, these data do not accurately reflect noise associated with training exercises such as hovering activities at landing zones (LZs). A better representation is provided in Table 6.2-3 for low-speed flights. However, these noise levels are modeled at the slowest speeds the models are capable of calculating. It is expected that noise levels in the hovering mode would be higher (Czech 2009).

Table 6.2-2. Sound Levels (SEL and L_{max} [dBA]) for Proposed Aircraft Associated

Altitude (ft AGL)	*MV-22*		*CH-53*		*AH-1*		*UH-1*	
	SEL	*L_{max}*	*SEL*	*L_{max}*	*SEL*	*L_{max}*	*SEL*	*L_{max}*
100	108	104	106	106	98	97	106	97
250	96	96	101	98	94	89	100	89
500	92	89	98	91	91	83	96	83
1,000	88	82	94	85	87	76	91	76
KIAS	220		120		100		80	
Power Setting	Cruise		68% Q-BPA		LFO Lite 100 knots		100% RPM	

Legend: KIAS = Knots indicated air speed; LFO = Level flight operation; RPM = Revolutions per minute; AGL = above ground level

Notes: Environmental conditions were assumed to be 80% humidity and 80^{o} F.

Sources: Air Force 2002, Navy 2009.

Table 6.2-3. Single Event Maximum Noise Levels (L_{max}, dBA) for Low-speed Flights

Altitude (ft AGL)	*MV-22*[1]	*CH-53E*[1]	*AH-1W*[1]	*UH-1N*[2]
	64 KIAS	*65 KIAS*	*65 KIAS*	*65 KIAS*
30	117	112	110	NA
60	110	106	103	103
100	106	101	99	97
150	102	97	95	94

Notes: 1. RNM Single Track Mode used for L_{max} calculation
Receiver directly below flyover and at 5 ft AGL
Time spacing equal to 0.1 seconds
Modeled utilizing the appropriate slowest speed sound sphere available for each aircraft
2. Modeled with MRNMAP single track flyover using L_{max} metric mode
NA -- MRNMAP altitude limitations do not allow calculation down to 30 ft AGL

Live-Fire Training

The operation of the four proposed ranges on Tinian: would result in the introduction and long-term presence of a noise source associated with small arms fire. At the Automated Combat Pistol/Military Police Firearms Qualification Course, 9 millimeter small arms would be authorized for use. At the other three ranges, 5.56 millimeter rifles would be authorized for use. Noise that would be generated by the proposed small arms firing is characterized as impulsive noise that is associated with a higher level of annoyance as compared to more continuous noise sources (e.g., traffic noise). Impulsive sound is of short duration (typically less than one second) and high intensity. It has abrupt onset, rapid decay, and often a rapidly changing spectral composition. Other example sources of impulse sound include explosions, impacts, and the passage of supersonic aircraft (sonic booms), though none of these sources are included within the description of the proposed action.

There are two major noise sources generated from small arms munitions firing. The first is the muzzle blast from the firing of a bullet. The second is the noise from the bow shock wave (also known as ballistic wave) generated by the super-sonic bullet. The bow shock wave propagates out from the path of the bullet. The bullet from an M16 has an exit velocity of approximately 3,100 ft (945 m) per second, but decelerates quickly. After approximately 3,937 ft (1,200 m), it is no longer flying at supersonic speeds and the shock wave would likely end within 6,562 ft (2,000 m).

Firing noise from single shots merged in bursts, machine gun bursts, and concurrent firing of multiple weapons as would occur at the proposed ranges, would result in short periods of intense firing followed by longer periods of silence. There may be an increased annoyance associated with this type of noise exposure pattern. Under these conditions, the number of shots becomes less important than the dB level of the typical (average) shot. It has been found that small arms fire is usually not a concern unless the linear peak sound pressure level of individual shots is above 85 dB PK-15(met). In addition to PK-15 noise contours, A-weighted Day Night Average Level (ADNL) contours were also calculated. The results of the modeling of the noise impacts from Range Complex Alternative 1 are provided in Figure 6.2-1 for PK-15 contours and in Figure 6.2-2 for ADNL contours. The contours would be entirely within the DoD-controlled land except for a small portion extending on the northern edge of the Tinian Airport property. In this case, no noise-sensitive receptors would be impacted, resulting in no noise impacts associated with this alternative.

Noise from other elements of the proposed action on Tinian, such as from bivouac activity and ground transport of the 200-400 Marines would be discountable and would not affect sensitive noise receptors. Since neither live-fire noise nor the other activities associated with Tinian would reach sensitive receptors, operational impacts due to airfield operations and live-fire training would result in less than significant noise impacts.

6.2.2.2 Summary of Alternative 1 Impacts

Airfield operations at Tinian Airport would be due to weekly airlifting Marines to and from Guam on Mondays and Saturdays. The number of operations would be at most 14% if CH-46s are used and noise impacts would be less than significant. Aviation and live-fire training would be located well with the military area and noise associated with these activities would not likely be heard from off-base receptors. Table 6.2-4 summarizes Alternative 1 impacts.

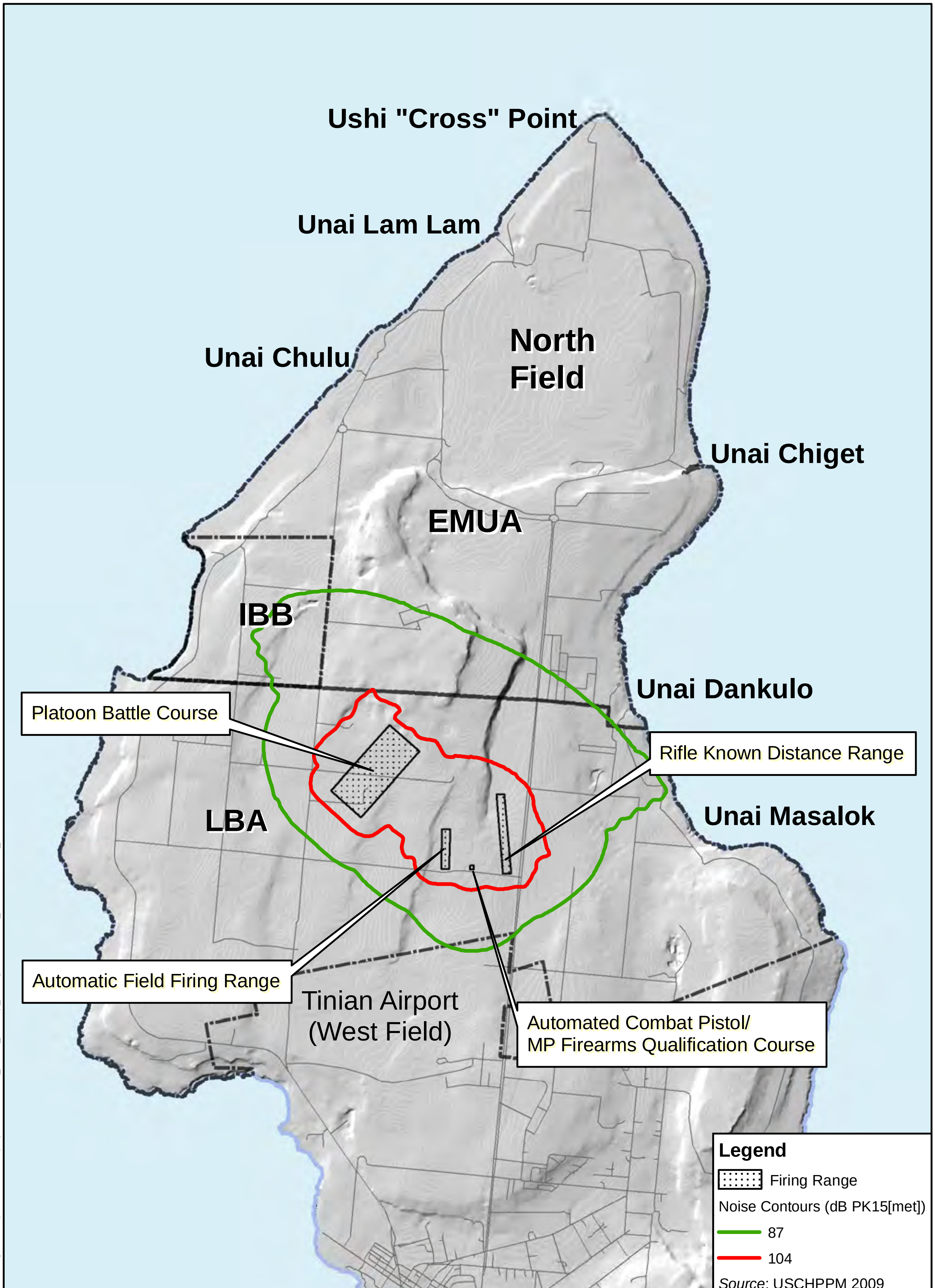

Figure 6.2-1
Projected Small Caliber Operational Noise Contours (PK15) - Alternative 1

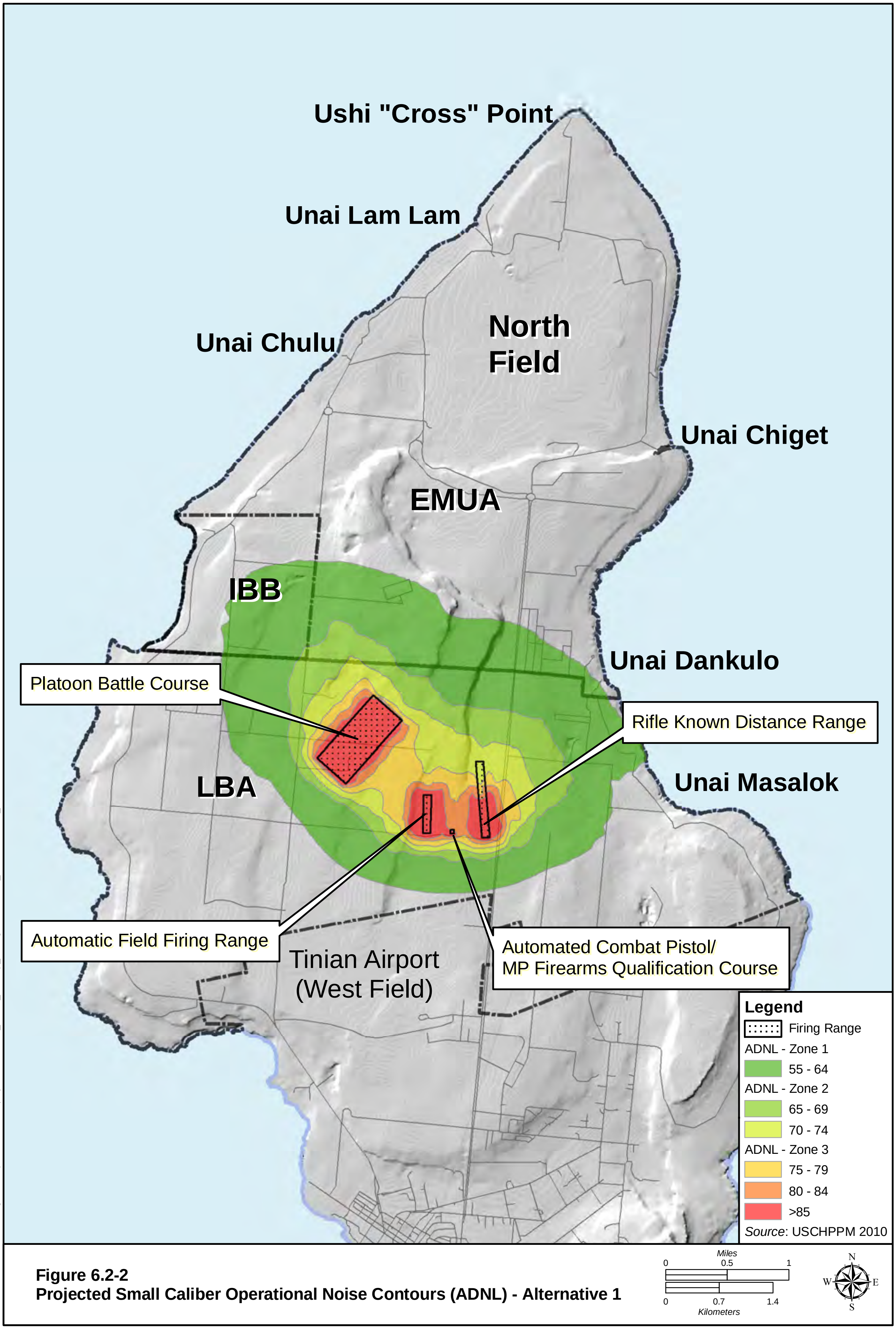

Figure 6.2-2
Projected Small Caliber Operational Noise Contours (ADNL) - Alternative 1

Table 6.2-4. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Noise impacts would be less than significant because noise from construction activities would not reach sensitive receptors
	Operation	Noise impacts would be less than significant for airfield operations and live-fire training

6.2.2.3 Alternative 1 Proposed Mitigation Measures

Mitigation measures have not been identified for any of the activities or locations associated with the proposed action since noise levels above casual receptors not permanently living or working under a noisy location would be within acceptable standards.

6.2.3 Alternative 2

6.2.3.1 Tinian

Construction

Noise impacts during the construction phase of Alternative 2 would be identical to Alternative 1, except for the location and orientation of the firing ranges, and below the threshold for sensitive receptors or continuous exposure. Given these assessments, potential noise impacts associated with construction activities for Alternative 2 would be less than significant.

Operation

Noise impacts during the operational phase of Alternative 2 would be identical to Alternative 1 and would be considered less than significant.

The results of the modeling of the noise impacts from Range Complex Alternative 2 are provided Figures 6.2-3 and 6.2-4. With the exception of the configuration of the potential noise exposure locations, the noise impacts of Alternative 2 would be as described for Alternative 1.

6.2.3.2 Summary of Alternative 2 Impacts

Table 6.2-5 summarizes Alternative 2 impacts.

Table 6.2-5. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Noise impacts would be less than significant because noise from construction activities would not reach sensitive receptors
	Operation	Noise impacts would be less than significant for airfield operations and live-fire training

6.2.3.3 Alternative 2 Proposed Mitigation Measures

Mitigation measures have not been identified for any of the activities or locations associated with Alternative 2 since noise levels above casual receptors not permanently living or working under a noisy location would be within acceptable standards.

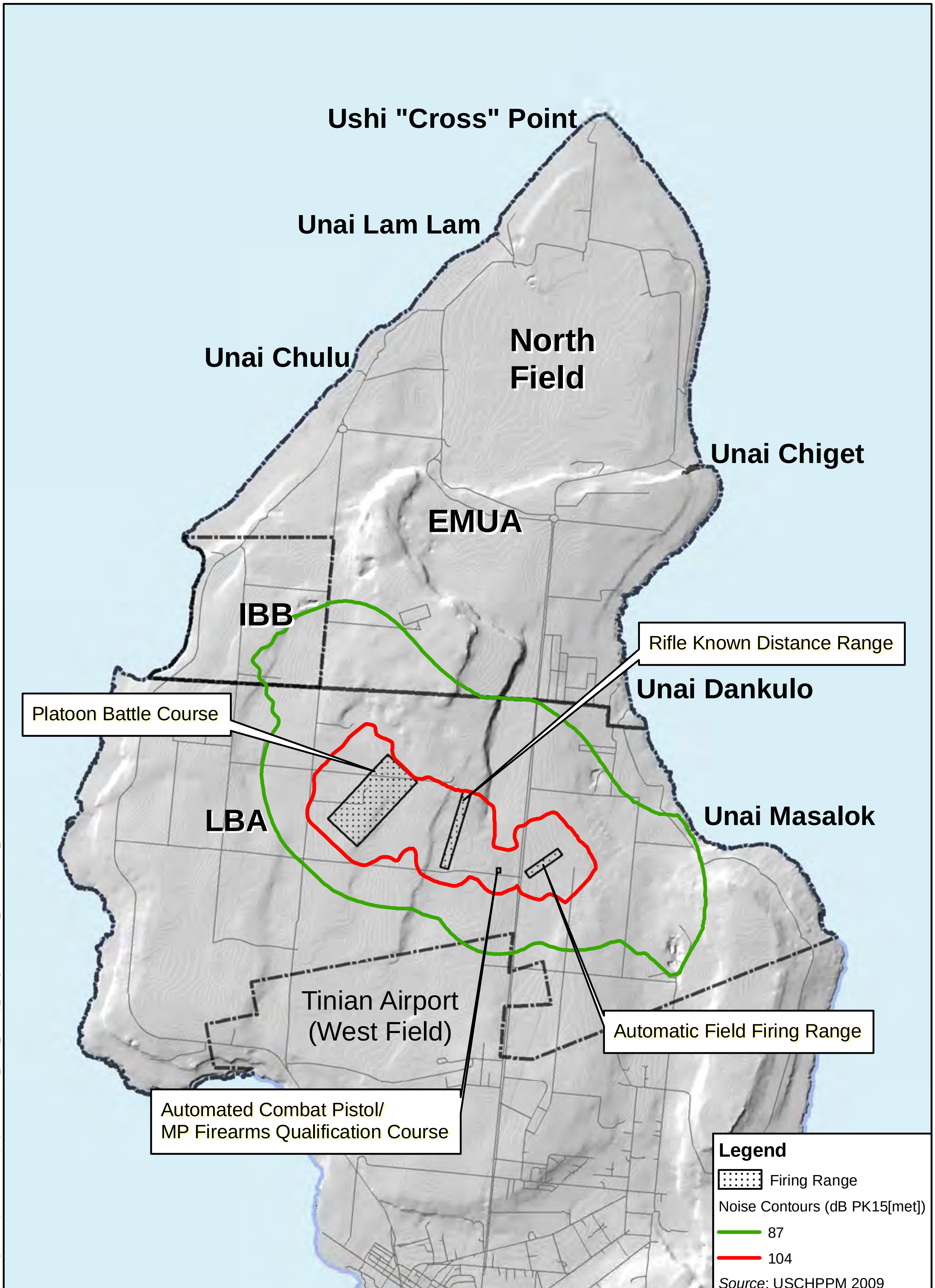

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Figure 6.2-3
Projected Small Caliber Operational Noise Contours (PK15) - Alternative 2

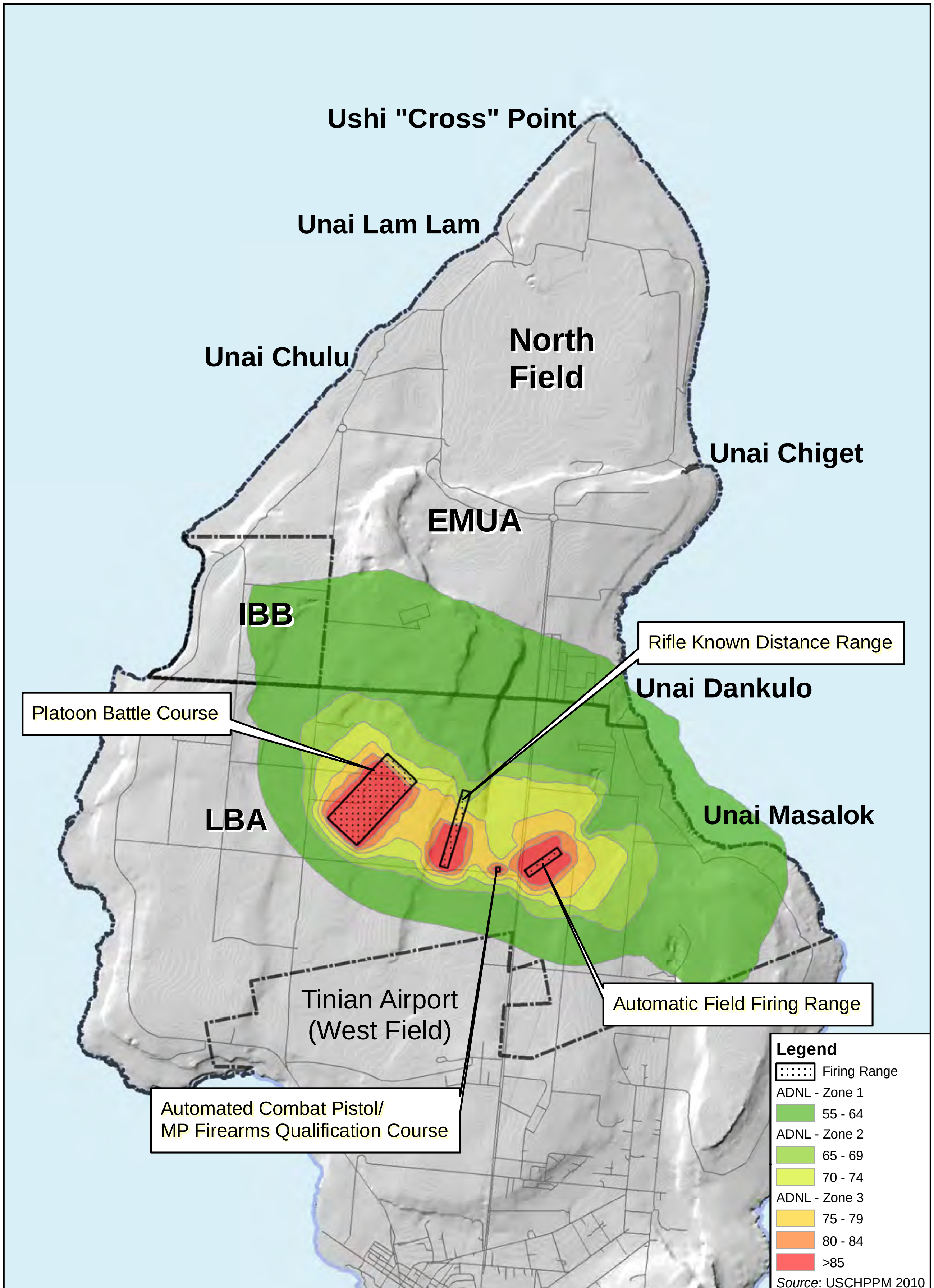

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Figure 6.2-4
Projected Small Caliber Operational Noise Contours (ADNL) - Alternative 2

6.2.4 Alternative 3

6.2.4.1 Tinian

Construction

Noise impacts during the construction phase of Alternative 3 would be identical to Alternative 1, except for the location and orientation of the firing ranges, and it would be below the threshold for sensitive receptors or continuous exposure, and therefore considered less than significant.

Operation

Sources of noise pollution during daily operations are common to all Alternatives and are detailed above in Alternative 1. Therefore, potential operational noise impacts from this alternative would be less than significant.

The results of the modeling of the noise impacts from Range Complex Alternative 3 are provided Figure 6.2-5 and 6.2-6. The noise contours for this alternative extend farther onto non-DoD lands, but are still within the Tinian Airport property and no sensitive noise receptors would be affected. As a result, there would be less than significant noise impacts associated with live-fire training for this alternative.

6.2.4.2 Summary of Alternative 3 Impacts

Table 6.2-6 summarizes Alternative 3 impacts.

Table 6.2-6. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Noise impacts would be less than significant because noise from construction activities would not reach sensitive receptors
	Operation	Noise impacts would be less than significant for airfield operations and live-fire training

6.2.4.3 Alternative 3 Proposed Mitigation Measures

Mitigation measures have not been identified for any of the activities or locations associated with Alternative 3 since noise levels above casual receptors not permanently living or working under a noisy location would be within acceptable standards.

6.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. Therefore, the no-action alternative would result in no noise impacts.

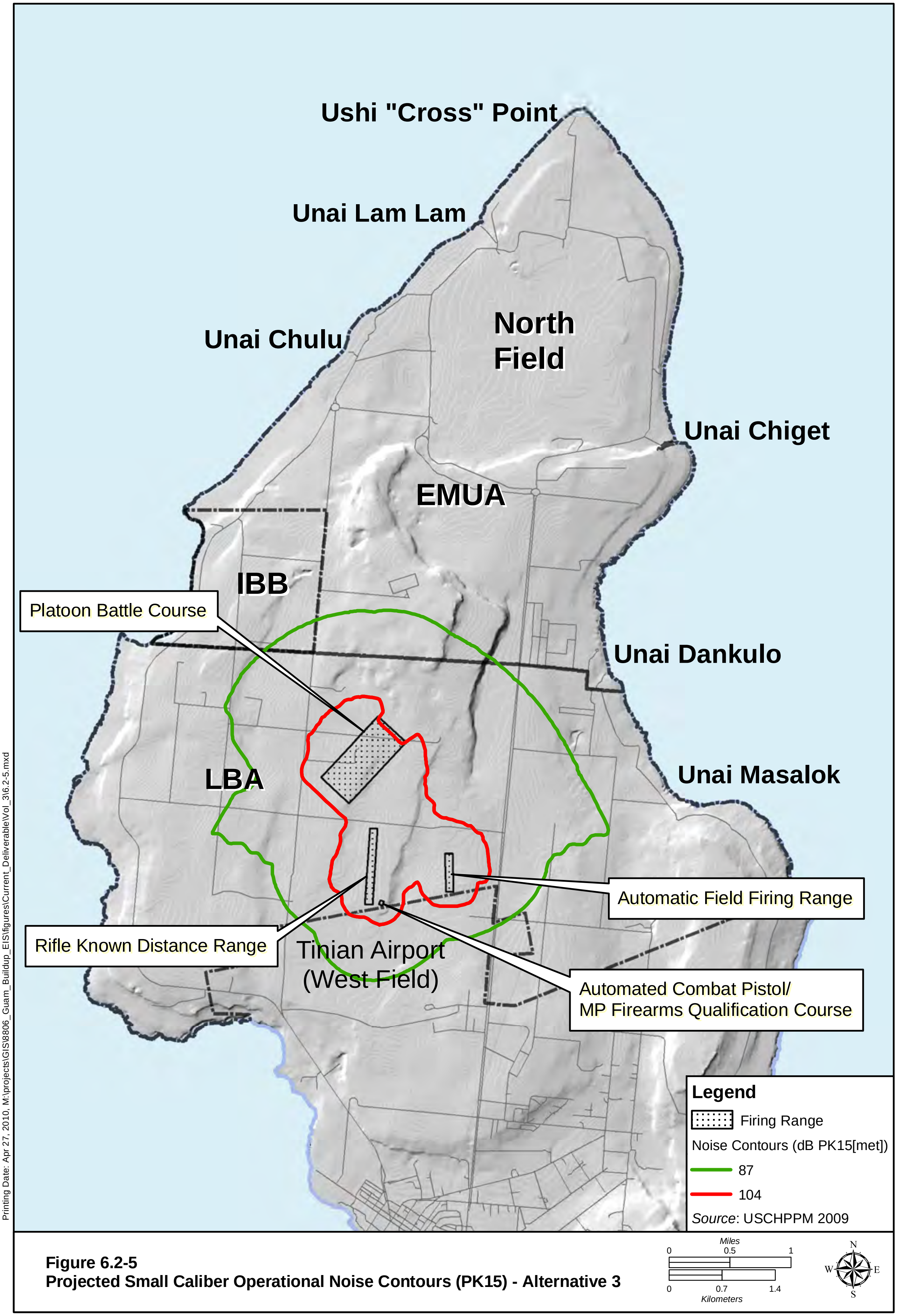

Figure 6.2-5
Projected Small Caliber Operational Noise Contours (PK15) - Alternative 3

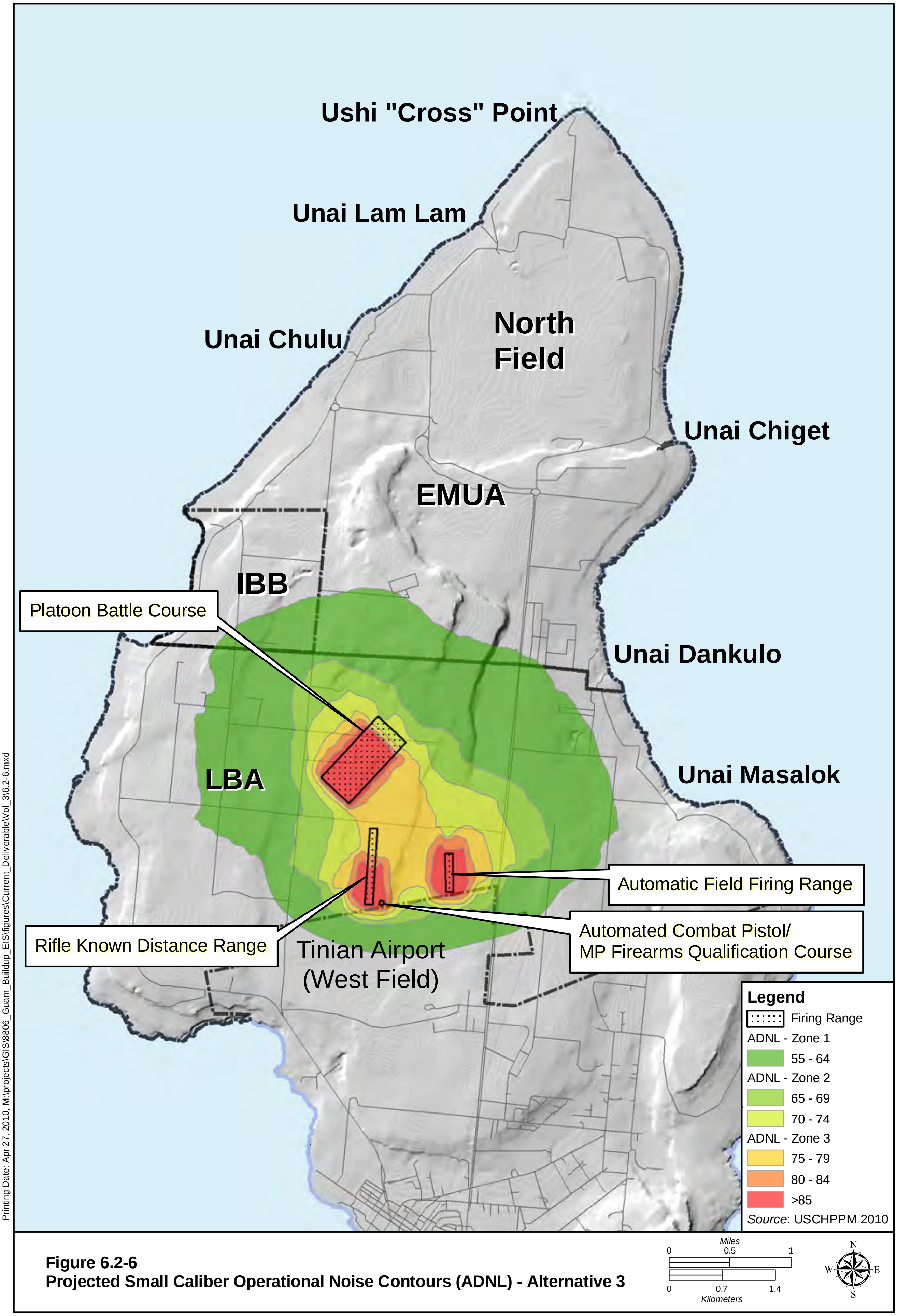

Figure 6.2-6
Projected Small Caliber Operational Noise Contours (ADNL) - Alternative 3

6.2.5.1 Summary of Impacts

Table 6.2-7 summarizes the potential impacts of each action alternative and the no-action alternative. A text summary is provided below.

Table 6.2-7. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
LSI • Construction noise impacts would be less than significant • Operation noise impacts would be less than significant for airfield operations and live-fire training	LSI • Construction noise impacts would be less than significant • Operation noise impacts would be less than significant for airfield operations and live-fire training	LSI • Construction noise impacts would be less than significant • Operation noise impacts would be less than significant for airfield operations and live-fire training	NI

Legend: LSI = Less than significant impact, NI = No impact.

Aircraft noise would be generated on Tinian and in Special Use Airspace at other CNMI locations, but would be concentrated well away from populated areas or at the Tinian Airport. Noise levels (if any) experienced by sensitive receptors would be low and concentrated on the days the airlift is transporting Marines to and from Tinian. Construction noise would be minimal because it would be located well within the boundary of the LBA or EMUA. Similarly, live-fire training exercises would create noise, but at levels to far away from the nearest receptor(s) to be heard, consequently not creating incompatible noise zones that would extend past the boundary of military controlled lands on Tinian. Therefore, construction and operation noise impacts would be less than significant.

6.2.6 Summary of Proposed Mitigation Measures

Table 6.2-8 summarizes the proposed mitigation measures.

Table 6.2-8. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Construction		
• None	• None	• None
Operation		
• None	• None	• None

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CHAPTER 7. AIRSPACE

7.1 AFFECTED ENVIRONMENT

7.1.1 Definition of Resource

Airspace management is defined as directing, controlling, and handling flight operations in the volume of air that overlies the geopolitical borders of the United States (U.S.) and its territories. In the U.S. and its territories, airspace is a resource that is managed by the Federal Aviation Administration (FAA). The FAA has established policies, designations, and flight rules to protect aircraft. The FAA has overall responsibility to manage and control this airspace, including that used by commercial, civil, and military aircraft. To ensure safe and efficient airspace use, the FAA defines the types of airspace and the nature of activities that each type can accommodate. The FAA Western Service Area (Renton, Washington) provides guidance and control of U.S. territory airspace in the Pacific that includes Tinian and Saipan airspace. Saipan Air Traffic Control (ATC) manages airspace for both Saipan and Tinian airports. The practices used to manage airspace consider how the airspace is designated, used, and administered to best accommodate the individual and common needs of the military, commercial organizations, and private aviation enthusiasts. Because of these multiple and sometimes competing demands, the FAA considers all aviation airspace requirements in relation to airport operations, federal airways (FAA air routes approved for use at different altitudes and provided on aeronautical charts available for pilots), jet routes, military flight training activities, and other special needs to determine how the National Airspace System can best be structured to satisfy all user requirements.

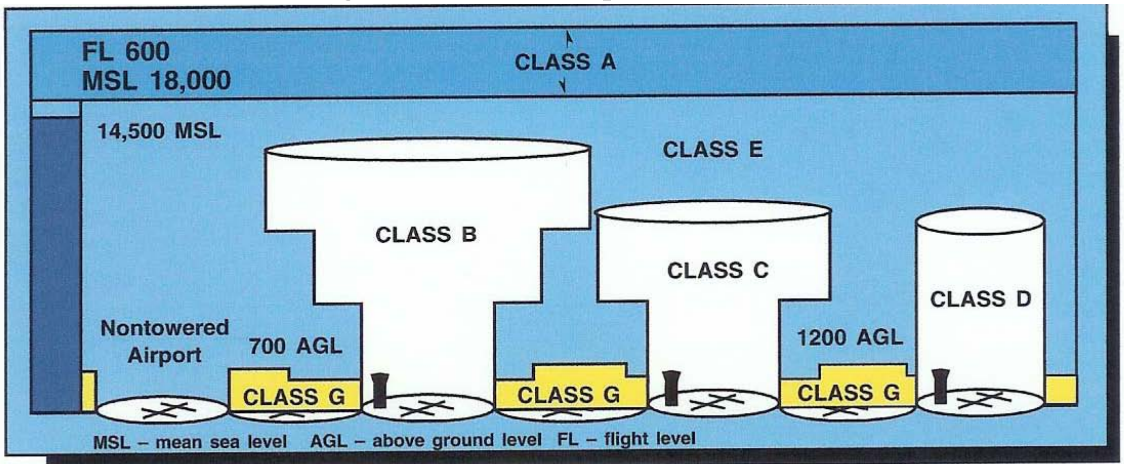
The types of airspace designated by the FAA are identified below (Figure 7.1-1). Saipan International Airport is currently surrounded by Class D and Class E airspace. The FAA is making changes effective May 7, 2009, to the airspace surrounding Saipan International Airport and Tinian Airport (West Field). In accordance with FAA Order 7400.9S, Class D airspace would surround Saipan International Airport and Class E airspace would become Northern Mariana Islands Class E airspace.

7.1.2 Tinian

7.1.2.1 North

The military currently conducts training in the Military Lease Area (MLA) in the form of airlift of personnel and cargo to maneuver areas. Training also includes providing various support functions to forces already on the ground, such as cargo delivery, firefighting, and search-and-rescue. An important feature of the Exclusive Military Use Area (EMUA) is North Field, a large abandoned World War II-era airfield that is still usable as a contingency landing field and supports fixed-wing and helicopter training activities. North Field's four runways, taxiways, and parking aprons provide various tactical scenarios without interfering with commercial and community activities south of the MLA. The remote area is suitable for a variety of aviation support training. Use of North Field by military aircraft also reduces or eliminates the need to share use of Tinian Airport (West Field) with commercial flight activity. There would be no impacts to existing International Broadcasting Bureau (IBB) towers or interference with FAA activities in this area.

Figure 7.1-1. FAA Airspace Classifications



Airspace Features	*Class A*	*Class B*	*Class C*	*Class D*	*Class E*	*Class G*
Former Airspace Equivalent	Positive Control Area	Terminal Control Area	Airport Radar Service Area	Airport Traffic Area and Control Zone	General Controlled Airspace	Uncontrolled Airspace
Operations Permitted	IFR	IFR and VFR	IFR and VFR	IFR and VFR	IFR and VFR	IFR and VFR
Entry Requirements	ATC Clearance	ATC Clearance	ATC Clearance for IFR. All require Radio Contact	ATC Clearance for IFR. All require Radio Contact	ATC Clearance for IFR. All require Radio Contact	None
Minimum Pilot Qualifications	Instrument Rating	Private or student certificate	Student Certificate	Student Certificate	Student Certificate	None
Two-way Radio Communications	Yes	Yes	Yes	Yes	Yes for IFR	No
VFR Minimum Visibility	NA	3 statute mi	3 statute mi	3 statute mi	3 statute mi	1 statute mi
VFR Minimum distance from Clouds	NA	Clear of Clouds	500’ below, 1,000’ above and 2,000’ horizontal	500’ below, 1,000’ above and 2,000’ horizontal	500’ below, 1,000’ above and 2,000’ horizontal	Clear of Clouds
Aircraft Separation	All	All	IFR, SVFR, and runway operations	IFR, SVFR, and runway operations	IFR and SVFR	None
Traffic Advisories	NA	NA	Yes	Workload permitting	Workload permitting	Workload permitting
Safety Alerts	Yes	Yes	Yes	Yes	Yes	Yes
Differs from International Civil Aviation Organization	No	Yes	Yes	Yes for VFR	No	Yes for VFR
Changes the Existing Rule	No	Yes for VFR	No	Yes	No	No

Legend: IFR= Instrument Flight Rule; VFR= Visual Flight Rule; NA= Not Applicable

7.1.2.2 South

All commercial flights fly into Tinian Airport (West Field). The airport has one asphalt runway that is 8,600 feet (ft) (2,621 meters [m]) by 150 ft (45.7 m). The airport is equipped with a navigational light system, but has no control tower or additional navigational aids. The FAA at Saipan International Airport conducts air traffic control for flights in and out of Tinian Airport. Daily activity consists of commuter flights connecting Tinian with Saipan, Rota, and Guam. Currently Tinian Airport (West Field) averages 67 flight operations a day, (62 air taxi, and 5 general aviation flights). There are four single-engine aircraft and two multi-engine aircraft based at the airport. The closest airport with instrument approaches is Saipan International Airport located 11 nautical miles (nm) (20.5 kilometers [km]) northeast of Tinian Airport (West Field) (Flightaware 2009). There are three published approaches to Tinian Airport (West Field) (Skyvector 2009). There is an average of 108 aircraft operations a day at Saipan International Airport (AirNav 2009).

7.1.3 Other

7.1.3.1 Military Air Traffic on Farallon de Medinilla

R-7201 is a restricted airspace with a 3 nm (5.6 km) radius surrounding Military Air Traffic on Farallon de Medinilla (FDM), although the published Notice to Airmen (NOTAM) usually advises that a 10 nm (18.6 km) radius is to be observed. The altitude limits of R-7201 span from surface to infinity and the airspace supports live-fire and inert training activities such as surface to ground and air to ground gunnery, bombing, and missile exercises, along with Fire Support and Precision Weapons delivery on the range.

7.1.3.2 Civilian Air Traffic on Farallon de Medinilla

There is no civilian use of airspace around FDM because it is a restricted area and available only to military traffic. NOTAMs usually advise of a 10 nm (18.6 km) radius around FDM to be used exclusively by the military.

7.2 Environmental Consequences

7.2.1 Approach to Analysis

7.2.1.1 Methodology

Impacts on airspace use were assessed by evaluating the potential effects of the proposed training activities on the principal attributes of airspace use, as described in Section 7.1. Impact categories and how they were assessed for this project are as follows:

- Impacts on controlled and uncontrolled airspace were assessed by determining if the project would reduce the amount of navigable airspace by creating new or expanding existing Special Use Airspace (SUA) or by introducing temporary flight restrictions or presenting an obstruction to air navigation.
- Impacts on SUA were assessed by determining the project's requirement either for new SUA or for modifying existing SUA.
- Impacts on en route airways were assessed by determining if the project would lead to a change in a regular flight course or altitude or instrument procedures.
- Impacts on airports and airfields were assessed by determining if the project would restrict access to or affect the use of airports/airfields available for public use or if it would affect airfield/airport arrival and departure traffic flows.

Factors used to assess impacts on air traffic include consideration of an alternative's potential to result in an increase in the number of flights such that they could not be accommodated within established operational procedures and flight patterns; a requirement for airspace modification; or an increase in air traffic that might increase collision potential between military and nonparticipating civilian operations. A distinction between the impacts associated with construction and operation was not applicable to this impact evaluation, and therefore not made.

7.2.1.2 Determination of Significance

Based in part on FAA Order 7400.2E, *Procedures for Handling Airspace Matters*, an action is considered to have a significant airspace impact if it would result in any of the following:

- Reduce the amount of navigable airspace that would have adverse aeronautical impacts to non-participating users that could not be mitigated.
- Create an obstruction to air navigation.
- Assign new SUA (including Controlled Firing Areas, Restricted Areas, Warning Areas, and Military Operations Areas) or require the modification of existing SUA that would have adverse aeronautical impacts that could not be mitigated.
- Change an existing or planned instrument flight rule (IFR) minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure or require a visual flight rule (VFR) operation to change from a regular flight course or altitude.
- Reduce public health and safety due to a change in aviation safety risk.
- Restrict access to or effects on the use of airports and airfields available for public use.
- Change commercial or private airfield or airport arrival and departure traffic flows.

7.2.1.3 Issues Identified during Public Scoping Process

There were no airspace issues for Tinian mentioned by the general public, including regulatory stakeholders, during the public scoping process. No new SUA would be developed involving Tinian or Saipan.

7.2.2 Alternative 1 (Preferred Alternative)

7.2.2.1 Tinian

Under Alternative 1, existing SUA and other existing designated airspace would be used to conduct aircrew flight training and in periodic airlifts of Marines from Guam to Tinian for training evolutions. Airlifts would be conducted under VFR and also would not require SUA. Under this alternative, there would be no new SUA. Additional military aircraft operations would be within the capacity of existing air traffic control capabilities.

There would be no impacts to general aviation or commercial aviation from limitations of airspace use. Flights between Tinian Airport (West Field), Saipan International Airport, and other airfields would not change. Since none of the proposed firing training ranges would require SUA, there would be no need for any changes to existing approach or departure routes for Tinian Airport (West Field).

There would be no reduction in the amount of navigable airspace, or no assignment of new or modified SUA. Similarly, there would be no change to enroute airways or IFR procedures. There would also be no restrictions on access to and no effect on the use of airports or airfields available for public use, and there would be no effect on airport or airfield arrival and departure traffic flows. There would be no construction that could obstruct air navigation and no new air traffic that could affect aviation safety.

Since there would be no restricted airspace or other SUA for activities on Tinian, there would be no impacts to approaches, departures, or traffic patterns for either Saipan International Airport or Tinian Airport (West Field). Airspace management procedures outlined in Section 2.4 would be implemented. Any hazardous air training activities would continue to be communicated to commercial airlines and general aviation by NOTAMs for SUA, published by the FAA. There would be no additional impacts on the FAA's capabilities, no expected decrease in aviation safety, and no adverse effect on commercial or general aviation activities. There would be no impacts to airspace resources.

7.2.2.2 Summary of Alternative 1 Impacts

Table 7.2-1 summarizes Alternative 1 impacts.

Table 7.2-1. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	NA
	Operation	No impacts to airspace would occur

Legend: NA = Not Applicable

7.2.2.3 Alternative 1 Proposed Mitigation Measures

No mitigation measures would be required.

7.2.3 Alternative 2

7.2.3.1 Tinian

Airspace for training under this alternative would be the same as under Alternative 1.

7.2.3.2 Summary of Alternative 2 Impacts

Table 7.2-2 summarizes Alternative 2 impacts.

Table 7.2-2. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	NA
	Operation	No impacts to airspace would occur

Legend: NA = Not Applicable

7.2.3.3 Alternative 2 Proposed Mitigation Measures

No mitigation measures would be required.

7.2.4 Alternative 3

7.2.4.1 Tinian

The impacts to airspace for the Alternative 3 would be the same as identified for Alternative 1.

7.2.4.2 Summary of Alternative 3 Impacts

Table 7.2-3 summarizes Alternative 3 impacts.

Table 7.2-3. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	NA
	Operation	No impacts to airspace would occur

Legend: NA = Not Applicable

7.2.4.3 Alternative 3 Proposed Mitigation Measures

No mitigation measures would be required.

7.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. There would be no impacts on airspace use. There would be no reduction in the amount of navigable airspace, or no assignment of new or modified SUA. Similarly, there would be no change to enroute airways or IFR procedures. There would also be no restrictions on access to and no effect on the use of airports or airfields available for public use, and there would be no effect on airport or airfield arrival and departure traffic flows. There would be no construction that could obstruct air navigation and no new air traffic that could affect aviation safety. There would be no impacts to airspace resources.

7.2.6 Summary of Impacts

Table 7.2-4 summarizes the impacts of all the proposed alternatives. A text summary is provided below.

Table 7.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Construction			
• NA	• NA	• NA	• NA
Operation			
• NI	• NI	• NI	• NI

Legend: NI = No impact, NA = Not Applicable.

Under all of the alternatives, there would be no impacts to airspace resources. Alternatives 1, 2, and 3 would increase aircraft operations in the north and south portions of Tinian, but would be well within the capacity of existing airspace use. There would be no new SUA and there would not require any changes to existing arrival and departures from either the Tinian or Saipan airports. There are no enroute low-altitude airways, and no IFR procedures would need to change. Access to and the approach and departure patterns associated with the airports and airfields would not be restricted, nor would they be required to change. Airspace management procedures outlined in Section 2.4 would be implemented. Well-established and understood aviation procedures and rules governing flight operations in both controlled and uncontrolled navigable airspace and existing SUA make future adverse impacts on public health and safety extremely unlikely. Aircrews for military participants and non-participating aircraft would be responsible for using see-and-avoid techniques to avoid hazards.

7.2.7 Summary of Proposed Mitigation Measures

Table 7.2-5 summarizes the proposed mitigation measures.

Table 7.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Construction		
• NA	• NA	• NA
Operation		
• None	• None	• None

Legend: NA = Not Applicable.

CHAPTER 8. LAND AND SUBMERGED LAND USE

8.1 AFFECTED ENVIRONMENT

8.1.1 Definition of Resource

This chapter describes and analyzes impacts of the proposed action on land and submerged lands ownership and management, and land and submerged lands use. Submerged lands refer to coastal waters extending from the Commonwealth of the Northern Mariana Islands (CNMI) coastline into the ocean 3 nautical miles (nm) (5.6 kilometers [km]), the limit of state or territorial jurisdiction.

Land use discussions for this Draft Environmental Impact Statement (EIS) include civilian and military existing and planned land uses, and land use planning guidance that directs future development. With respect to land ownership on Tinian, fee interest ownership is the primary means of private land ownership; leases or easements may also be used for land transfer or management purposes. On Tinian, the Department of Defense (DoD) leases approximately two-thirds of the total island area, exerting a notable influence upon Tinian land use.

This chapter is organized to first look at existing conditions then impacts are identified by alternatives and components. The chapter concludes with identification and discussion of proposed mitigation measures that apply to significant impacts.

The region of influence (ROI) for land use is land and submerged lands of Tinian. The proposed action is limited to Tinian; therefore, the emphasis is on Tinian with background information provided on CNMI.

8.1.2 Tinian

Article XI and XII of the CNMI Constitution states that public lands collectively belong to the people of the Commonwealth who are of Northern Marianas decent. These lands were originally to be managed by the board-governed autonomous government agency known as the Marianas Public Land Authority. In 2006, the governor replaced the Marianas Public Land Authority with the Department of Public Lands (DPL). The DPL is under the executive branch and is the official government agency responsible for the administration and deposition of public lands in the CNMI. These public lands are available for lease for commercial purposes.

Land can be privately owned in the CNMI, but only by persons of “Northern Marianas descent,” which is defined as persons who are “of at least one-quarter Northern Marianas Chamorro or Northern Marianas Carolinian” and those persons are further defined as those who were living in the Northern Marianas in 1950.

The Northern Mariana Islands became self-governing under the terms of the “Covenant to Establish a CNMI in Political Union with the United States of America (Covenant)” that was negotiated with the United States (U.S.) (U.S. and CNMI 1975a). The Covenant defines the relationship between the Northern Mariana Islands and the U.S., recognizing sovereignty of the U.S., but limiting, in some respects, the applicability of federal law. The Covenant was approved by Northern Mariana Islands voters on June 17th, 1975, and after approval by the U.S. House of Representatives and the Senate, then President Ford signed Public Law 94-281 enacting the Covenant on March 24, 1976.

8.1.2.1 CNMI DoD Land Lease and Management

Article VIII of the Covenant (1975a) stated that the following property would be "made available to the U.S. by lease to enable it to carry out its defense responsibilities" (Figure 8.1-1):

- On Tinian, approximately 17,799 acres (ac) (7,203 hectares [ha]) and the waters immediately adjacent thereto
- On Saipan, approximately 177 ac (72 ha) at Tanapag Harbor
- On Farallon de Medinilla, approximately 206 ac (83 ha) encompassing the entire island the waters immediately adjacent thereto

The lease was issued on January 6, 1983 for an initial term of 50 years, and with an option for the U.S. to renew for a succeeding additional 50-year term.

A separate *Technical Agreement Regarding Use of Land to Be Leased by the United States in the Northern Mariana Islands* (Technical Agreement) was simultaneously executed with the Covenant that provided for the leaseback of property and joint use arrangements for San Jose Harbor and West Field on Tinian (U.S. and CNMI 1975b). The Technical Agreement allowed for leaseback on Tinian for agricultural and grazing type uses for a sum of one dollar per acre per year and leaseback at Tanapag Harbor on Saipan to be used for uses compatible with military use. The Technical Agreement also allowed the leaseback of the remaining leased property on Saipan at no cost for use as a memorial park to honor those who died in the World War II Marianas campaign (Navy Facilities Engineering Command [NAVFAC] Pacific 2008). The remaining portion of the lease area at Tanapag Harbor on Saipan is used for a U.S. Army Reserve Center.

On January 6, 1983, a lease agreement covering the above lands was signed and the Department of the Navy (DoN) assumed control and possession. Any non-military uses within the leased areas must be approved by the DoN (NAVFAC Pacific 2008).

No lands on Rota are included under the lease; however, the CNMI Government allows the DoD uses of certain areas on Rota as well as certain non-lease areas on Tinian, including the commercial harbor, Tinian International Airport, and a staging area near San Jose Village (refer to Table 8.1-1). A right-of-entry agreement was granted for Navy SEAL training on Rota. The area of use is limited to West Harbor in Song Song village and the adjacent Angyuta Island (Commander of the Navy Region [COMNAV] Marianas 2004).

8.1.2.2 CNMI Submerged Lands Ownership and Management

Article XI of the Commonwealth Constitution states that "the submerged lands off the coast of the commonwealth are public lands belonging collectively to the people of the Commonwealth who are of Northern Marianas descent." The Commonwealth jurisdictional boundaries extend 3 nm (5.6 km) offshore and are managed by the DPL. Although jurisdiction has been disputed in the past, *CNMI v. U.S.* (2002) concluded that "the U.S. possesses paramount rights in and powers over the waters extending seaward of the ordinary water mark on the Commonwealth coast and the lands, minerals and other things of value underlying the waters…" (DoN 2010).

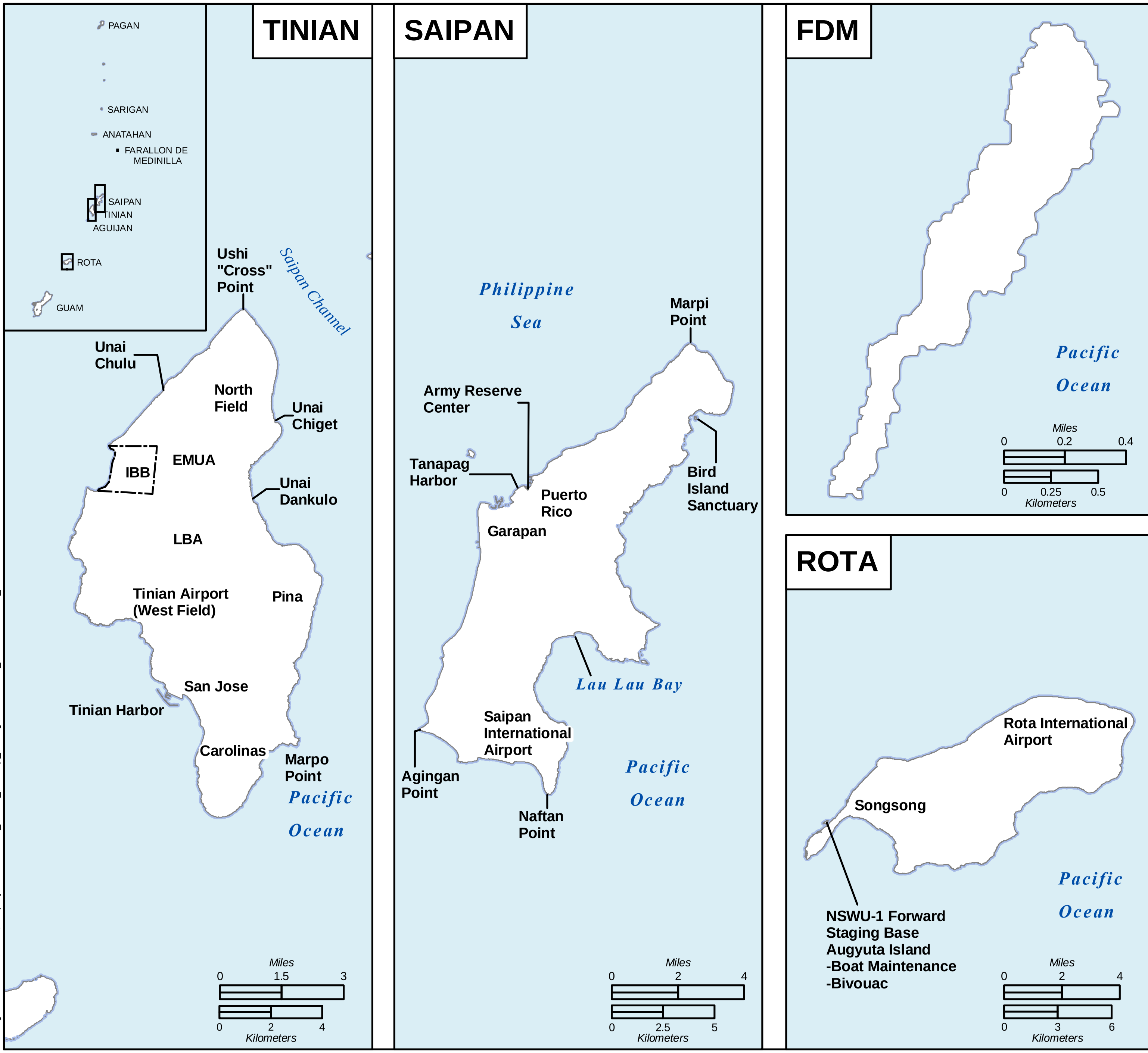


Figure 8.1-1
CNMI Lands

Source: DPL 2009b

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8.1.2.3 CNMI Land Use

Based on a DPL 2000 report, 58% of CNMI land was public land. Of these public lands, the percentages allocated for different land uses are shown in Table 8.1-1. The U.S. military does not have permanently stationed personnel on any island of the CNMI. The leased lands on Tinian, Saipan, and Farallon de Medinilla, are used for training purposes only.

Table 8.1-1. Percent Breakdown of Land Use for Public Lands in the CNMI

Land Use Category	*%*
Conservation and Wildlife	8.9
Temporary Agriculture and Grazing	3.7
Public Facilities	7.5
Village Homesteads	6.3
Golf Courses	9.3
Transportation	2.1
Land Exchange	0.5
Commercial and Hotel	15.0
Other	46.6

Source: CNMI Central Statistics Division Department of Commerce 2002.

A Land Use Master Plan is being prepared for Saipan and should be completed in 2009. A Tinian Land Use Master Plan has begun but relevant land use information derived from this planning process is not currently available (DPL 2009a).

8.1.2.4 Coastal Zones

The Coastal Zone Management Act (CZMA) was promulgated in 1972 as a means to "…preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations" through "…the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and esthetic values as well as the needs for compatible economic development..." (16 U.S. Code [USC] § 1451-1466 [2005]). The CZMA is administered through local programs designed in cooperation with the federal government.

Federal consistency requirements of the CZMA require that federal activities comply to the greatest extent possible with applicable local management programs. Non-federal activities must comply fully with local management programs if they require a federal permit or license, or if they receive federal funding (15 Code of Federal Regulations [CFR] Part 930). Land/submerged lands under federal jurisdiction is excluded from the territorial coastal zone. According to the CZMA, federal activities that affect any land or submerged lands use or natural resource of a territory's coastal zone shall be carried out in a manner that is consistent to the maximum extent practicable with the enforcement policies of federally-approved territorial Coastal Zone Management Program.

The CZMA is administered in CNMI by the Coastal Resources Management Office. The coastal zone includes all non-federal lands on the island, as well as offshore islands and non-federal submerged lands within 3 nm. The DoN has prepared a coastal zone consistency determination for the proposed project. Volume 9, Appendix H contains the CNMI consistency determination correspondence.

The CZMA is administered in CNMI by Coastal Resources Management Office. The coastal zone includes all non-federal lands on the island, as well as offshore islands and non-federal submerged lands within 3 nm. The Navy prepared and submitted a coastal zone consistency negative determination for the proposed actions on Tinian to the Coastal Resources Management Office on April 1, 2010 (resubmitted April 27, 2010). Pursuant to 15 CFR Section 930.35(c), the CNMI Coastal Resources Management Office was not obligated to respond to the negative determination, and since the CNMI Coastal Resources Management Office did not respond to the negative determination within 60 days, the CNMI Coastal Resources Management Office concurrence with the negative determination was presumed. Volume 9, Appendix H contains the CNMI negative determination.

The Coastal Resources Management Office has identified Areas of Particular Concern (APC) that are geographic delineated areas with special management requirements. Before work begins on any project to be located wholly or partially within an APC, a valid coastal permit is required. This is not applicable to federal-lease lands or federally-owned submerged lands, but the CZMA consistency determination addresses potential impacts on these APCs. Currently, there are five APCs in CNMI:

1. Shoreline – The area between the mean high water mark and 150 feet (ft) (46 meters [m]) 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 – Those areas that are permanently or periodically covered with water and where species of wetland or mangrove vegetation can be found
4. Port and Industrial – Those land and water areas surrounding the commercial ports of Saipan, Tinian, and Rota
5. Coastal Hazards – Those areas identified as coastal flood hazard zones in the Federal Emergency Management Agency Flood Insurance Rate Maps

8.1.2.5 Tinian Land and Submerged Lands Ownership

Tinian land area is approximately 25,151 ac (10,180 ha) in size. Tinian has approximately 68 miles (mi) (110 km) of roads, administered by CNMI's Department of Public Works. Eighth Avenue and Broadway are the key north-south roadways (Figure 8.1-2). Ten percent (approximately 2,422 ac [980 ha]) is privately owned and the remainder (22,726 ac [9,200 ha]) is public land (DPL 2009b). Public land is further classified and is listed in Table 8.1-2 and shown in Figure 8.1-2.

Table 8.1-2. Tinian Land Ownership

Owner	*Acres (% Total land)*	*Public Land Sub-classification*	*Public Land Acreage (% Total land)*
Private	2,422 (10%)	NA	NA
Public Land	22,729 (90%)	Grant of Public Domain	1,569 (7%)
Total	**25,151 (100%)**	Designated/In use	662 (3%)
		Leased	1,638 (7%)
		Covenant Leased	15,469 (68%)
		Undesignated/Not in Use	3,388 (15%)
		Total	**22,726 (100%)**

Legend: NA = Not Applicable.
Source: DPL 2009a.

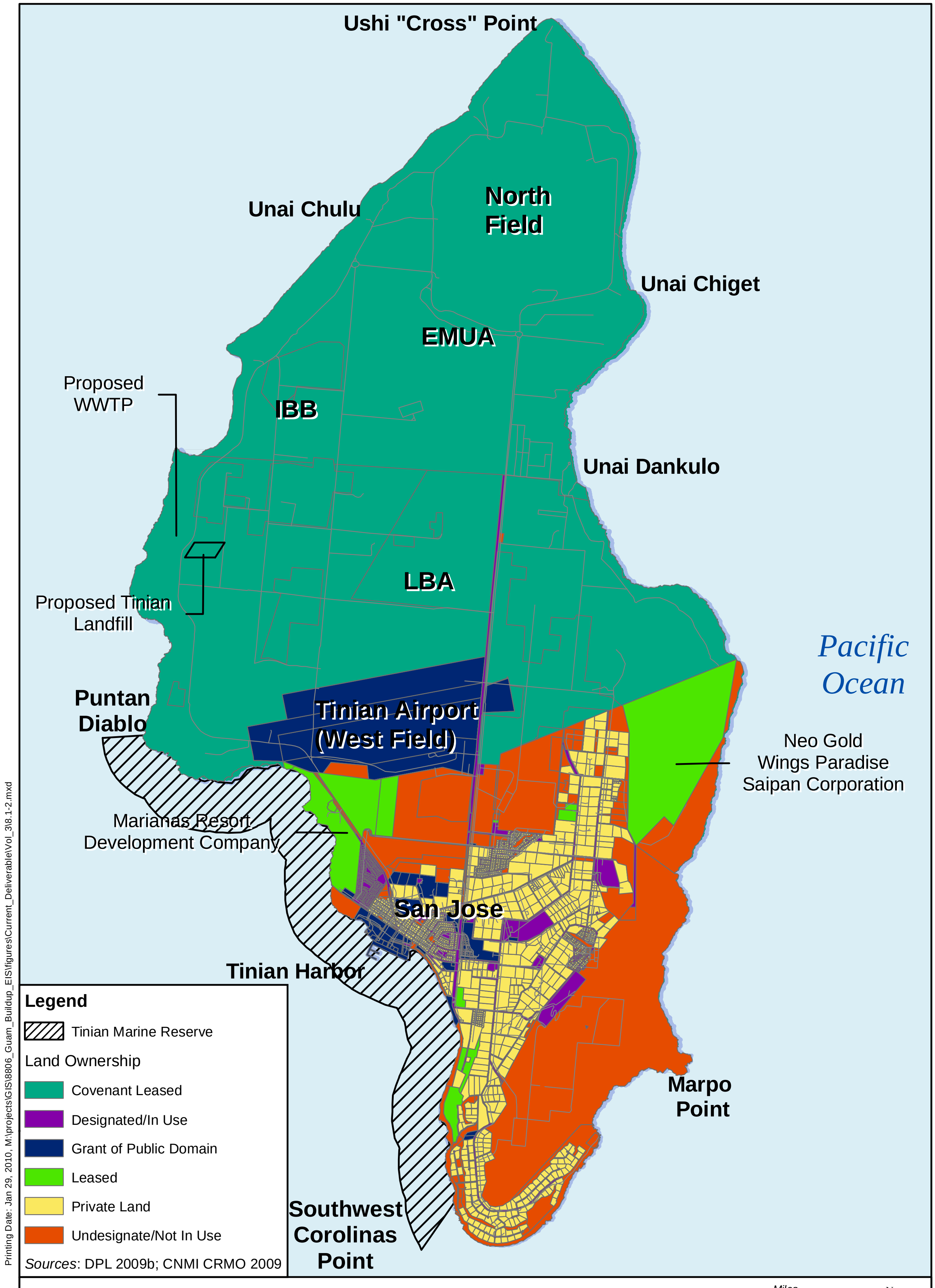

Figure 8.1-2
Tinian Land Ownership

Grant of Public Domain public lands are given in fee simple, and no specific use is specified. Designated public lands are actively managed for a particular use such as a forest or park. Leased land use requires government approval. If the area is greater than 12.4 ac (5 ha), then it must be approved by CNMI legislature. Areas less than 12.4 ac (5 ha) require DPL approval. These permits tend to be for commercial operations, such as hotels, golf courses, and cattle grazing. There are two approved permits as shown in Figure 8.1-2. Neo Gold Wings Paradise Saipan Corporation leases 741 ac (300 ha) for development of a casino, hotel, conference hall and amusement park (16th Northern Marianas Commonwealth Legislature 2009). Marianas Resort Development Company holds a lease for 337 ac (136 ha) for development of a golf course, casino, hotel and guest cottages (15th Northern Marianas Commonwealth Legislature 2007).

Tinian public lands without a specified use are undeveloped and are classified as undesignated public lands. DPL is required to make available some portion of public lands for a homestead program. 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 (15th Northern Marianas Commonwealth Legislature 2007). A future village homestead has been designated northwest of San Jose.

Covenant lands are leased to the military for training and are collectively referred to as the Military Lease Area (MLA). The MLA encompasses the northern estimated two-thirds of the island, and it is divided into the Exclusive Military Use Area (EMUA) and the Leaseback Area (LBA) (Figure 8.1-3). The MLA is largely undeveloped. There are no fences or gates to control access to the MLA. Specific areas within the MLA are fenced, such as an unexploded ordnance (UXO) area and a communications facility. There are remnant roadways, structures, airfields and runways from historical military use that are used for access and military training. Broadway and 8th Avenue are the primary Tinian north-south access roads that extend through the MLA.

All private land and non-covenant leased lands are located south of the MLA (refer to Figure 8.1-2). The submerged lands extend to 3 nm (5.6 km) from the coast of Tinian and other CNMI islands. The U.S. acquired rights to submerged lands of the CNMI pursuant to Article I, § 101 of *The Covenant to Establish a Commonwealth of the Northern Mariana Islands* (U.S. and CNMI 1975a). The jurisdiction over submerged lands has been disputed in the past, but in *CNMI v. U.S.* (2002) it was concluded that “The United States possesses paramount rights in and powers over the waters extending seaward of the ordinary water mark on the Commonwealth coast and the lands, minerals and other things of value underlying the waters…”

8.1.2.6 Tinian Areas of Particular Concern

The CRM office has identified three APCs for Tinian. These consist of shoreline, wetlands, port, and industrial APCs (Figure 8.1-3). The shoreline APC includes the entire island to the high water mark and is not depicted on Figure 8.1-3. The shoreline APC encompasses the entire island to the mean high water mark on the coastline. The Lake Hagoi portion of the wetland APC and most of the shoreline APC lies within the MLA. Before work begins on any project to be located wholly or partially within an APC, a valid coastal permit is required. This is not applicable to federal lease lands or federally owned submerged lands, but the CZMA consistency determination addresses potential impacts on these APCs. The Coastal Zone Consistency Determination Assessment and correspondence is included in the EIS appendices.

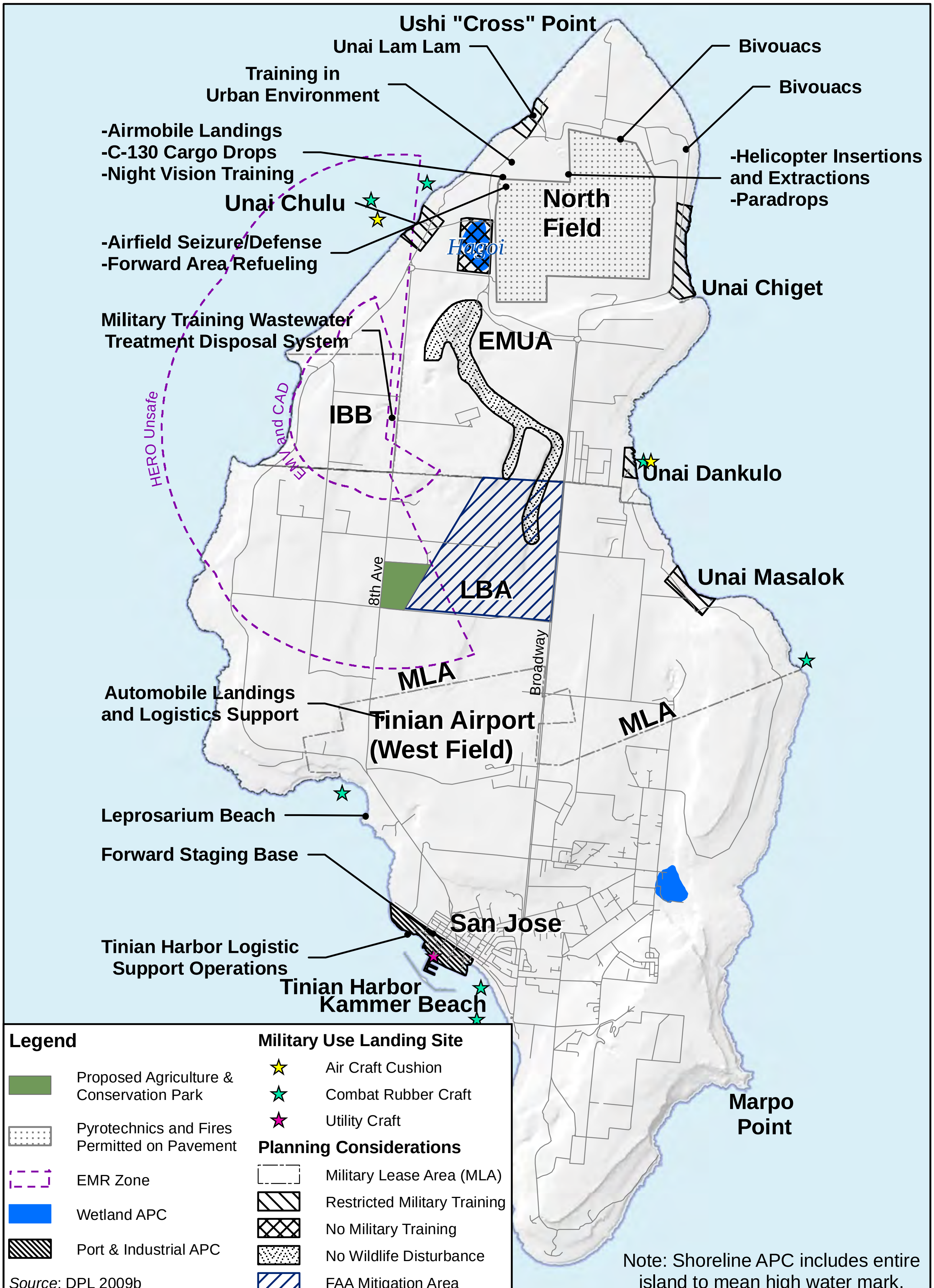

Figure 8.1-3
Tinian Military Land Use

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Tinian EMUA Land and Submerged Lands Use

The EMUA covers approximately the northern third of Tinian containing 7,574 ac (3,065 ha) of land (NAVFAC Pacific 2008). There is an active International Broadcasting Bureau (IBB) site located within the EMUA; it is distinct and fenced off from the remainder of the EMUA. The EMUA is used for ground element training including Military Operations in Urban Terrain-type training, command and control, logistics, bivouac, vehicle land navigation, convoy training, and other field activities (Figure 8.1-3).

IBB

The IBB operates the Mariana Relay station on the coast of northwestern Tinian within the EMUA that occupies an approximate 800-ac (324-ha) parcel (refer to Figure 8.1-2). The site was developed in 1998, and improvements include access roads, an antenna field, and operations area. It is considered semi-improved, as it requires minimal landscaping and maintenance. Power is supplied by the municipal power generation system in San Jose. Onsite diesel generators provide emergency power for the site and there is above ground fuel storage capacity for 500,000 gallons (1,890 kiloliters) of diesel. Potable water is transported to the site via tanker and supplemented with rainwater catchment from rooftops. Wastewater is managed via onsite septic and leachfield systems (COMNAV Marianas 2004).

The relay station broadcasts approximately 14 hours per day, 7 days per week. There are approximately 22 employees and none reside on the site (COMNAV Marianas 2004). The high frequency electromagnetic fields generated by the IBB's curtain antennas vary in frequency from 6 to 21.95 megahertz. The radiation hazard area (as defined by American National Standards Institute) to animals is contained within the project site boundaries. There are exclusion zones that extend around the operational facility boundaries. The potential risks associated with exposure to radio frequency electromagnetic radiation emitted by the relay station is mitigated by restricted ground access via security fencing. There are general population exclusion zones within the IBB site boundary. Electromagnetic vulnerability and cartridge actuated device susceptible exclusion zones are established to avoid inadvertent detonation of ordnance that has electronic firing mechanisms. The cartridge actuated device and electromagnetic vulnerability exclusion zones coincide for the IBB site, and include airspace to 656 ft (200 m) above ground surface. Aircraft equipped with flight control or mission-critical electronic systems should remain outside of the electromagnetic vulnerability exclusion zone to avoid potential interference with vehicle control.

Many ordnance types are activated by electronic firing systems and are susceptible to stray voltages induced by electromagnetic fields. Ordnance is classified based on susceptibility to Radiofrequency energy, and a Hazards of Electromagnetic Radiation to Ordnance UNSAFE exclusion zone delineates the area where the most sensitive ordnance are banned from transport or storage.

Perimeter fencing and a security gate restrict public access to the relay station operations buildings. The public has access to the coastal areas for recreation. No training occurs in the IBB area.

Non-IBB EMUA

The key feature of the EMUA is North Field, an unimproved expeditionary World War II-era airfield used for vertical and short-field landings. North Field is also used for expeditionary airfield training including command and control, air traffic control, logistics, armament, fuels, rapid runway repair, and other airfield-related requirements. Pyrotechnics and fires are permitted during training exercises on the North Field (COMNAV Marianas 2004). The surrounding area is used for force-on-force airfield defense and offensive training.

The frequency of training activities planned on Tinian is described in the Mariana Islands Range Complex (MIRC) EIS/Overseas EIS (OEIS) (DoN 2010). The MIRC training frequency is the baseline for the "no-action alternative" training tempo. The baseline establishes a maximum frequency per year for a type of training that can occur within the MIRC.

Four major military exercises could occur per year on Tinian, including joint forces training. Night vision training exercises at North Field range from 30 to 75 sorties per year. Night vision ground training (Intelligence Surveillance and Reconnaissance) is estimated to occur on Tinian twice per year. Approximately four "seize airfield" events and airfield expeditionary events could occur per year. There are five annual Amphibious Assault Marine Air Ground Task Force training events. Military Operations in Urban Terrain (MOUT) training is estimated at one event per year.

There are no active live-fire ranges on the EMUA. There have been clandestine reconnaissance and hostage rescue exercises at the Japanese Air Command Post at North Field where controlled live-fire was used. The sniper small arms were shot into bullet traps inside the building. The EMUA has been used for large (e.g., 2,000 troops) Marine Expeditionary Unit training events. The area is mostly forested, providing a realistic combat environment for jungle-like maneuvers and amphibious landings (DoN 2010).

The EMUA has two sandy beaches, Unai Chulu and Unai Dankulo (Long Beach). Only Unai Chulu has been used for Landing Craft Air Cushion training; however, storm damage and tree growth requires craft landing zone and beach improvements prior to use. Hydrographic surveys are conducted from small boats in the submerged lands around Tinian. Non-combatant evacuation operations occur at Unai Chulu and Tinian Harbor and North Field (DoN 2010).

There are five areas where training is not allowed in the EMUA. One exclusion area is a former small arms range located on the east coast. This former range is an UXO (60 millimeter [mm] and 40 mm) contaminated area near Unai Chiget within the EMUA that should not be accessed except by trained UXO personnel. The area is secured by fencing and warning signs are posted. Lake Hagoi, Unai Chulu, Unai Lam Lam and Unai Dankulo (Long Beach) have training restrictions in designated areas because of cultural or natural resources. There is a no wildlife disturbance area that is located in the EMUA and the LBA.

There are 13 points of interest within the EMUA that are on the self-guided Tinian Historic Interpretive Trail. No parks or recreation areas are designated in the EMUA. Refer to the recreation section for land and submerged lands uses off of the EMUA coastline. No agricultural uses are permitted within the EMUA, but historically there have been reports of animals grazing (COMNAV Marianas 2004).

Public access to the EMUA could be restricted an estimated eight weeks per year, for the four two-week major training events per year, based on the MIRC range training plan. In recent history, the entire EMUA has been closed to the public for Tandem Thrust exercises (Joint U.S. and Australian forces) that occurred in March 15-April 4 1999 and April 14, to May 5, 2003. Portions of the EMUA have been restricted for Millennium Edge, a few cargo drop exercises, TriCab and the 1996 Operation Pacific Heaven (DoD Public Military Affairs 2009).

<u>LBA and Tinian Agriculture</u>

The Tinian LBA is approximately 7,779 ac (3,148 ha) and located in the middle third of the island. The CNMI government issues permits for LBA lands to Tinian residents for grazing and agricultural uses. LBA is used for ground element training including MOUT-type training, command and control, logistics, bivouac, vehicle land navigation, convoy training, and other field activities. There are no active live-fire ranges in the LBA. Exercise maneuver training is permitted in the LBA. The U.S. may train in the LBA, subject to written notification of CNMI, and has agreed to minimize impact to the Tinian Airport. The frequency of training is tied to that described for the EMUA. There is one limited training area on the east coast near Unai Masalok, restricted to small unit insertion training. There is a Federal Aviation Administration (FAA) wildlife mitigation area and a no wildlife disturbance area in the LBA. The conservation area is commonly referred to as the FAA Mitigation Area.

There are seven points of interest within the LBA that are on the Tinian self-guided tour; however, public access is restricted during training. Refer to the recreation section for other land and submerged lands uses in the LBA.

Land uses adjacent to the LBA include the Tinian Airport, the three lease areas, undesignated lands and private land parcels.

The LBA can be used for agricultural grazing or other uses. The CNMI government consults with the U.S. government on agreed compatible uses. The leaseback area is generally subject to the following conditions under the leaseback agreement terms (U.S. and CNMI 1975b):

- Initial term of lease is 10 years and is potentially renewable in 10 year increments.
- The uses located in the vicinity of the Tinian Airport must be consistent with FAA safety requirements.
- Uses must be compatible with planned military use.
- No permanent construction without prior consent.
- The leaseback agreement is subject to cancellation upon one year's notice or sooner in the event of a national emergency.
- Provisions for fair compensation exist in the event of cancellation or early termination.

There are 35 lessees, leasing 48 parcels in the LBA for a total agriculture/grazing permit area estimated at 2,552 ac (1,032 ha) (Figure 8.1-4). The largest parcel is 563 ac (228 ha) and all others are less than 124 ac (50 ha) (DPL 2009b). Individual pastures may be fenced. Total agricultural land use for the entire island of Tinian is estimated at 11,956 ac (4,838 ha).

The USDA identifies prime farmland soils that have properties that are suitable for economic production of sustained high yields of crops. Three prime farmland soils classes were identified on Tinian in the *Soil Survey of the Islands of Aguijan, Rota, Saipan, and Tinian, Commonwealth of the Northern Mariana Islands* (Young 1989), as follows:

- Dandan-Saipan clays, 0-5% slope
- Kagman clay, 0-5% slopes
- Saipan clay, 0-5% slopes

Dandan-Saipan clays 0-5% and Saipan clay, 0-5% were identified within and adjacent to the LBA as shown on Figure 8.2-1 located in the Environmental Consequences Section 8.2. The Kagman clay 0-5% prime farmland soils are located outside the MLA in the southern area of Tinian. A map of CNMI designated important or unique farmlands was not available for review. Although they may not have met the specific USDA soil criteria for prime farmland, 46% of the farmland in CNMI is located on Tinian and is concentrated in the southern area of Tinian (Carolinas Plateau) and in the MLA between Tinian International Airport and North Field. Crops (e.g., watermelons, cucumbers) are exported to Saipan and Guam (COMNAV Marianas 2004).

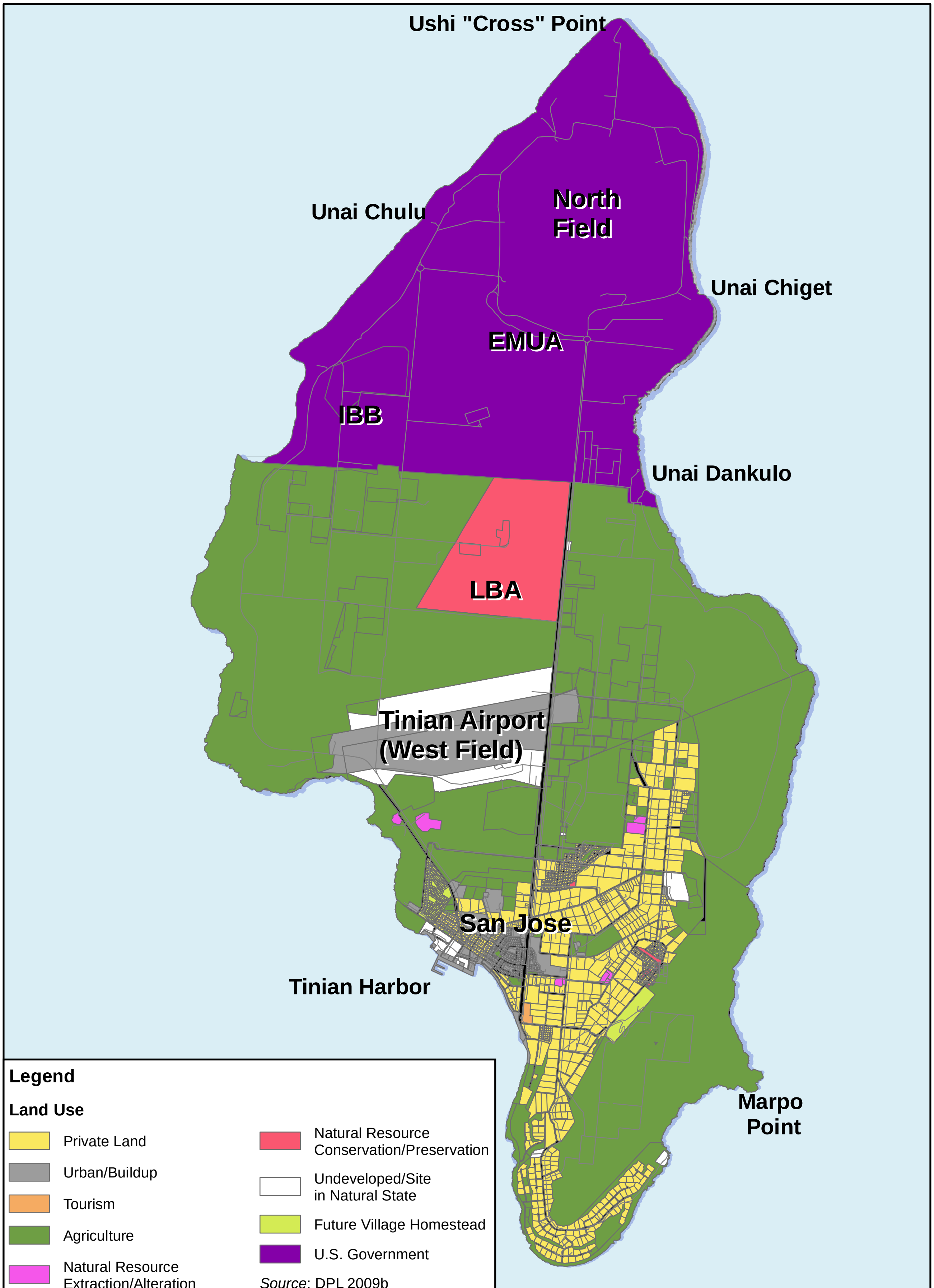

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Figure 8.1-4
Tinian Public Land Uses

U.S. Department of Agriculture (USDA), in cooperation with local agencies, proposed to develop a Tinian Agricultural and Conservation Park within the LBA located adjacent and west of the FAA Mitigation Area. The 176.2-ac (71.5 ha) parcel would provide 148-ac (60 ha) of cropland that would be subdivided into sixty 2.47-ac (1 ha) farm plots. The park would promote joint marketing of agricultural products, facilitate information sharing among farmers, increase the supply of local fresh fruits and vegetables, and promote sound water and soil conservation practices (COMNAV Marianas 2004). The project was never initiated.

8.1.2.7 Military Use Outside of the MLA

A separate Technical Agreement was simultaneously executed with the Covenant that provided for the leaseback of property and joint use arrangements for San Jose Harbor and West Field on Tinian Island. Under the previously referenced Technical Agreement (U.S. and CNMI 1975b) the arrangements for military joint use of San Jose Harbor and West Field on Tinian include the following rights:

- Moor vessels, handle cargo, stage equipment and conduct other port related activities.
- Install, operate and maintain fuel and utility lines from the harbor to the MLA landing rights and development and operating rights for support facilities at the airport.
- Use the harbor and airport 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.

The Tinian government allows special operations teams using combat rubber craft at Leprosarium and Kammer Beach for nigh-time training landings. Kammer Beach is near the Tinian Dynasty Hotel and residential areas. Only the beach and nearby abandoned structures are used (DoN 2010).

8.2 Environmental Consequences

8.2.1 Approach to Analysis

8.2.1.1 Methodology

Potential direct, short-term land use impacts would be related to facility construction activities; these activities would be located within the project footprint or on previously disturbed lands. In addition, the construction staging and equipment area would be located on DoD land. There would be no land/submerged lands acquisition, nor would pockets of land or public access restrictions would be generated. The land use and land ownership impacts could be discussed under construction or operation. Since the impacts would be long term, the changes in land use and ownership are described under operation and the construction phase impacts are described as not applicable.

The potential indirect impacts that are due to changes in land ownership and use are addressed under other specific resource categories such as traffic, noise, natural resources and recreation. Incompatibility with adjacent land uses to the extent that public health and safety may be impacted is addressed under public health and safety, and noise resource sections. Federal lands are not subject to local zoning regulations and permitting; however, consistency with surrounding non-federal land uses is an important consideration for land use planning. A CZMA consistency determination was prepared by the Marine Corps for all Tinian proposed actions and the correspondence is included in Volume 9, Appendix H.

Land Ownership/Management

Land ownership and management includes lease and right-of-way interests. The impact assessment for land and submerged lands ownership and management is not based on regulatory authority or permit requirements. No change in land or submerged lands ownership is proposed on Tinian. But the existing agriculture/grazing permits in the LBA would be affected, thus impacting land use.

There are no indirect impacts associated with changes in land ownership, except for those that would be discussed under the aforementioned other resource categories. For example, changes in land ownership may impact potential CNMI tax revenues.

<u>Land Use</u>

Two criteria are applied for assessing impacts on land/water use:

1. Consistency with current or documented planned land/water use
2. Restrictions on access due to changes in land use on federally-controlled lands

Land Use Criterion 1: Consistency with Current or Documented Planned Land Use

Tinian land use plan Geographic Information Systems graphics are being prepared for DPL, and the February 2009 versions are presented in this analysis, with permission from DPL. These are draft mapping products and the accompanying land use plan is being developed. Potential adverse land use impacts would result from a proposed land use that is inconsistent with the existing land use or the development of vacant land and open space. Potential adverse impacts would also result if there are incompatible changes in use within submerged lands. The test for significance is the degree of incompatibility and is qualitative.

Land use changes on existing DoD land could be the basis for significant adverse impacts to other resource categories (such as aesthetics, noise, traffic, recreation, cultural and natural resources) within and beyond DoD land boundaries. Impacts to these resources and others are addressed elsewhere in this EIS.

Land Use Criterion 2: Restrictions on Access

Additional restrictions on public access would be a potential adverse impact. The test for significance is subjective and based on the geographic area affected, the schedule or timing of the access restrictions (permanent or occasional), and the population affected.

Farmland Protection Policy Act

The DoD is attempting to minimize effects to agricultural land use. The Farmland Protection Policy Act (FPPA) (Public Law 97-98, 7 USC 4201 and 7 CFR 658) is intended for federal agencies to: 1) identify and take into account the potential adverse effects of federal programs on the preservation of farmland land; and 2) consider alternative actions, as appropriate, that could lessen such adverse effects; and assure that such federal programs, to the extent practicable, are compatible with state, unit of local government, and private programs and policies to protect farmland. The FPPA addresses prime and important farmlands. Consistency with FPPA was a land use significance criterion in the Draft EIS, but was removed for the Final EIS. In the interval between the Draft EIS and the Final EIS, the DoN determined that the Guam and CNMI Military Relocation is exempt from FPPA regulations because the action is undertaken by a federal agency for national defense purposes (section 1547(b) of the Act, 7 U.S.C. 4208(b). However, consistency with FPPA is not a criterion for analysis, impacts to agricultural use are assessed in this EIS in conjunction with impacts to other land uses, such as residential or urban.

8.2.1.2 Issues Identified During Public Scoping Process

Many of the scoping issues regarding land use overlap with other resource areas such as noise and recreation and are discussed under those other resource sections. Comments on land use did not necessarily identify Guam or Tinian as the area of concern. The following are public, including regulatory agency, preferences:

- No increases in federal land ownership (unclear but assumed that comments meant to also apply to military use of the LBA agricultural/grazing permits)
- Current public rights-of-way be retained
- Balance between economic benefits and access to the northern part of Tinian

8.2.2 Alternative 1 (Preferred Alternative)

8.2.2.1 Tinian

Construction

The land use and land ownership impacts could be discussed under construction or operation. Since the impacts would be long-term, the changes in land use and ownership are described under operation.

Operation

North

The four proposed ranges would be constructed in the LBA in the north or northeast direction. The Surface Danger Zones (SDZs) generated by the ranges would extend into the EMUA, but would not impact submerged lands. No additional land or submerged lands would be acquired. Existing leases within the LBA would be reviewed and those located within the range footprints or SDZs would be terminated. This represents a potential adverse impact to the lessee and private sub-lessees. The impact is considered less than significant from a land ownership perspective because the leaseback term options are of relatively short duration and may be reviewed by DoD in the event of a military requirement for the land. In addition, the lease terminations would not change land use designations. Other impacts such as the loss of agricultural income are addressed in Chapter 16, Socioeconomics.

Noise from airfield operations and firing range activities would generate increased noise levels within the military area, but not impacting surrounding land use. Some of these activities would occur at night. As shown in Chapter 2 (refer to Table 2.3-1), approximately 20% of munitions used for firing range training would be expended during non-daylight hours (from 7 p.m. to 6 a.m.). The results of the modeling of the noise impacts from Range Complex Alternative 1 are presented in Chapter 6, Noise. The contours would be entirely within the DoD-controlled land except for a small portion extending on the northern edge of the Tinian Airport property. In this case, no noise-sensitive receptors would be impacted, resulting in no noise impacts associated with this alternative.

Portions of the range area would not be accessible by non-participating personnel during training. Training periods would be scheduled in advance with signs posted and published on a regular basis. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would safeguard the public by keeping them out of any areas where there are potential dangers while simultaneously maintaining access to areas where training is not being conducted. This would ensure access to National Historic Landmark, northern beaches, and the IBB via 8th Avenue. Broadway would be closed during training. However, the public would be able to travel north on 8th Avenue and check in with personnel manning the first traffic control point. Once cleared by range control, they would proceed, checking in with each successive traffic control point until clear of the training area. Prior to training, range flags would be raised and traffic control points would be established and manned continuously throughout the duration of training. Interior portions of the range area (those affected by SDZs) would be inspected and watches would be posted in a range observation site for boats and aircraft, with positive observation of the sea and air space and having positive communications with range control. The impact is not considered significant. The impact on access would be adverse but less than significant because the military is exercising an existing right based on existing policy. The encroachment of the SDZ into a no-training area is an adverse impact; however, the impact would not be significant because no physical training or construction would occur in the area.

During non-firing periods, the MLA would remain open to other approved civilian uses in accordance with the RTA Management Plan, as discussed in Chapter 2.

In the interval between the Draft EIS and the Final EIS, the DoD attempted to minimize the potential acreage of agricultural leases affected by the proposed action. Based on data obtained in March of 2009, there were 35 agricultural/grazing permits, with lease area totaling approximately 2,552 ac (1,032 ha) in the LBA as shown on Figure 8.2-1. The number of leases may have changed over time and the discussion on impacts is based on 2009 data. It is currently estimated that only approximately 134 ac (55 ha) of the current total agricultural lease area would require termination due to these areas being located within the proposed Alternative 1 range footprints and associated SDZs. This acreage is about 5% of the total amount of agricultural/grazing land available in the LBA. The prime farmland soils within the Alternative 1 range footprints are shown on Figure 8.2-1. According to the data obtained in March of 2009, none of the agricultural lease areas subject to termination are located on prime farmland soils (Figure 8.2-1). Prime farmland soils within the LBA that are located outside of the Alternative 1 range footprints and associated SDZs would continue to be available for agricultural use. There is history of grazing and crop production in the LBA; therefore, the land is suitable for farmland although it may not have designated prime farmland soils. Alternative 1 would result in significant impacts to agricultural use. Associated socioeconomic impacts on agricultural use are discussed in Volume 3, Chapter 16.

There would be a minor loss of open space associated with the range support activities and the ranges that would be situated on vacant lands. No support facilities would be constructed. The SDZs would remain open space except for some access roads for fire protection.

The current policy of restricting public access for an estimated eight weeks to portions of the EMUA being utilized during training would continue under the proposed action. It is estimated that civilian use and access to and through the proposed live-fire ranges would be affected approximately 12 to 16 weeks per year. Traffic control points would be established on primary roadways and manned throughout the duration of training. Security sweeps would be done through the area prior to training. Training would be scheduled and advance notification would be provided to the public. There is no UXO concern that would further restrict access to the SDZs when there is no training. Broadway would be closed during training but access to the National Historic Landmark, northern beaches, and the IBB would continue to be maintained via 8th Avenue. The impact on access would be adverse but less than significant because the military would be exercising an existing right based on existing policy. Access restrictions would have potential impacts on recreation and other resources, as described under other resource sections.

The training ranges are consistent with the intended use of the MLA. No impact to IBB is anticipated and its personnel would be allowed to access the facility. FAA mitigation area and the no wildlife disturbance area would be encumbered by the SDZs and associated impacts are described under the natural resources section.

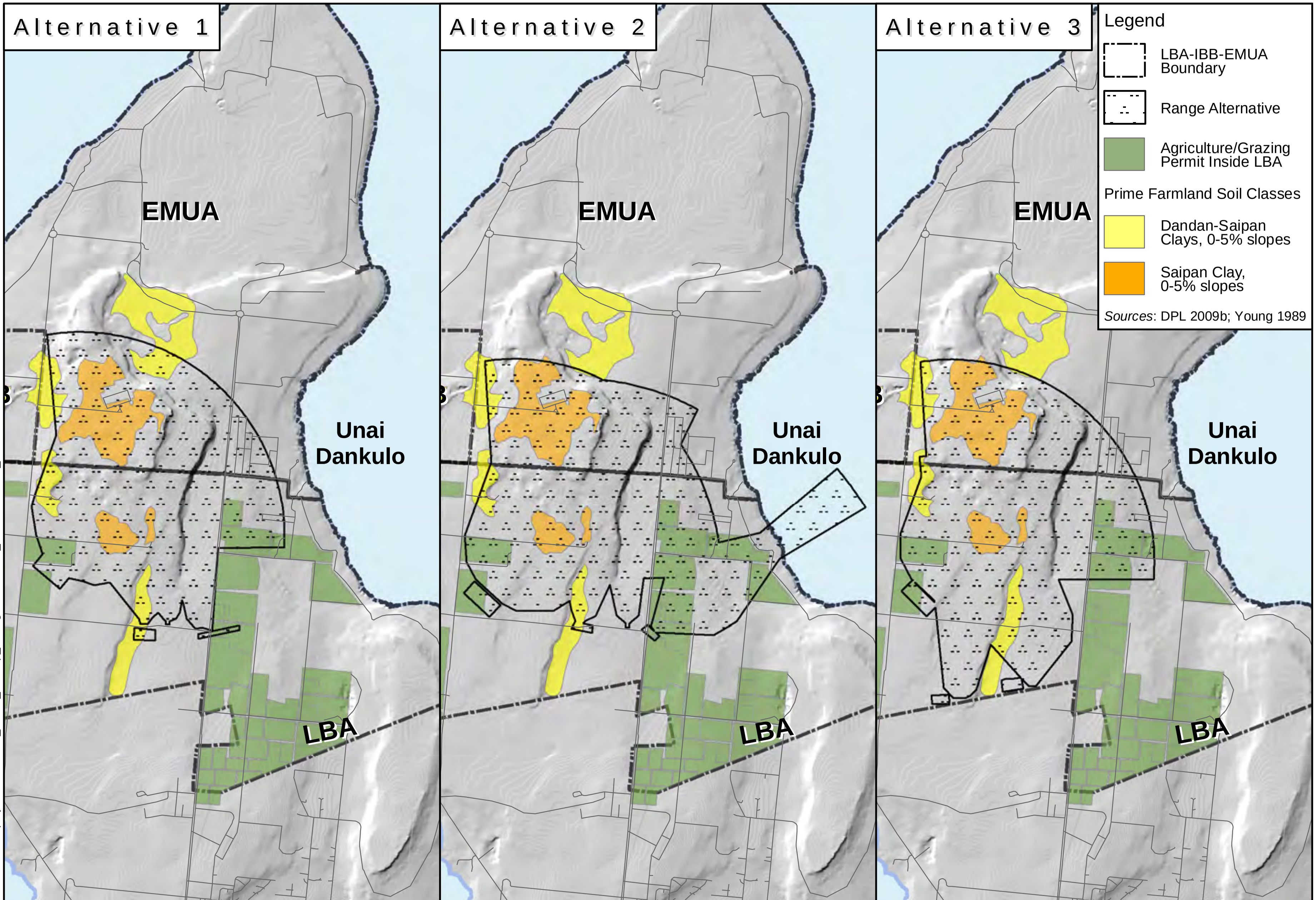

Figure 8.2-1
Alternatives Impacts on Agriculture/Grazing Permits

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South

No facilities are proposed in the South, outside of the MLA. Tinian Airport and Harbor would continue to be used to transport personnel, equipment and supplies. There would be no impact to land or submerged lands ownership.

The southernmost proposed facility in the MLA is the rifle "known distance" (KD) 5.56-mm range and it would be adjacent to the Tinian Airport runways. Range support activities (e.g., bivouac activities) could occur adjacent to 8th Avenue and north of the airport runway. As industrial facilities, the airport, firing ranges, and firing range support activities would be consistent land uses. No impact on airport operation is anticipated. The other proposed range facilities are sufficiently north of the MLA boundary as to have no anticipated impact on land uses outside of the MLA.

No impact on agricultural lands is anticipated in the southern area. Use of port and airport facilities would increase but would be consistent with their existing land use. No restrictions on public access are proposed in the south.

8.2.2.2 Summary of Alternative 1 Impacts

Table 8.2-1 is a summary of land use impacts under Alternative 1 by geographic area.

Table 8.2-1. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Not Applicable
	Operation	Permits within the LBA located in the range footprints or associated SDZs would require termination, causing less than significant impact to land ownership but significant impacts to agricultural use The impact on MLA access would be less than significant because the military would be exercising an existing right based on existing policy

8.2.2.3 Alternative 1 Proposed Mitigation Measures

The impacts described are unavoidable and would be true of any range configuration in the MLA. Agricultural uses could potentially relocate to areas outside of the MLA, but this would not be a mitigation that DoD would implement.

8.2.3 Alternative 2

8.2.3.1 Tinian

Construction

The land use and land ownership impacts could be discussed under construction or operation. Since the impacts would be long-term, the changes in land use and ownership are described under operation..

Operation

North

The orientation of the ranges under Alternative 2 would be similar as under Alternative 1 except for the Field Firing Range. The Platoon Battle Course would be located south of its Alternative 1 location but with the same northeast orientation. Alternative 2 impacts are as described for Alternative 1, except for impacts to submerged lands. The Field Firing Range would be located east of Broadway and oriented to the northeast with the SDZ extending over the ocean and submerged lands. No change in submerged lands ownership is proposed, but there would be public access restrictions on use of submerged lands on the east coast of Tinian during training events.

It is likely that there would be other training events held in the MLA during firing range training. Broadway would be closed during training but access to the National Historic Landmark, northern beaches, and the IBB would continue to be maintained via 8th Avenue. Potential impacts to cultural and natural resources are discussed under other resource sections. As described under Alternative 1, one of the no-training areas would be within the SDZ resulting in less than significant impacts.

In the interval between the Draft EIS and the Final EIS, the DoD attempted to minimize the potential acreage of agricultural leases affected by the proposed action. Based on data obtained in March of 2009, there were 35 agricultural/grazing permits, with lease area totaling approximately 2,552 ac (1,032 ha) in the LBA as shown on Figure 8.2-1. The number of leases may have changed over time and the discussion on impacts is based on available data. It is currently estimated that only approximately 391 ac (159 ha) of the total agricultural lease area would require termination due to these areas being located within the proposed Alternative 2 range footprints and associated SDZs. This acreage is about 15% of the total amount of agricultural/grazing land available in the LBA. The prime farmland soils within the Alternative 2 range footprints are shown on Figure 8.2-1. According to the data obtained on March of 2009, none of the agricultural lease areas subject to termination are located on prime farmland soils (refer to Figure 8.2-1). Prime farmland soils within the LBA that are located outside of the Alternative 2 range footprints and associated SDZs would continue to be available for agricultural use. Alternative 2 would result in significant impacts to agricultural use. Associated socioeconomic impacts on agricultural use are discussed in Volume 3, Chapter 16.

South

Impacts would be as described under Alternative 1.

8.2.3.2 Summary of Alternative 2 Impacts

Table 8.2-2 is a summary of land use impacts under Alternative 2 by geographic area.

Table 8.2-2. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	No impacts
	Operation	Permits within the LBA located in the range footprints or associated SDZs would require termination, causing less than significant impact to land ownership but significant impacts to agricultural use. There would be public access restrictions on the use of submerged lands during training events at the Field Firing Range. The impact on MLA access would be less than significant because the military would be exercising an existing right based on existing policy.

8.2.3.3 Alternative 2 Proposed Mitigation Measures

The impacts described are unavoidable and would be true of any range configuration in the MLA. Agricultural uses could potentially relocate to areas outside of the MLA, but this would not be a mitigation that DoD would implement.

The restriction on use of submerged lands is a less than significant impact and no mitigation is proposed.

8.2.4 Alternative 3

8.2.4.1 Tinian

Construction

The land use and land ownership impacts could be discussed under construction or operation. Since the impacts would be long-term, the changes in land use and ownership are described under operation.
Operation

North

Although three of the ranges would be sited south of 86th Street under Alternative 3, the orientation of the ranges would be similar to Alternative 1. The Platoon Battle Course would be sited as described in Alternative 2. Broadway and 86th Street would be closed during training but access to the National Historic Landmark, northern beaches, and the IBB would continue to be maintained via 8th Avenue. The impact on access would be adverse, but not significant because the military is exercising an existing right based on existing policy. The restricted access would have potential impacts on other resource categories such as recreation and navigation. As described under Alternative 1, one of the no-training areas would be within the SDZ resulting in less than significant impacts.

In the interval between the Draft EIS and the Final EIS, the DoD attempted to minimize the potential acreage of agricultural leases affected by the proposed action. Based on data obtained in March of 2009, there were 35 agricultural/grazing permits, with lease area totaling approximately 2,552 ac (1,032 ha) in the LBA as shown on Figure 8.2-1. The number of leases may have changed over time and the discussion on impacts is based on available data. It is currently estimated that only approximately 229 ac (93 ha) of the total agricultural lease area would require termination due to these areas being located within the proposed Alternative 3 range footprints and associated SDZs. This acreage is about 9% of the total amount of agricultural/grazing land available in the LBA. The prime farmland soils within the Alternative 3 range footprints are shown on Figure 8.2-1. According to the data obtained in March of 2009, none of the agricultural lease areas subject to termination are located on prime farmland soils (refer to Figure 8.2-1). Prime farmland soils within the LBA that are located outside of the Alternative 2 range footprints and associated SDZs would continue to be available for agricultural use. Alternative 3 would result in significant impacts to agricultural use. Associated socioeconomic impacts on agricultural use are discussed in Volume 3, Chapter 16.

South

Impacts would be as described under Alternative 1.

8.2.4.2 Summary of Alternative 3 Impacts

Table 8.2-3 is a summary of land use impacts under Alternative 3 by geographic area.

Table 8.2-3. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	No impacts
	Operation	Permits within the LBA located in the range footprints or associated SDZs would require termination, causing less than significant impact to land ownership and significant impacts to agricultural use The impact on MLA access would be less than significant because the military would be exercising an existing right based on existing policy

8.2.4.3 Alternative 3 Proposed Mitigation Measures

The impacts described are unavoidable and would be true of any range configuration in the MLA. Agricultural uses could potentially relocate to areas outside of the MLA, but this would not be a mitigation that DoD would implement.

8.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. Therefore, the no-action alternative would have no land and submerged lands impacts. However, due to other planned activities not related to the proposed action, Tinian would still experience an increase in training event frequency that would result in an increase in the maximum number of days the MLA would be restricted to the public. These increases are described and analyzed in the MIRC EIS/OEIS (DoN 2010) and could begin in 2010.

8.2.6 Summary of Impacts

Table 8.2-4 summarizes the operational impacts of each action alternative and the no-action alternative. A text summary is provided below. The land use impact analysis is based on operational impacts. The assumption is that land use impacts are long-term, although they would be initiated in the short-term construction phase. The construction staging and disturbed area would be situated on previously disturbed land or within the project footprint. The construction phase impacts for land ownership and use are described as not applicable.

Table 8.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Land Use			
SI • Permits within the LBA located in the range footprints or associated SDZs would require termination, causing significant impacts to agricultural use LSI • The increased restrictions on public access to the MLA is an adverse impact, but considered less than significant • Permits located in the range footprints or associated SDZs	SI • Permits within the LBA located in the range footprints or associated SDZs would require termination, causing significant impacts to agricultural use LSI • The increased restrictions on public access to the MLA is an adverse impact, but considered less than significant • Permits located in the range footprints or associated SDZs	SI • Permits within the LBA located in the range footprints or associated SDZs would require termination, causing significant impacts to agricultural use LSI • The increased restrictions on public access to the MLA is an adverse impact, but considered less than significant • Permits located in the range footprints or associated SDZs	NI

Alternative 1	Alternative 2	Alternative 3	No-Action Alternative
within the LBA would require termination, causing less than significant impact to land ownership	within the LBA would require termination, causing less than significant impact to land ownership	within the LBA would require termination, causing less than significant impact to land ownership	
Submerged lands Use			
• NI	• LSI	• NI	• NI

Legend: SI = Significant impact, LSI = Less than significant impact, NI = No impact.

None of the alternatives would result in an impact to the federal government lease of the MLA. Permits within the LBA located in the range footprints or SDZs would require termination, causing less than significant impact to land ownership, but significant impact to agricultural land use.

The decrease in public access to the MLA is an adverse impact, but it is considered less than significant because it is within the authority of the federal government to restrict access during training events for public safety. In addition, access to the northern portion of the island would be maintained via 8th Avenue during training and unlimited access to the training ranges SDZs would be permitted during non-training periods.

8.2.7 Summary of Proposed Mitigation Measures

Table 8.2-5 lists the mitigation measures.

Table 8.2-5. Summary of Proposed Mitigation Measures

Alternative 1	Alternative 2	Alternative 3
Land Use		
• None	• None	• None
Submerged lands Use		
• None	• None	• None

CHAPTER 9. RECREATIONAL RESOURCES

9.1 AFFECTED ENVIRONMENT

9.1.1 Definition of Resource

Recreational uses of an area for the purposes of this Environmental Impact Statement (EIS) may include any type of outdoor activity in which area residents, visitors, or tourists may participate. Typically (though not exclusively) focused on weekends or vacation periods, such activities may include hiking, fishing, beachcombing, spelunking, and boating. Recreational opportunities and resources can be a very important component of an area's economy and the lifestyle of its residents. Recreational resources as discussed in this chapter are primarily assets pertaining to the physical geography of the Island of Tinian, from the mountains to the oceans, and terrains in between; there are various man-made resources in urban and semi-rural settings as well.

Recreational resources have been organized into the following categories with similar uses grouped in parentheses: *trails* (pedestrian hikes, mountain bike trails, "boonie stomping," or hiking through "boonies" of large areas of undeveloped jungle and beaches); *historic and cultural attractions* (historic monuments, parks, and cultural sites); *scenic points* (vistas, lookouts, and overlooks); *dive spots* (snorkeling, *s*elf *c*ontained *u*nderwater *b*reathing *a*pparatus, or SCUBA diving, and free diving); *beaches and parks* (also including conservation areas, preserves, and refuges); *spelunking*, or cave exploration; *fishing*; and *other*. The categories employed throughout the chapter are for the purpose of data organization only; this point is emphasized to acknowledge multi-recreational opportunities from a particular resource. For instance, a resource organized under *trail* may offer hiking as well as swimming, snorkeling, and picnicking at the trail terminus. Because all such activities are considered to be recreational resources, a description of each resource, is provided to supplement its categorization.

9.1.2 Tinian

Tinian lies approximately 100 miles (mi) (160 kilometers [km]) northeast of Guam and 3 mi (4.8 km) south of Saipan. Although Tinian covers an area of only 39 square mi (mi^2) (101 square km [km^2]), nearly 26 mi^2 (67 km^2) of it are leased to the Department of Defense (DoD) (DoN 2010). Most establishments catering to the community and tourism activities are in coastal San Jose village, on the southwest section of the island. Much of the Tinian coast is noted for its precipitous cliffs, but there are pockets of coves and beach area as well. Near the Tinian Harbor on the west side of the island are several small and narrow fringing reefs and a small barrier reef. Notable recreational resources are trails, historic and cultural attractions, scenic points, dive spots, and beaches and parks as shown in Figure 9.1-1.

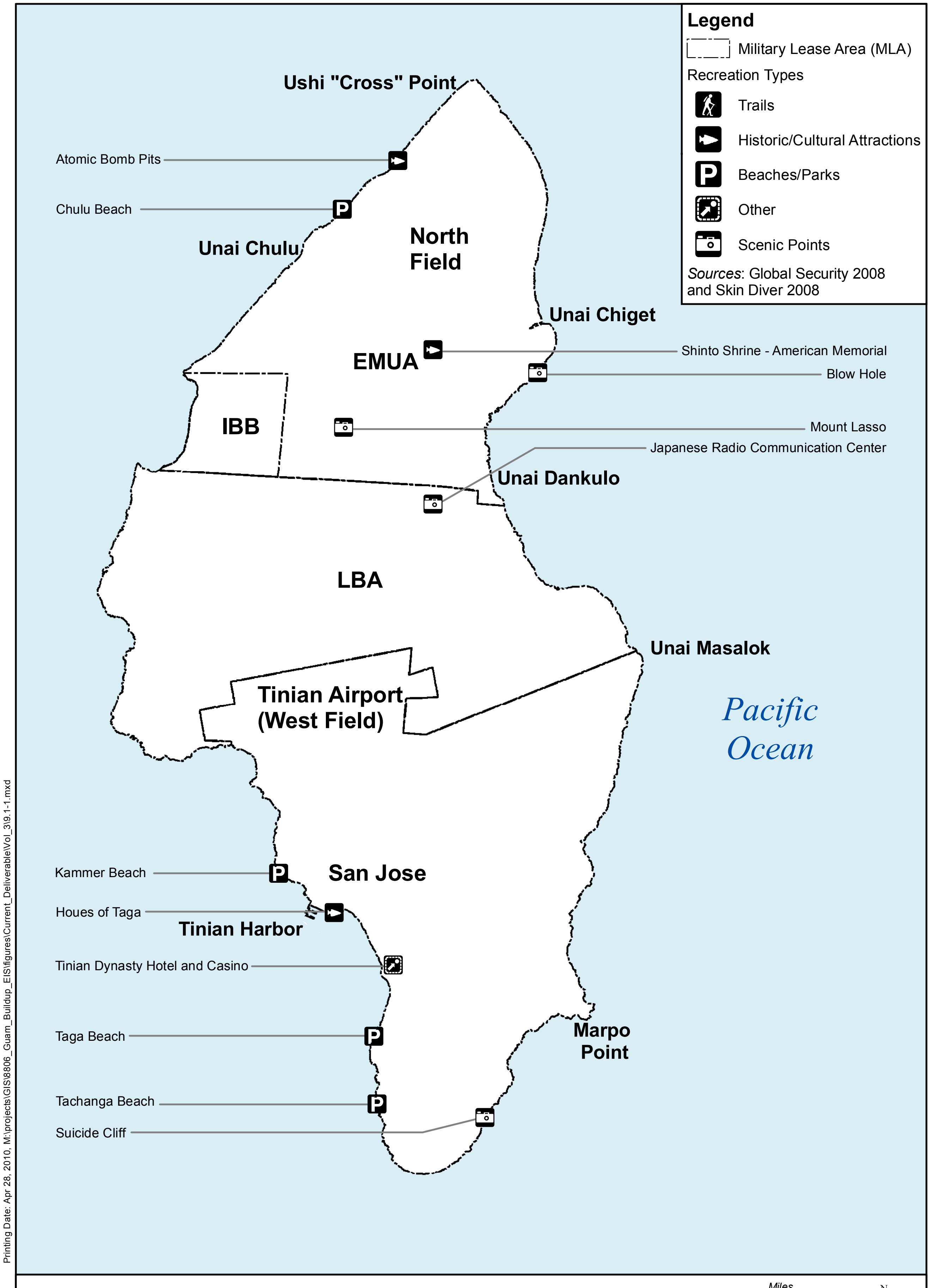

Figure 9.1-1
Island of Tinian

9.1.2.1 North

Trails

Ushi Field-North Field Trail

This is an interpretive trail that identifies 14 points of interest from World War II. The Seabees and Marines constructed six air strips on the island, four of them on North Field. Each had an alphabetical designation—A (Able), B (Baker), C (Charlie), and D (Dog). Able is at the northernmost location and was where the Enola Gay took off to drop the atomic bomb on Hiroshima, Japan, on 6 August 1945, and Bock's Car took off to drop the bomb on Nagasaki, Japan, on August 9, 1945. Before the U.S. took control of Tinian, the Japanese had an airfield in northern Tinian named Ushi Field. Two B-29 airstrips and a third airstrip for smaller aircraft were built by the Seabees further south, near the Japanese Kahit Airfield. These were named West Field and the smaller runway is still in use as a civilian airport. Also present are World War II Japanese fortification features such as a bunker, naval battery, command post, and the Bomb Assembly Building.

Scenic Point

Mount Lasso Lookout

Situated south of North Field, Mount Lasso is a frequently visited lookout point.

Historic and Cultural Attractions

Shinto Shrine

Situated in the North Field, the site marks the sole Shinto Shrine in the Marianas.

Beaches and Parks

Chulu Beach

Chulu Beach is located on the northwestern shore of Tinian.

9.1.2.2 Central

Beaches and Parks

Unai Dankulo (Long Beach)

Situated on the east coast, Unai Dankulo is the largest beach on Tinian and has a continuous reef crest across the entire run of the beach. Unai Dankulo comprises at least 10 beaches over a distance of 4,921 feet (ft) (1.5 km).

Unai Masalok

Unai Masalok is comprised of three beaches over a distance of 1,640 ft (0.5 km).

9.1.2.3 South

Historic and Cultural Attractions

Ruins of House of Taga

The House belonging to Taga, ancient Chamorro Chief, in San Jose village, contains the tallest set of latte stones that were actually used by the ancient Chamorros. The stones are quarried limestone, each approximately 20 ft (6 meters [m]) in length. Of the 12 large latte structures, only one remains standing.

According to a local legend, when the last stone falls, Chief Taga would return to Tinian (The House of the Ancient Chamorro Chief Taga 2008).

Beaches and Parks

Taga Beach

Taga Beach is located on the south end of Tinian. Adjacent to the beach are picnic facilities, parking, and a place to rent scooters.

Tachogna

Situated adjacent to Taga Beach, Tachogna Beach spans for several blocks. Activities available include snorkeling, SCUBA diving, jet skiing, and various other marine activities.

Kammer Beach

Kammer Beach is located near San Jose village.

9.2 ENVIRONMENTAL CONSEQUENCES

9.2.1 Approach to Analysis

9.2.1.1 Methodology

Information on recreational resources on Tinian and public access were collected through stakeholder meetings in April 2007, Geographic Information System data compiled and reviewed for this EIS, literature review, and personal communications. A comprehensive recreational carrying capacity analysis—assessing the number of individuals who can be supported in a given area within natural resource limits without degrading the natural social, cultural, and economic environment (Global Development Research Center 2009)—was not conducted as part of this EIS.

9.2.1.2 Determination of Significance

For the purpose of this EIS, the proposed action and alternatives would cause a significant impact to recreational resources if they:

- Would impede access to recreational resources
- Would substantially reduce recreational opportunities
- Would cause substantial conflicts between recreational users
- Would cause substantial physical deterioration of recreational resources

To determine whether impacts might be significant, potentially adverse impacts are identified and evaluated using the significance criteria for the recreational resources on Tinian. This EIS addresses both adverse and beneficial impacts resulting from the proposed actions.

9.2.1.3 Issues Identified during Public Scoping Process

As part of the analyses, concerns relating to recreation impacts that were raised by the public, including regulatory stakeholders, during scoping meetings were addressed. A concern was raised regarding potential obstruction of access to historical sites on Tinian at the scoping meetings in April 2007.

9.2.2 Alternative 1 (Preferred Alternative)

9.2.2.1 Tinian

Construction

Recreational resources on Tinian are situated primarily along the North Field, coastal areas islandwide, and southwest in the vicinity of San Jose village. The proposed development associated with Alternative 1 implementation would not be situated in the proximity of the existing recreational resources; as such, impediments to access are not expected. North-south thoroughfares such as Broadway and 8th Avenue would experience an increase in the number of construction-related vehicles, including slow moving and/or oversized vehicles. Increased numbers of vehicles on roads may cause inconvenience to travelers using these thoroughfares. However, access to recreational resources would still be possible. Therefore, construction associated with Alternative 1 would result in less than significant impacts to recreational resources.

Operation

Under Alternative 1, the Range Training Area and associated Surface Danger Zone (SDZ) would affect a segment of Broadway, one of two north-south thoroughfares on Tinian. The range area would not be accessible by non-participating personnel for 12 to 16 weeks per year during training periods. There would be sufficient lead-time before training to ensure range area clearance. Training periods would be scheduled in advance with signs posted and published on a regular basis. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would safeguard the public by keeping them out of any areas where there would be potential dangers while simultaneously maintaining access to areas where training is not being conducted. This would ensure access to the National Historic Landmark, northern beaches, and the International Broadcasting Bureau via 8th Avenue. Broadway would be closed during training. However, the public would be able to travel on 8th Avenue, check in with personnel manning the first traffic control point. Once cleared by range control, they would proceed on 8th Avenue, checking in with each successive traffic control point until clear of the training area. Prior to training, range flags would be raised and traffic control points would be established and manned continuously throughout the duration of training. Interior portions of the range area (those affected by SDZs) would be inspected and watches would be posted at a range observation site for boats and aircraft, with positive observation of the sea and air space and having positive communications with range control.

Feeder roads off of Broadway leading to Unai Dankulo and nearby recreational resources would be closed due to the SDZ. The closure of the smaller roads would compound traffic congestion on other smaller roads outside of the SDZ and 8th Avenue. Recreational resources situated within the SDZ (i.e., Mount Lasso and Japanese Communications Center) would not be accessible by the general public during training periods. These impacts are not considered significant as they would be limited in duration. As such, less than significant impacts to recreational resources would result.

Noise from airfield operations and training would generate increased noise levels within the military area, not impacting surrounding use of recreational resources. The results of the modeling of the noise impacts from Range Complex Alternative 1 are analyzed in Chapter 6, Noise. The contours would be entirely within the DoD-controlled land except for a small portion extending on the northern edge of the Tinian Airport property. In this case, no noise-sensitive receptors would be impacted, resulting in no impacts from noise to recreational resources associated with this alternative.

The proposed actions would be situated outside of South Tinian. No disturbance to access to the existing recreational resources is anticipated in this region.

Recreational resources would also be affected by the proposed action if the Marines in training are granted liberty, as has been the case in the past. However, such liberty is not currently guaranteed for regular training exercises under the current description of proposed action. Liberty may be available to advanced teams before and after training exercises, though these advanced teams would be much smaller. During periods when Marines are at liberty, there would be a minor increase in use of recreational resources throughout Tinian.

Therefore, Alternative 1 would result in less than significant impacts to recreational resources.

9.2.2.2 Summary of Alternative 1 Impacts

Table 9.2-1 summarizes Alternative 1 impacts.

Table 9.2-1. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Increased travel time due to construction vehicles on roads.
	Operation	Broadway would be closed during training operation; increased travel time due to diversion of traffic to 8th Avenue.

9.2.2.3 Alternative 1 Proposed Mitigation Measures

No mitigation is suggested for Alternative 1.

9.2.3 Alternative 2

9.2.3.1 Tinian

Construction

The effects of Alternative 2 would be similar to those described in Alternative 1 as the proposed development would not be situated in proximity to the existing recreational resources. Inconvenience to travelers on roads accommodating construction related vehicles may occur. Therefore, construction associated with Alternative 2 would result in less than significant impacts to recreational resources.

Operation

Under Alternative 2, the SDZ would cause Broadway to be closed during training periods. Considerable portions of the Unai Dankulo and Unai Masalok are situated in the SDZ, and access would be impeded. To seek comparable resources during training periods, recreational users would have to venture to northern parts of Unai Dankulo outside of the SDZ or to other coastal areas on the island. Since comparable uses already exist on Tinian, resulting impacts would be less than significant. Similar to Alternative 1, road congestion would result due to feeder roads in the SDZ being closed. Access to the northern half of Tinian would still be available via 8th Avenue. Identical to Alternative 1, recreational resources situated within the SDZ (i.e., Mount Lasso and Japanese Communications Center) would not be accessible by the general public during training periods. Increased noise would not impact recreational resources, as discussed in Alternative 1.

Similar to Alternative 1, the proposed Range Training Area would be outside of South Tinian and no impacts to the existing recreational resources would be expected in this region.

Therefore, Alternative 2 would result in less than significant impacts to recreational resources.

9.2.3.2 Summary of Alternative 2 Impacts

Table 9.2-2 summarizes Alternative 2 impacts.

Table 9.2-2. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Increased travel time due to construction vehicles on roads.
	Operation	Lost access to parts of Unai Dankulo and Unai Masalok during training periods. Broadway and smaller roads off of Broadway would be closed. For recreational resources on other parts of the island, increased travel time due to diversion of traffic to 8th Avenue.

9.2.3.3 Alternative 2 Proposed Mitigation Measures

No mitigation is suggested for Alternative 2.

9.2.4 Alternative 3

9.2.4.1 Tinian

Construction

The effects of Alternative 3 would be similar to those described in Alternative 1 as the proposed development would not be situated in proximity to the existing recreational resources. Inconvenience to travelers on roads accommodating construction related vehicles may occur. Therefore, construction associated with Alternative 3 would result in less than significant impacts to recreational resources.

Operation

The effects of Alternative 3 would be similar to those described in Alternative 1; Broadway would be closed during training periods, but access to the northern half of Tinian would be available through 8th Avenue. During range operations, 86th Street would also be closed to traffic. Similar to Alternative 1, 8th Avenue and smaller roads east of Broadway would be likely to experience congestion due to some roads in the SDZ being closed (in the vicinity of Broadway). Recreational resources situated within the SDZ (i.e., Mount Lasso and Japanese Communications Center) would not be accessible by non-participating personnel during training periods. Inconvenience to road travelers would be likely to happen. Increased noise would not impact recreational resources, as discussed in Alternative 1.

Similar to Alternative 1, the proposed Range Training Area would be outside of South Tinian and no impacts to the existing recreational resources would be expected in this region.

Therefore, Alternative 3 would result in less than significant impacts to recreational resources.

9.2.4.2 Summary of Alternative 3 Impacts

Table 9.2-3 summarizes Alternative 3 impacts.

Table 9.2-3. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Increased travel time due to construction vehicles on roads.
	Operation	Broadway and 86th Street would be closed during training operations; increased travel time due to diversion of traffic to 8th Avenue.

9.2.4.3 Alternative 3 Proposed Mitigation Measures

No mitigation is suggested for Alternative 3.

9.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. The existing land uses, access to recreational resources, and other conditions would continue to remain as described under existing conditions. Therefore, the no-action alternative would have no impacts to the existing recreational resources.

9.2.6 Summary of Impacts

Table 9.2-4 summarizes the potential impacts. A text summary is provided below.

Table 9.2-4. Summary of Impacts-Construction and Operation

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Access to recreational resources			
• LSI	• LSI	• LSI	• NI
Reduction of recreational opportunities			
• LSI	• LSI	• LSI	• NI
Conflicts between different recreational uses			
• LSI	• LSI	• LSI	• NI
Substantial deterioration to recreational resources			
• LSI	• LSI	• LSI	• NI

Legend: LSI = Less than significant impact, NI = No impact.

In each alternative presented, the SDZ associated with the proposed action would affect a substantial portion of Broadway, inhibiting access on the Island's north-south thoroughfare. Traffic leading to the recreational resources on north Tinian would have to be diverted to the other north-south thoroughfare, 8th Avenue. Consequently, congestion on 8th Avenue would increase. Because training would last 12 to 16 weeks per year and access to recreational resources in north Tinian would be restored otherwise, the effects of the proposed actions are determined to be less than significant. Under Alternative 2, training activities would result in loss of access and use for portions of Unai Dankulo and Unai Masalok; however, because comparable resources exist on other parts of the island, this would result in less than significant impact to recreational resources. Under Alternative 3, 86th Street would be closed during training operations, but this would not limit access to recreational resources. Therefore, all three alternatives would result in less than significant impacts to recreational resources.

9.2.7 Summary of Proposed Mitigation Measures

Table 9.2-5 summarizes the proposed mitigation measures for all alternatives.

Table 9.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Construction		
• None	• None	• None
Operation		
• None	• None	• None

CHAPTER 10. TERRESTRIAL BIOLOGICAL RESOURCES

10.1 AFFECTED ENVIRONMENT

This chapter describes the plant and animal species and habitats that occur in terrestrial and wetland environments potentially impacted by the proposed action. The region of influence (ROI) encompasses the lands that support terrestrial biological resources (i.e., individual species, their habitats, and areas of habitat connectivity) that may be affected directly or indirectly by the proposed action. The ROI varies depending on the type of disturbance and the resource being considered. Construction, operations, and/or training activities have the potential to impact biological resources. Potential activities that may cause impact include, but are not limited to, ground-disturbing activities, noise, lighting, introduction of non-native species, and operational movement (e.g. vehicle traffic). Consequently, the ROI is broadly defined for terrestrial biological resources as the entire Military Lease Area (MLA) of Tinian.

10.1.1 Definition of Resource

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. For the purposes of this document, terrestrial biological resources are divided into three categories: *vegetation communities*, *wildlife*, and *special-status species*. Special-status species include those species listed under the Endangered Species Act (ESA), candidates for ESA listing, and listed by the Commonwealth of the Northern Mariana Islands (CNMI). Species mentioned in this section are described using the common name when there is an accepted English common name (wildlife and some plants). Common names are cross-referenced to scientific names in Appendix G. If available, the Chamorro name is provided in parentheses when the species is first mentioned in the text.

Key sources of information for this section include the Integrated Natural Resources Management Plan (INRMP) for Navy lands (Commander Navy Region [COMNAV] Marianas 2004); United States Fish and Wildlife Service (USFWS) (USFWS 2009b) Tinian survey report; Natural Resource Survey and Assessment Report (TEC Joint Venture [JV] 2007) and references therein; Environmental Impact Statements (EISs), Environmental Assessments, Biological Assessments (BAs), and resulting USFWS Biological Opinions (BOs) for previous actions on military lands on Tinian; and internal Navy field survey reports. Site-specific natural resources data within the ROI was obtained from the COMNAV Marianas Geographic Information System as of January 2008.

10.1.2 Tinian

10.1.2.1 Vegetation Communities

The general physiography of Tinian is a series of five limestone plateaus, separated by escarpments. Vegetation on Tinian was described and mapped by Hawaiian Agronomics International, Inc. (1985). In the 1920s, the island was cleared for sugarcane production under Japanese occupation. Aerial photographs reveal that World War II bombing, fires, and military reconstruction significantly reduced the amount of native limestone forest on Tinian, and once-forested areas not under cultivation were susceptible to encroachment of non-native tangantangan. Vegetation mapping was updated islandwide by the U.S. Forest Service (USFS) (2006; based on 2000-2001 aerial photography) and this base mapping was subsequently updated by USFWS (2009a; based on 2006 aerial photography) (Figure 10.1-1; Table 10.1-1). The USFWS (2009a) did not conduct species-specific plant surveys during their studies.

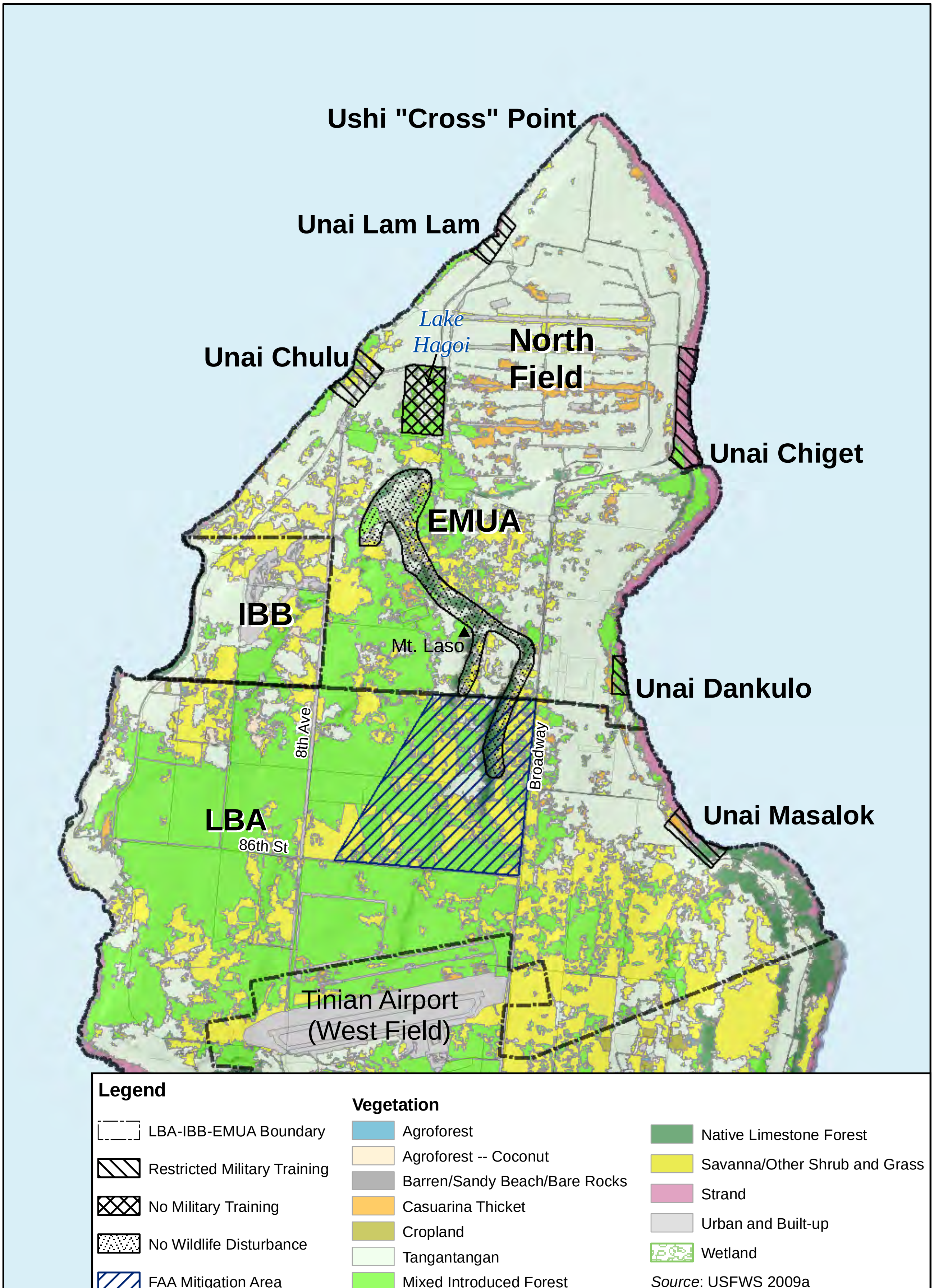

Figure 10.1-1
Vegetation Communities - Tinian MLA

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Table 10.1-1. Vegetation Types on Tinian within the MLA

Vegetation Community	*ac (ha)*
Native Limestone Forest	391 (158)
Mixed Introduced Forest	4,680 (1,894)
Casuarina Thicket	299 (121)
Tangantangan	5,998 (2,427)
Savanna/Other Shrub and Grass	2,934 (1,187)
Agroforest and Coconut Groves	32 (13)
Wetland	34 (14)
Strand and Barren/Beach/Bare Rocks	460 (186)
Cropland	2.5 (1.0)
Urban and Built-up	483 (195)
Total	**15,314 ac (6,197 ha)**

Legend: ac = acres, ha = hectares.
Source: USFWS 2009a.

The USFWS (2009b) assessment of vegetation changes since the 1980s noted that coverage of open fields decreased 11.6% while coverage of secondary forest increased 10.3%, likely a result of succession over the last two decades as open areas are abandoned. Smaller changes included a decrease in tangantangan and an increase in urban land cover. Vegetation community descriptions that follow are summarized from Falanruw et al. (1989).

Native Limestone Forest

Few native limestone forests remain on Tinian. Within the MLA they occur along cliff lines near Mount Lasso and around the north escarpment of Maga. This forest community harbors native tree species such as *Cynometra ramiflora* (gulos), *Neisosperma oppositifolia* (fagot), *Cerbera dilatata* (chiute), *Psychotria* spp., *Eugenia* spp., *Guamia mariannae* (pai pai), pandanus, coral tree, *Ficus* spp. (nunu), *Pisonia grandis* (umumu), and tropical almond. These species are important habitat and food sources for Mariana fruit bat, Micronesian megapode, and Tinian monarch.

Mixed Introduced Forest

Secondary growth forests contain a mixture of predominantly introduced trees, shrubs, and dense herbaceous plants. Introduced trees common in this vegetation community include *Albizia lebbeck* (Trongkon-mames), Formosan koa, flame tree, and *Pithecellobium dulce* (kamachile).

Casuarina thicket

Casuarina equisetifolia, commonly called ironwood or Australian pine, tolerates dry and salty conditions. It often grows in shrub and grass habitat and in some locations forms a sparse woodland with little understory. Ironwood also occurs in exposed areas and along the coast at some locations in narrow bands.

Tangantangan

Tangantangan forests dominate much of the level and moderately sloping areas of lowland habitat areas, especially in the northern portions of the island. This habitat is nesting and foraging habitat for the Tinian monarch.

Savanna/Other Shrub and Grass

These areas, dominated by grassy and low herbaceous vegetation, occur on both limestone and volcanic soils. *Pennisetum* spp. are common, as well as patches of other weeds and areas of mixed ferns.

<u>Agroforest and Coconut groves</u>

The agroforest land class category is applied to areas of mixed growth including trees managed for fruit, food, wood, and other products.

<u>Wetland</u>

Wetland vegetation communities are areas of grasses, sedges, and herbs, or woody species growing in standing water or saturated soils most of the year. This type is most prevalent at Lake Hagoi.

<u>Strand</u>

Strand vegetation occurs on sandy beaches, and includes beach heliotrope, Portia tree, and beach naupaka. In rocky areas it includes *Pemphis acidula* (nigas).

Hawaiian Agronomics (1985) listed and mapped four terrestrial plant species of special concern on Tinian due to their status in the Southern Marianas. Those species within the MLA are: *Heritiera longipetiolata* (Ufa halomtano) from coastal forests where it was reported growing with *Barringtonia asiatica* (puteng) near Unai Masalok on the east coast, and along the Lamanibot Bay escarpment of the MLA; *Canthium odoratum* (listed as variety *tinianense* in Raulerson 2006) where it was reported near the shrine at Mount Lasso and near Unai Masalok; *Callicarpa lamii*, a shrub reported from the north-south trending cliff area of Mount Lasso; and *Euphorbia sparrmannii* var. *tinianensis*, a small, semi-succulent herb reported from a single rock at Unai Masalok (not reported in Raulerson 2006).

10.1.2.2 Wildlife - Native

Indigenous wildlife species on Tinian reported in the most recent INRMP (COMNAV Marianas 2004) include 46 birds, the majority are classified as migratory birds under the Migratory Bird Treaty Act (MBTA); one bat species (Mariana fruit bat); seven reptile species (two sea turtles, three geckos and two skinks); and two land crustaceans (coconut crab and land crab). Special-status species are addressed separately below. The 936-acre (ac) (379-hectare [ha]) Federal Aviation Administration (FAA) mitigation area is located in the Lease Back Area (LBA) just south of the Exclusive Military Use Area (EMUA) boundary. It was designated to compensate for the loss of Tinian monarch habitat during the expansion of the Tinian airport (COMNAV Marianas 2004).

A total of 18 land bird species were detected during one or more of the three surveys conducted between 1982 and 2008 on Tinian (USFWS 2009b). The most abundant native species were the bridled white-eye, rufous fantail, collared kingfisher, island-collared dove, white-throated ground-dove, Mariana fruit-dove, white tern, Tinian monarch (see additional discussion below), Micronesian honeyeater, Micronesian starling, and yellow bittern. Monthly DoN monitoring and periodic monitoring by CNMI Department of Fish and Wildlife [DFW] has also been conducted and support these observations. Of these species, the bridled white-eye and rufous fantail were the most abundant. The abundance of collared kingfisher, white-throated ground-dove, rufous fantail, Micronesian starling, and yellow bittern has increased since 1982 while the abundance of Tinian monarch, Mariana fruit dove, and Micronesian honeyeater has decreased since 1982 (USFWS 2009b).

The Tinian monarch is an endemic land bird species that nests in limestone, secondary, and tangantangan forest habitats. It was federally delisted in 2004 (USFWS 2004) and was delisted by the CNMI government in 2009. Although the Tinian monarch is no longer listed, the species is currently being monitored under the *Post-Delisting Monitoring Plan for the Tinian Monarch* (USFWS 2005). The DoN would continue to assist with that monitoring. Based on monitoring being conducted, the population of this species may be in decline (USFWS 2009b).

Based on several sources, the USFWS (2004) estimated the monarch currently inhabits approximately 62% of the land area on Tinian, of which approximately 93% is secondary and tangantangan vegetation and 7% is native limestone forest. The MLA encompasses roughly 75% of the current monarch habitat on the island and supports about 70% of the total monarch population (USFWS 2004). An island-wide Tinian monarch survey in 1982 estimating a population of 35,846 was repeated in 1996, resulting in an estimated population of 55,721 (Lusk et al. 2000). The same survey found a significant increase in forest density since 1982, indicating an improvement in monarch habitat quality.

The current population estimate for Tinian based on June 2008 surveys is approximately 40,000 individuals. Based on the 2008 survey, the greatest monarch densities were observed in limestone forest, secondary forest, and tangantangan thicket, decreasing in that order but not statistically different. Territory densities ranged from 4.2 territory pairs/ac (1.7 pairs/ha) in tangantangan thickets to 19.3 pairs/ac (7.8 pairs/ha) in limestone forest (USFWS 2009b). Native tree species are preferred monarch nesting sites, as evidenced by higher densities, nesting rates, and reproductive success in limestone forest (Naval Facilities Engineering Command [NAVFAC] Pacific 1997).

A total of 58 species of migratory seabirds and shorebirds were detected in various studies summarized in the Mariana Islands Range Complex (MIRC) EIS/Overseas EIS [OEIS]), of which 11 species are residents or species breeding on the island (DoD 2009). Most of the resident or breeding species have been observed at Lake Hagoi, a major bird area on Tinian. In surveys conducted in 1994 and 1995, a total of 9 different bird families including at least 12 species were recorded at Lake Hagoi wetlands, including 2 native forest birds and 10 migratory bird species (USFWS 1996). Specific birds identified at Lake Hagoi from the most recent studies include the Mariana common moorhen (discussed further below under Special-Status Species), black noddy, brown noddy, white tern, brown booby, masked booby, red-footed booby, Pacific reef heron, yellow bittern, great frigatebird, red-tailed tropicbird, and white-tailed tropic bird (DoN 2010).

Numerous gray-tailed (aka) Siberian tattlers and wandering tattlers, reef herons, black noddies, and white terns (including one large colony of 30 plus birds), all protected under the MBTA, were recorded during 2008 shoreline surveys of Navy lands on Tinian (USFWS 2009b). No black noddy nesting areas were observed on Tinian during the survey. Most birds observed were 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. White-tailed tropicbirds, black noddies, and white terns were noted in point transect surveys on Tinian and the white tern total population was estimated at approximately 18,000 birds (USFWS 2009b). Puntan Masalok and Puntan Tahgong are identified as potential habitat for pelagic birds including noddies and terns in Environmental Sensitivity Index Maps (National Oceanic and Atmospheric Administration [NOAA] 2005).

In a recent reptile survey several native species were found including the snake-eyed skink that was found adjacent to Unai Chulu and in a monitoring plot just northeast of North Field (USFWS 2009b). The tide-pool skink was reported as common in the *Pemphis acidula* vegetation zone north of Unai Chulu and thought likely to be present in similar habitat at other locations (USFWS 2009a). In 2008, surveys the blind snake was found in both mixed and limestone forest (USFWS 2009b). USFWS states that it is unquestionably native given that Pregill (1998) found archeological evidence of its presence in the Mariana Islands since at least early pre-human times.

In addition to being a highly-valued game species in the CNMI, the coconut crab serves important ecological functions such as dispersing seeds and as scavengers. Recently, coconut crabs densities have been estimated at 4.95 crabs/ha in native forest and 1.83 crabs/ha in tangantangan. Coconut crab size distribution was highly skewed to the lower sizes, possibly due to illegal poaching (USFWS 2009b).

10.1.2.3 Wildlife – Non-Native

Non-native species are common on Tinian. The most abundant non-native bird is the Eurasian tree sparrow (USFWS 2009b). Introduced mammals include rats, mice, shrews, cats and dogs. The musk shrew and roof rat are distributed throughout the island but other rats are uncommon (COMNAV Marianas 2004). Roof rat densities of up to 185/ac (75/ha) were found in native forest and musk shrew densities of up to 183/ac (74/ha) were found in tangantangan. Roof rat densities were higher than on many other tropical Pacific islands and it is likely these high densities are having a detrimental effect on flora and fauna including bird species (USFWS 2009b).

Oceanic geckos were reported during the 2008 surveys and constituted about half of the lizard biomass in limestone forest areas (USFWS 2009b). Monitor lizards have been observed at Lake Hagoi and they may be a primary threat to Mariana common moorhen chicks and eggs (USFWS 1996, Vogt 2008a). It should be noted that recent studies have indicated that monitor lizards may be native to some Mariana Islands (Pregill and Steadman 2009). The marine toad is the only introduced amphibian and the mangrove crab, introduced as a potential food source, is the only crustacean (COMNAV Marianas 2004).

The brown tree snake (BTS) has the potential to impact the economy, human health, and island ecology in the CNMI. This species was inadvertently introduced to Guam by way of military cargo after World War II (Rodda and Savidge 2007). The BTS native range is coastal Australia, Papua New Guinea, and a large number of islands in northwestern Melanesia (Fritts and Leesman-Tanner 2008).

Although BTS were known to occur on Guam in the 1950s through the 1980s, they were not seen as a threat as this was the first instance of a predatory snake arriving on an isolated island. However, as a result of this introduction, 17 of 18 native bird species were severely impacted, and 12 of the 18 species were likely extirpated due to the BTS (Wiles et al. 2003).

Efforts to control the BTS are mostly limited to preventing BTS from leaving Guam in cargo, by ship or air. The DoD has collaborated with other partners and participated in the development of BTS-specific trapping techniques, BTS detection using sniffer dogs, fence design, development of toxicants, and delivery methods. While these efforts have had success, BTS originating on Guam have been found in Kwajalein, Pohnpei, Hawaii (Oahu), Diego Garcia, Spain, Alaska, Texas, Oklahoma, and neighboring CNMI islands (Rota, Tinian, and Saipan).

The potential establishment of the BTS on Tinian is of great concern. As of 2008, there have been 75 confirmed BTS detections throughout the CNMI (N. Hawley, CNMI DFW, unpublished data). There have been eight unconfirmed BTS sightings on Tinian: one in February 1990, four reported in 1994 (Fritts and Leasman-Tanner 2001), and three reported in 2003 (BTS Technical Working Group 2009). If BTS were to become established (without immediate suppression) on Tinian as a result of the proposed action, the impacts would likely be similar to those experienced on Guam.

Goats have been recently transported from Aguiguan to Tinian. A survey around the coast in October 2008 confirmed at least 20 goats at Puntan Kastiyu and there was some evidence they were already creating trails, accelerating erosion, and impacting the native vegetation (USFWS 2009b).

10.1.2.4 ESA-listed Species

Six federally listed threatened and endangered or candidate species have been observed or potential habitat for those species is present on Tinian (Table 10.1-2, Figure 10.1-2). Another species, the Mariana swiftlet is presumed extirpated from Tinian and is not evaluated further in this EIS. Green sea turtles are known to nest on Tinian; there is no known nesting of hawksbill sea turtles.

Table 10.1-2. Occurrence of Special-Status Species within the Tinian ROI

Common Name/ Chamorro Name	*Status* *ESA*	*CNMI*	*Habitat*	*Occurrence in ROI*
Mammals				
Mariana fruit bat/ Fanihi	T	E	Limestone forest, coastal forest, and coconut plantations	Occasional sightings.
Birds				
Mariana common moorhen/Pulattat	E	E	Freshwater wetlands	Population up to 75 birds.
Micronesian megapode/Sasangat	E	E	Limestone forest and coconut groves	Reports of a few individuals in recent years but none in 2008 surveys.
Mariana swiftlet/ Chuchaguak	E	E	Nests in caves	Observed historically; no records since 1970 - presumed extirpated.
Reptiles				
Green sea turtle/ Haggan bed'di	T	T	Suitable beaches for basking and nesting.	Nesting documented.
Hawksbill sea turtle	E	E	Suitable beaches and strand for basking or nesting	No nesting known.
Micronesian gecko/ Guali'ek	-	E	Forested areas	Reported from Mt Lasso and Carolinas Plateau in 2008.
Invertebrates				
Humped tree snail/ Akaleha', Denden	C	-	Intact limestone forest	Not seen since 1970; possibly extirpated.

Legend: C = candidate, E = endangered, T = threatened.
Sources: COMNAV Marianas 2004, CNMI Department of Land and Natural Resources (DLNR) 2005, TEC JV 2007, Vogt 2008a, b; DoN 2010, USFWS 2009b.

Mariana Fruit Bat

Although Tinian once held a large number of fruit bats, after World War II it was estimated to retain only 5% of native forest cover (USFWS 1998), a primary reason, along with poaching, for the current near-absence of Mariana fruit bats on Tinian. No permanent fruit bat colony is believed to exist on Tinian. However, bats may fly between islands in the southern Marianas. Within the MLA, fruit bats have been observed historically in the vicinity of Mount Lasso, Puntun Diaplo, and Lake Hagoi (COMNAV Marianas 2004). Surveys were conducted for Mariana fruit bat on Tinian in 1994 and 1995 at five observation stations and fruit bats were not observed. However, there were two incidental observations, one near San Jose village and one near the south end of the island. No bat colonies were observed on Tinian so no direct colony counts were conducted (Kreuger and O'Daniel 1999). In 2008, eight separate station counts were conducted at seven locations on Tinian and no bats were observed (Brooke 2008).

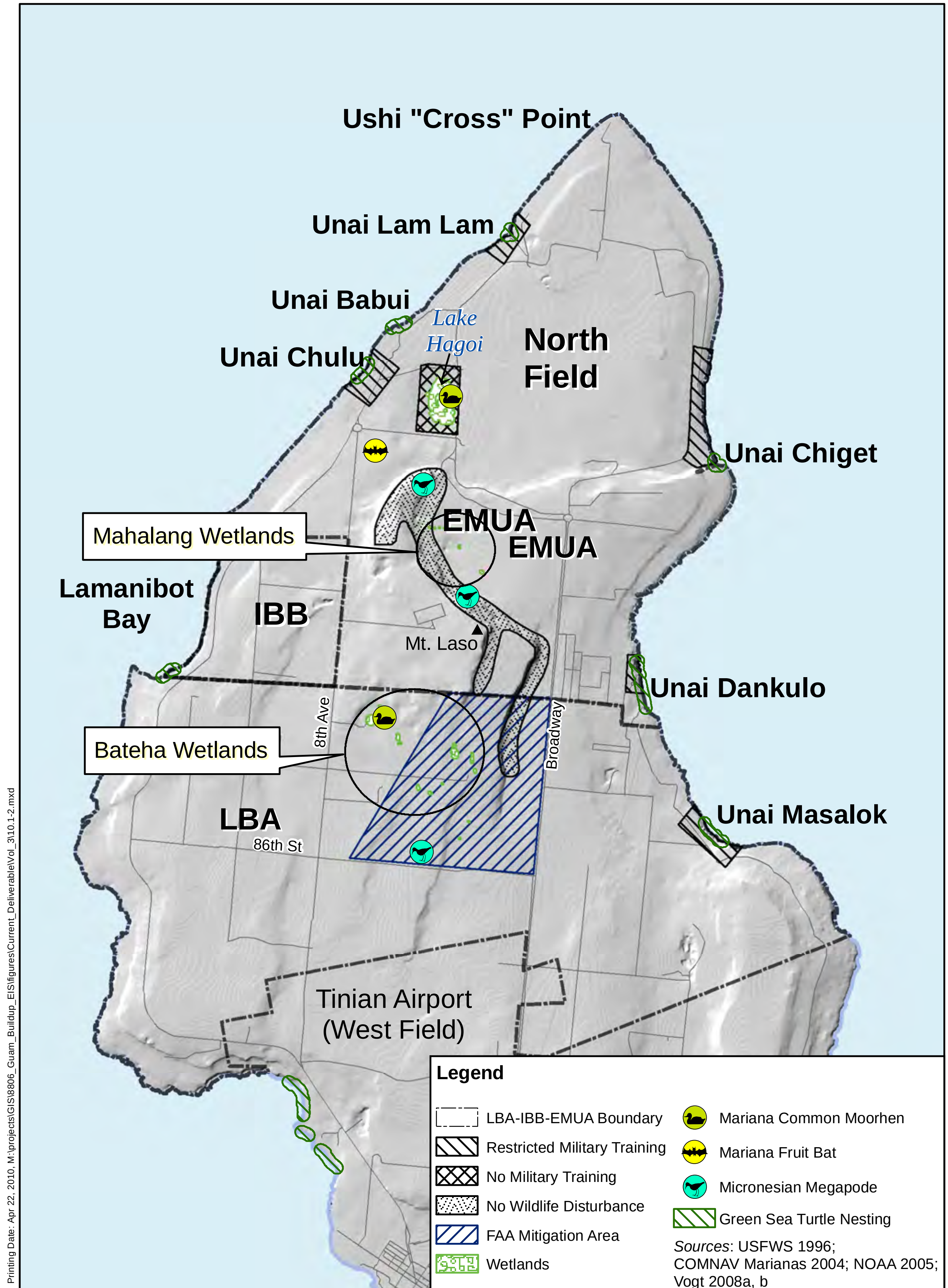

Figure 10.1-2
Occurrence of ESA-listed Species - Tinian MLA

Mariana Common Moorhen

The Mariana common moorhen is an inhabitant of emergent vegetation of freshwater marshes, ponds, and placid rivers. In the Mariana Islands, its preferred habitat includes freshwater lakes, marshes, and swamps. The recovery plan for the moorhen identifies Lake Hagoi (44 ac -18 ha] with 2.5 ac [1 ha] of open water) (Takano and Haig 2004) within Tinian's EMUA as primary habitat for the moorhen. Primary habitat is defined as the best current or potential remaining moorhen habitat and is considered essential to the recovery program (USFWS 1991).

The 1991 recovery plan estimated the moorhen population on Tinian to be between 20 and 125 birds (USFWS 1991). Based on previous reports and surveys from 1989, 1994-1995, and 2001, the moorhen population on Tinian was estimated to be between 41 and 75 birds (Takano and Haig 2004). Yearly averages of a monthly monitoring program show that 2003 and 2007 were peak years for moorhen numbers at Lake Hagoi (16.9 and 17.1, respectively), and lows during 1999 and 2005 (10.1 and 9.9, respectively). These numbers are the means for the year and are index surveys not an absolute population estimate. The number of birds observed appears to correlate to periodic dry conditions at the Lake Hagoi wetland; Lake Hagoi was completely dry in April 2005 (Vogt 2008a). Predation from rats and monitor lizards may be impacting the moorhen population at Lake Hagoi, especially during peak nesting periods (USFWS 1996, Vogt 2008a).

The 27 ac (11 ha) Magpo wetland area identified as secondary moorhen habitat (USFWS 1991) is located over 1 mi (1.6 km) south of the MLA boundary in southeastern Tinian. In 1995, the estimated maximum numbers of moorhens using the smaller 32 ac (13 ha) Mahalang and 15 ac (6 ha) Bateha wetlands is three and four birds, respectively; however, these wetlands are overgrown with vegetation (USFWS 1996, Takano and Haig 2004). The moorhen populations have declined due to habitat loss (vegetation encroachment), historical poaching, and possible predation by rats and monitor lizards (USFWS 2009b).

Micronesian Megapode

In 1902, the Micronesian megapode was noted as common on Tinian. However, by 1949 these birds were already becoming difficult to locate in surveys (NAVFAC Pacific 1997). Its continued existence on Tinian was confirmed during a USFWS survey in 1995 where incidental sightings of single birds were reported at three separate locations including Mount Lasso, the Maga area (to the northeast of the International Broadcast Bureau), and a small section of native forest adjacent to Cross Island Road in the Bateha area (Krueger and O'Daniel 1999). Extensive megapode surveys in 2001 resulted in a conservative estimate of at least two individual birds (Witteman 2001). During monthly surveys from 1999-2005 three megapodes were detected on the Maga transect (Vogt 2006). In surveys conducted on seven transects in July and August 2006 no megapodes were documented (Vogt 2008b). This was also the only area where megapodes were documented in the 2001 surveys (Witteman 2001). Since 1995 biologists have detected megapodes 13 times on Tinian during 234 individual survey efforts (Vogt 2008b). Because some of these detections may be repeat observations of the same bird, it is not possible to determine a current population size for Tinian. Occasional sightings of megapodes may be a result of movement from Aguiguan. No Micronesian megapodes were detected in 2008 during point-transect and playback surveys on Tinian (USFWS 2009b). However, as noted in a comment to the Draft EIS from the Office of the CNMI Governor, in the summer of 2009 a Tinian DLNR employee with bird survey experience sighted a Micronesian megapode along the road between the Seabees monument and Broadway near the FAA Mitigation Area.

Mariana Swiftlet

Mariana swiftlets were last documented on Tinian in the 1970s; however current evidence indicates that it is likely an infrequent visitor from Saipan or Aguiguan (Cruz et al. 2008). Detailed surveys and mapping of 88 caves on Tinian (Stafford 2003, as cited in Cruz et al. 2008) revealed no evidence of Mariana swiftlets and they are presumed extirpated from the island (USFWS 2009b).

Sea Turtles

The green sea turtle is known to nest on Tinian, and the hawksbill turtle has been sighted in the waters offshore, but is not known to nest on the island. Green sea turtle abundance and density are highest along the island's relatively uninhabited east coast. The most recent estimate of the number of green sea turtles occurring in the nearshore waters around Tinian was 832 turtles in 2001 (Kolinski et al. 2004). For successful nesting, green sea turtles require deep sand beaches with open ocean exposure and minimal disturbance. Beaches within the MLA where green sea turtles have nested include Unai Masalok, Unai Dankulo, Unai Lamlam, Unai Babui, Unai Chulu, Unai Dumpcoke, Unai Barcinas, and Leprosarium Beach (COMNAV Marianas 2004). Green sea turtle nesting activity occurs as early as late January and ends in mid-July on most of Tinian's sandy beaches (NAVFAC Pacific 1997). The beaches that occur within the MLA are surveyed monthly for sea turtle activity (i.e., crawls, nests, potential nests, body pits and hatchling tracks). Surveys between 1999 and 2005 were summarized by Vogt (2006). The highest number of beach crawls (13) and nests (6) were recorded in 2005 with activity occurring at Unai Dankulo (Long Beach), Chulu, and Masalok.

Tree Snails

The humped tree snail is a federal candidate species. It was historically present on Tinian but has not been observed since 1970 (CNMI DLNR 2005) and is thought to be extirpated (USFWS 2007). Recent surveys in likely habitat areas did not record this species (report in preparation).

Other Species

Recent surveys were conducted for ESA candidate butterfly species and none were found, although host plant species were present (USFWS 2009b). No federally listed plant species are known from Tinian.

10.1.2.5 CNMI-Listed Species

Seven CNMI-listed threatened and endangered species have been observed or potential habitat is present on Tinian (refer to Table 10.1-2 and Figure 10.1-2). As mentioned above, the Mariana swiftlet is also listed in Table 10.1-2 but it is presumed extirpated on Tinian and is not evaluated further in this EIS. Those species that are also federally listed were discussed above.

Micronesian Gecko

This species is endemic to Micronesia and native to Tinian (USFWS 2009b) and is the only CNMI-listed gecko in the CNMI. It was believed to be extirpated after 1946 but was again collected in 2003 on Tinian (CNMI DLNR 2005) and was sighted in 2007 and collected (a single specimen only) in limestone forest in 2008 studies (USFWS 2009b).

10.2 ENVIRONMENTAL CONSEQUENCES

10.2.1 Approach to Analysis

10.2.1.1 Methodology

Biological resource issues and concerns include the potential direct, indirect, and cumulative impacts of the proposed actions and alternatives during the construction and operation phases. Impacts may be either temporary (reversible) or permanent (irreversible). Direct and indirect impacts are distinguished as follows.

Direct impacts are associated with proposed construction activities (e.g., ground-disturbing activities) and operations (e.g., range use). Potential types of direct impacts include, but are not limited to:

- Loss of habitat due to vegetation removal during construction and potential wildfires from training activities.
- Temporary loss of habitat during construction from noise, lighting, and human activity.
- Potential loss of habitat due to increased noise from proposed aircraft activities and training range usage.
- Injury or mortality to wildlife or special-status species caused by the action that occur at the same time and place as the action.

Indirect impacts are caused by or result from project-related activities, are usually later in time, and are reasonably foreseeable (e.g., increased likelihood of non-native species moving into the area after disturbance). Potential indirect impacts include, but are not limited to:

- All disturbances from human activity, noise, and lighting that would potentially impact unoccupied suitable habitat for special-status species.
- Introduction of new non-native species or increased dispersal of existing non-native species on Tinian.
- Dispersal of existing non-native species from Tinian to other destinations.
- Increased threats from feral animals.
- Adverse effects from pollutants that are released from construction, military operations, or training.
- Adverse effects from wildfires.

Potential direct impacts of noise from small arms ranges were determined based on sound levels estimated from noise models. Potential direct and indirect impacts to species occupying habitat nearby to the ranges (e.g., from daily operations at facilities, and lighting disturbance) were assessed within 328 ft (100 m). This distance was selected because the impacts being considered for this analysis are for general noise and human activity, and there is no information available on the sensitivity of the species being evaluated.

General principles used to evaluate impacts are:

- The extent, if any, that the action would permanently lessen ecological habitat qualities that ESA-listed species depend upon, and which partly determines the species' prospects for conservation and recovery.
- The extent, if any, that the action would diminish population sizes, distribution, or habitat of regionally important native plant or animal species.

- The extent, if any, that the action would be likely to jeopardize the continued existence of any ESA-listed species.
- The extent, if any, that the action would be inconsistent with the goals of USFWS recovery plans, DoN INRMPs, or the CNMI Comprehensive Wildlife Conservation Strategy (CWCS).

10.2.1.2 Determination of Significance

Significance of impacts to vegetation, wildlife, and special-status species were determined using guidelines in the previous section. Special-status species are defined as ESA- and CNMI-listed species and species that are designated candidates for ESA listing. Specific significance criteria are discussed below.

Vegetation

Impacts would be determined significant if any primary limestone forest (mature forest dominated by native species) would be cleared, unless determined to be very minor in the context of the surrounding forest areas. Any loss of this forest vegetation community would be considered significant because of the large historical and continuing losses of this forest type on Tinian. Loss of wetland or mangrove vegetation would also be considered potentially significant.

Wildlife

Impacts would be determined significant if native wildlife species are present and the proposed project would result in more than minimal changes in population sizes or distributions of regionally important native animal species. These wildlife species include those designated in the CNMI CWCS. Non-native species impacts that exceed the criteria specified above are evaluated. A major concern for wildlife is if the BTS would be inadvertently introduced to Tinian. This concern is addressed comprehensively for all actions proposed in this EIS with proposed mitigation measures described in Volume 2, Section 10.2.2.6. If significant impacts are determined, then mitigation may be proposed to offset the impacts. For this EIS, a major consideration for minimizing impact is biosecurity. A Micronesia Biosecurity Plan (MBP) is being developed and is further discussed in Section 10.2.2.3 of this volume.

Migratory Birds

For migratory birds, the MBTA prohibits the taking, killing, or possession of migratory birds, with an exemption for military readiness activities (as defined in federal regulations) provided they do not result in a significant adverse effect on a population of a migratory bird species. 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 Part 21).

The DoD must consult with the USFWS if it is determined that a military readiness activity would have a significant adverse effect on a population of a migratory bird species. An activity has a significant adverse effect if, over a reasonable period of time, 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.

Migratory bird conservation relative to non-military readiness activities is addressed separately in a Memorandum of Understanding developed in accordance with EO 13186, *Responsibilities of Federal*

Agencies to Protect Migratory Birds. The Memorandum of Understanding between the DoD and USFWS was signed in July 2006 and DoD responsibilities included, but are not limited to: (1) incorporating conservation measures addressed in regional or state bird conservation plans and INRMPs; (2) managing military lands and activities other than military readiness in a manner that supports migratory bird conservation; and (3) avoiding or minimizing impacts to migratory birds, including incidental take and the pollution or detrimental alteration of the environments used by migratory birds.

Special-Status Species

The presence of special-status species in the project areas was described in Section 10.1. Background information is presented in the species profiles in Appendix G. Impacts would be determined significant if special-status species are present in the project area and any project action is likely to result in harassment or harm of an individual, population or species. Impacts to ESA-listed species would include vegetation clearing of habitat, unless it is determined that the removal of habitat or other affect is minor when considering all the remaining habitat and quality of habitat available to that species and considering USFWS recovery plan goals. Significant indirect impacts would also include disturbing ESA- and CNMI-listed species due to noise, lighting, or human activity. If unoccupied but recognized habitat is affected by operational noise, lighting, or human activity, impacts would be considered indirect and would be determined significant unless the area affected is considered minor when considering all the remaining habitat and quality of habitat available to that species.

For ESA-listed species, federal agencies are required to ensure that their actions do not jeopardize the continued existence of an endangered or threatened species or its critical habitat. Analyses of potential impacts are based on review of plans for the proposed action and the available current and historical distributional data for each species. In accordance with Section 7 of the ESA, a Biological Agreement (BA) has been prepared by the DoN, which analyzed the potential impacts to ESA-listed species on Tinian under the jurisdiction of the USFWS. There is no critical habitat designated on Tinian.

The BA and subsequent Biological Opinion (BO) issued by the USFWS would be the final determination of impacts to ESA-listed species that are evaluated in this EIS. Candidate species are also evaluated in the BA, but were not evaluated in the BO because they were not formally listed at the time the BO was completed. The USFWS effects determinations from the BO are incorporated into the Final EIS and/or Record of Decision. The BO also specifies conservation recommendations that are discretionary proponent activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

10.2.1.3 Issues Identified during Public Scoping Process

As part of the analysis, concerns related to terrestrial biological resources that were mentioned by the public, including regulatory stakeholders, during the public during scoping meetings were addressed. A general account of these comments includes the following:

- Concern that activities associated with the military expansion (i.e., construction, expansion, renovation projects, and military training activities) may result in habitat loss and physical disturbance of federally listed endangered species and other federal trust species.
- Potential for harm to fragile ecosystems on Guam and in the Marianas from the introduction of non-native species due to increased traffic among the islands from the movement of personnel and materials. Such species include the BTS, flatworms, various insects, and some plants. This EIS should outline inspection and sanitary procedures to prevent this movement.

- Existing control and containment activities at air and sea ports for BTS are insufficient to deal with the risk associated with the increased cargo and personnel movement from Guam to other vulnerable destinations. The issue "of utmost concern" is BTS interdiction and an effective and enforceable procedure for inspecting all military cargo, personnel, and equipment entering the CNMI. A sustainable 100% inspection rate of all cargo, vehicles, munitions, and household goods would be anticipated, and Guam regulation protocols 505 and 506 should be incorporated into a BTS control plan to be included as part of the EIS.

10.2.2 Alternative 1 (Preferred Alternative)

10.2.2.1 Tinian

Construction

Vegetation

Vegetation that would be removed for construction of ranges and other facilities is shown in Table 10.2-1 and Figure 10.2-1. Vegetation removed includes 173 ac (70 ha) of mixed introduced forest and smaller amounts of tangantangan and shrub/grassland. No limestone forest would be removed. Impacts to vegetation would be less than significant. The vegetation to be removed serves as potential habitat for all special-status species. This impact to habitat is addressed separately below.

Table 10.2-1. Potential Impacts to Vegetation Communities within the Tinian MLA with Implementation of Alternative 1 (ac [ha])

Parcel and Activity	*Mixed Introduced Forest*	*Tangantangan*	*Shrub and Grass*	*Developed*
Construction Areas (vegetation removed)				
Platoon Battle Course	123 (50)	0	13 (5.3)	0
Ranges	13 (5.3)	0	25 (10)	0
Range Control	9.0 (3.6)	0	9.8 (4.0)	1.0 (0.4)
Range Support Areas	28 (11)	0.8 (0.3)	19 (7.7)	0.4 (0.2)
Total area removed	**173 (70)**	**0.8 (0.3)**	**67 (27)**	**1.4 (0.6)**

Wildlife

TINIAN MONARCH. The Tinian monarch is an endemic species that nests in limestone forest, secondary forest, and tangantangan forest habitats. It is likely to be present in all areas surrounding the proposed ranges and range support areas. Potential habitat for the species would be removed as summarized in Table 10.2-2. The MLA encompasses roughly 75% of the current monarch habitat on the island and supports about 70% of the total monarch population. Based on densities estimated by USFWS (2009b), the number of Tinian monarchs that would potentially be displaced through construction would be 408 birds (USFWS 2008). With a total population estimated at approximately 40,000 birds, project construction would impact 1.0% of the current population. Based on territory densities estimated by USFWS (2009b), the number of Tinian monarch territories that would be lost through construction would be 204. Based on the amount of habitat removed compared to the total amount available, impacts to the Tinian monarch would be less than significant.

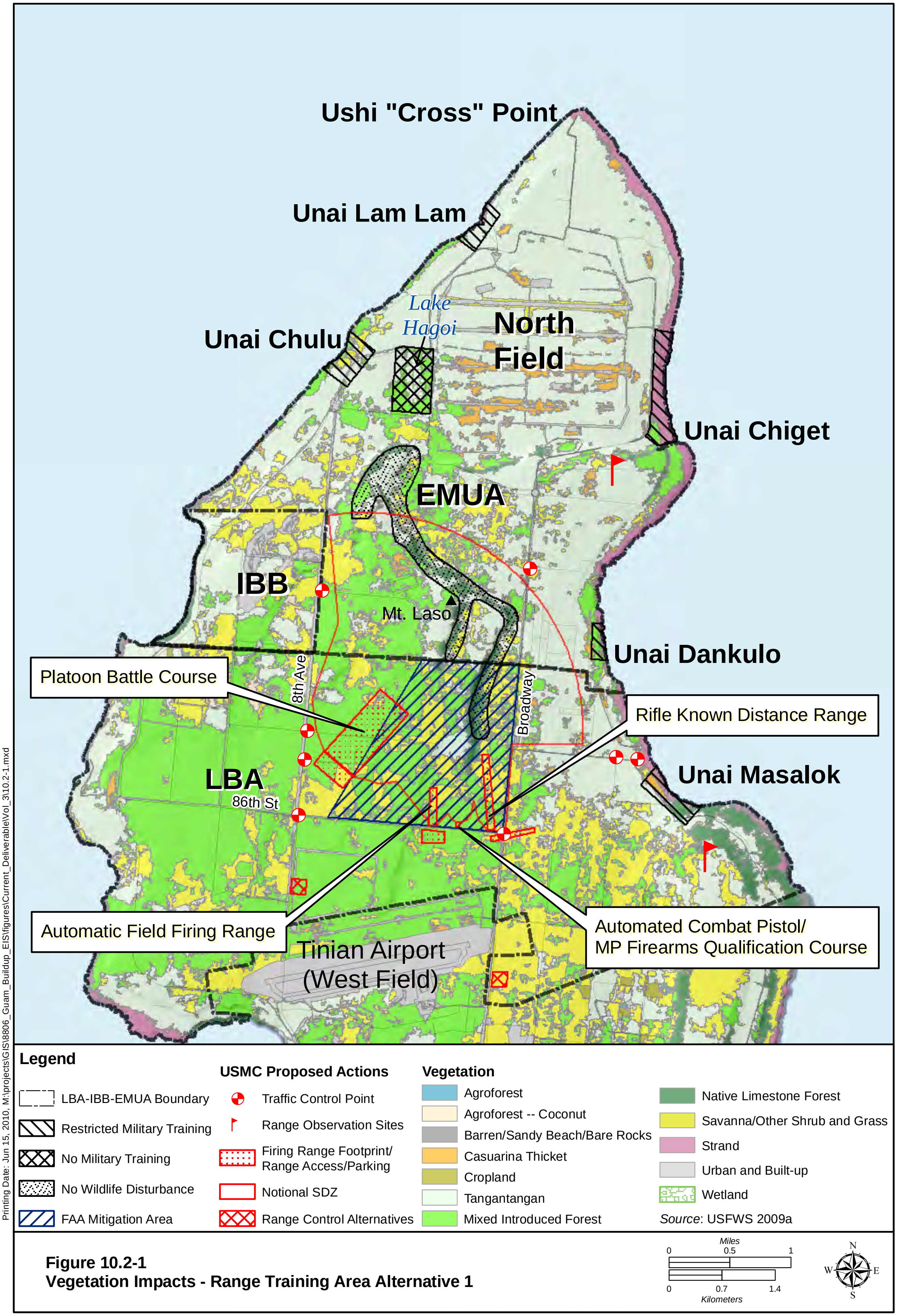

Figure 10.2-1
Vegetation Impacts - Range Training Area Alternative 1

Table 10.2-2. Direct Impacts to the Tinian Monarch with Implementation of Alternative 1

Habitat Type	*Habitat Removed (ac [ha])*	*Monarch Density (# per ha)**	*Total Potential Birds in Removed Habitat*	*Max. Territories (# per ha)**	*Total Potential Territories in Removed Habitat*
Mixed Introduced Forest	173 (70)	5.82	407	2.9	203
Tangantangan	0.8 (0.3)	4.36	1	2.5	1
Totals	**174 (70)**	NA	**408**	NA	**204**

Legend: NA = Not Applicable.
Source: *USFWS 2009b.

The placement of ranges under Alternative 1 does not meet the requirements set out in the "Dedication of Tinian Military Retention Area Land for Wildlife Conservation" (Government of CNMI and Navy 1999) whereby a 936-ac (379-ha) FAA Mitigation Area was established for the protection of "endangered and threatened wildlife, particularly the Tinian Monarch" with the provision that it is the right of the U.S. military to "use the premises for low-impact military training and for other purposes that do not disrupt the habitat and living conditions of the Tinian Monarch." Approximately 70 ac (28 ha) of the 936-ac (379-ha) FAA Mitigation Area that was intended as habitat for the monarch would be removed (Figure 10.2-2), resulting in a significant impact. In addition, a zone 328-ft (100-m) wide surrounding the perimeter of the range footprint areas is assumed to be indirectly impacted by noise and activity from construction (Table 10.2-3).

Table 10.2-3. Potential Indirect Impacts to Habitat surrounding the Proposed Ranges with Implementation of Alternative 1

Project	*Forested Habitat Affected - 100 m Buffer (ac [ha])*
Platoon Battle Course	71 (29)
KD Range	44 (18)
Field Firing Range	42 (17)
Combat Pistol/Qualification Course	12 (4.9)
Range Control/Bivouac Areas	24 (10)
Totals	**193 (78)**

As compensation for the removal of a portion of the FAA Mitigation Area, including the construction footprint and the surrounding area impacted by noise and activity, additional mitigation area would be established and other conservation measures would be implemented as described in Section 10.2.2.3. With this mitigation, impacts from loss of a portion of the FAA Mitigation Area would be less than significant.

OTHER WILDLIFE SPECIES. All the terrestrial bird species listed in Section 10.1.2 have the potential to be present in the proposed range area. Proposed construction activities would remove suitable habitat used by these species (refer to Table 10.2-1) and displace them to other areas. Construction actions could inadvertently kill small species such as skinks and geckos.

Other CWCS-designated species include the Micronesian honeyeater, a species known to be declining since 1982 and with a current estimated population of 4,156 on Tinian (USFWS 2009b) and the Mariana fruit dove, a Marianas endemic species with a current estimated population of 3,201 birds (USFWS 2009b). The honeyeater population density estimate is 0.41 birds per ha (USFWS 2009b) so the loss of 70 ha (refer to Table 10.2-2) would result in the loss of habitat for up to 29 birds.

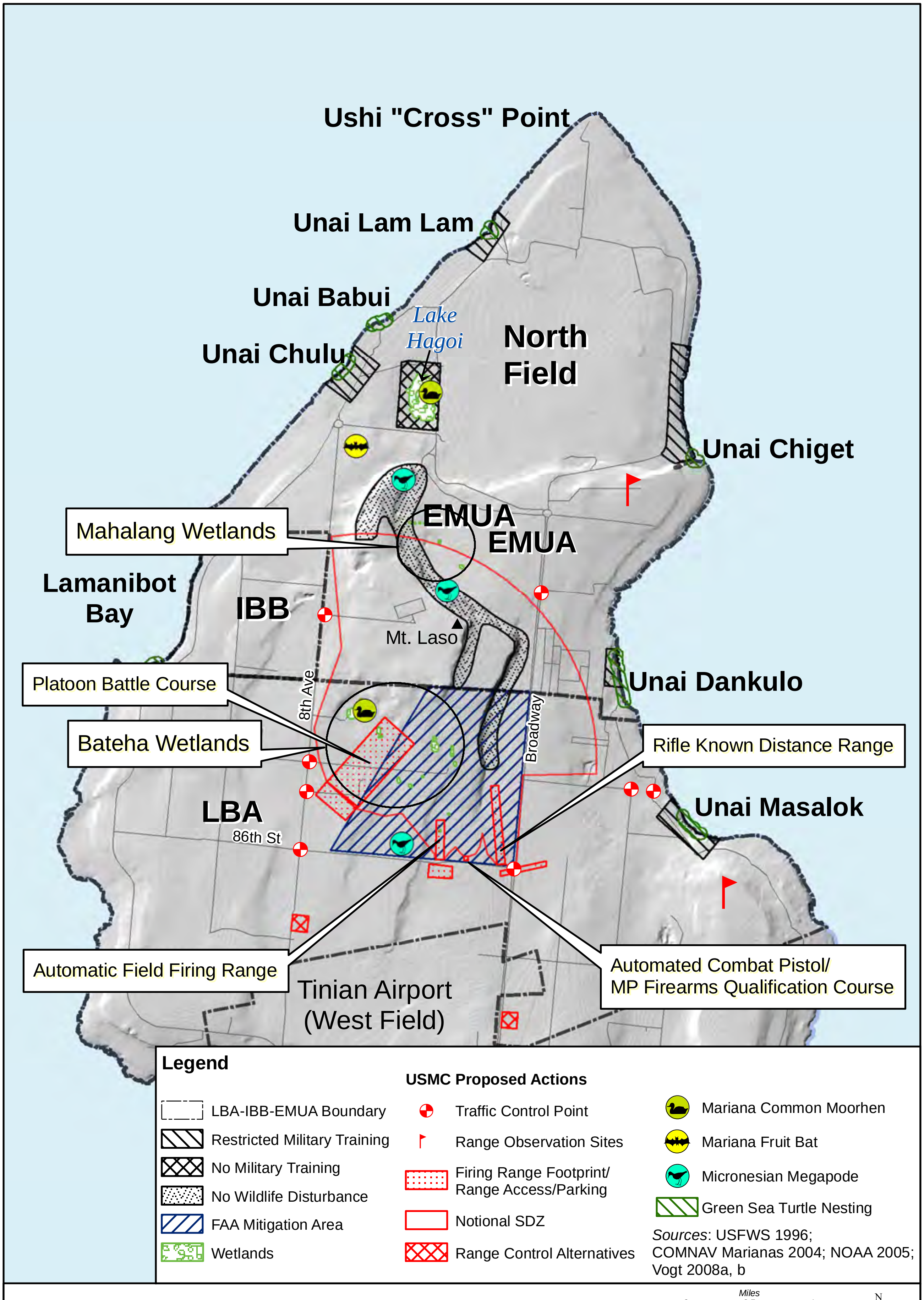

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Figure 10.2-2
Special-Status Species Impacts - Range Training Area Alternative 1

The fruit dove population density estimate is 0.33 birds per ha (USFWS 2009b) so the loss of 70 ha (refer to Table 10.2-2) would result in the loss of habitat for up to 23 birds. It is assumed that some birds would relocate to suitable adjacent habitat; however, it is probable that a portion of these birds may be unable to successfully relocate. During construction activities, some of the birds may not immediately establish territories and/or breeding pairs that may result in reduced breeding activity. However, this loss in habitat and temporary loss in reproduction would result in minimal changes in population size or distribution of these species.

NON-NATIVE WILDLIFE. Movement of construction personnel, equipment, and supplies could result in the movement and spread of invasive plant and animal species to Tinian. Of particular concern is the BTS. Non-native, invasive species would affect wildlife and special-status species or degrade habitat, thus are potential indirect impacts resulting from actions proposed in Alternative 1. Non-native, invasive species impacts for construction would be similar to those for operations but shorter-term. The impacts are discussed in detail under operations below. Impacts from non-native species such as the BTS would be significant but are biosecurity measures are included (see Section 10.2.2.3) to reduce this threat to less than significant.

Other areas surrounding the cleared ranges would be indirectly impacted by disturbance from range construction. Areas adjacent to the ranges, including portions of the FAA Mitigation Area, would be subject to disturbance from the range construction from noise and general human activity. However, construction would be for a relatively short period. Species sensitive to noise and activity would disperse to other areas that provide abundant habitat and could return to the area following construction. None of the species are rare based on survey results by USFWS (2009b). Long-term, permanent impacts to populations of wildlife would not likely result. Impacts to wildlife from construction noise would be less than significant.

Special-Status Species

Direct impacts to special-status species includes the removal of habitat and subsequent fragmentation of remaining habitat. Figure 10.2-4 shows general locations of special-status species in relation to the proposed ranges.

MARIANA FRUIT BAT. The fruit bat was not documented in 2008 surveys on Tinian (USFWS 2009b). Based on this finding, no proposed removal of limestone forest vegetation, and because of the relatively small amount of vegetation community types that would be removed compared to what is available, construction would have a less than significant impact on the fruit bat.

MARIANA COMMON MOORHEN. A wetland approximately 1,000 ft (305 m) to the northwest of the Platoon Battle Course is used by up to 4 moorhens (USFWS 1996). There is no documented use of other areas identified as potential wetlands (see Chapter 4 for an additional discussion of wetlands). To ensure no moorhens are disturbed, monitoring prior to construction would be conducted. If nesting moorhens are present in the limits of construction, construction would be halted until the species left the area. With this mitigation, impacts would be less than significant.

MICRONESIAN MEGAPODE. Although not observed in 2008 surveys, several birds were documented on Tinian in 1999 in the Maga area, northwest of Mount Lasso where there is native limestone habitat that is generally preferred by the species. A single bird was detected just west of the proposed Automatic Field Firing Range in 1995. However, surveys in 2001 (Witteman 2001) and in 2008 (USFWS 2009b) in this same area did not detect any megapodes. Proposed construction under Alternative 1 would be at least 7,500 ft (2,300 m) from the most recent sightings at the Maga location. If a megapode were within the direct action area it should be able to successfully disperse to adjacent unoccupied habitats. To ensure no megapodes are disturbed, monitoring prior to construction would be conducted. If the species is nesting within 984 ft (300 m), construction would be halted until the species left the area. With this mitigation, impacts would be less than significant.

SEA TURTLES. There are no proposed activities in Alternative 1 that occur in beach areas. Impacts would be less than significant.

MICRONESIAN GECKO. This species is uncommon but has been collected in 2008 in a limestone forest area and it is likely to be present only in limestone forest areas (USFWS 2009b). Clearing would not occur in known limestone forest areas and the species is unlikely to be found in other vegetation types, and because of the relatively small amount of vegetation community types that would be removed compared to what is present on Tinian, construction would have a less than significant impact on this species.

TREE SNAILS. The humped tree snail, a candidate species under ESA, historically occurred on Tinian, but is now thought to be extirpated (USFWS 2007). Recent surveys in likely areas recorded no occurrence of this species (report in preparation). There would be no impact on this species.

<u>Operation</u>

Vegetation

Stray ammunition would have limited impact to surrounding vegetation. Impacts to vegetation would be less than significant.

Wildlife

TINIAN MONARCH. There would be indirect impacts from general noise and activity at the ranges in the surrounding forested areas. As discussed below, because there is no information available on the sensitivity of the species being evaluated for general noise and human activity, significant impacts were assumed possible in forested habitat within a surrounding zone of 328 ft (100 m) surrounding the ranges. Using this buffer area, the areas affected are as specified in Table 10.2-3. Noise studies have been conducted for the proposed small arms firing ranges and a summary of the study and noise contours are provided in Chapter 6. Contours are based on two noise metrics: (1) A-weighted day-night level (ADNL) and (2) unweighted peak, 15% Metric (PK-15) (met) which is the peak noise exceeded by 15% of firing events and is a linear peak sound pressure level of individual shots rather than a cumulative or average level; using this measure means the size of the contours would not change if the number of rounds fired increases. For the Tinian monarch, the surrounding forested areas are important. The area within the PK-15 (met) 104 dB noise contour contains 577 ac (234 ha) of forest consisting of the following subtypes: limestone forest – 25 ac (10 ha); mixed introduced forest – 506 ac (205 ha); and tangantangan - 46 ac (19 ha). The area within the 65 dB ADNL noise contour contains 1,229 ac (497 ha) of forest consisting of the following subtypes: limestone forest – 41 ac (16 ha); mixed introduced forest – 999 ac (404 ha); and tangantangan - 189 ac (76 ha).

No noise studies have been conducted specifically on the Tinian monarch; however, noise studies have been conducted on the effects of military noise on a similar species in the Pacific. Vanderwerf et al. (2000) studied the effects of military noise on the elepaio, another endangered Pacific flycatcher in the same family as the Tinian monarch. That study provides some indirect evidence that the Tinian monarch may not be highly sensitive to noise, particularly small arms fire.

The study evaluated the responses of Oahu elepaio at the Schofield Barracks Range in Hawaii to 282 high explosive artillery (60-mm, 105-mm, and 155-mm) and demolition blasts located 328 to 3,281 ft (100 to 1,000 m) from elepaio nests, ranging in intensity from 81.4 to 116 dBA. The effects of artillery blast noise were only detected in two instances. In both instances, an incubating male elepaio was preening his breast feathers with its head down when a blast occurred and it suddenly looked up and scanned immediately after the blast, as if attempting to visually locate the source of the sound. The response was minor and short-lived in both cases; the male lowered its head and resumed preening 1 to 2 seconds after each blast noise had subsided. In no case 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). In addition to the elepaio study, coastal California gnatcatchers regularly occur and nest successfully within 400 ft (122 m) of the Sheriff's Training Range and a Trap and Skeet Range at Marine Corps Air Station Miramar (Navy 2001).

It should be noted the elepaio studied at Schofield Barracks Range may be habituated to the noise associated with live-fire training and since live-fire training has not been conducted on Tinian before, it may take some time for the birds on Tinian to habituate to the noise. Birds habituate to noises and may not respond to stimuli when they do not perceive a direct threat. In general, wildlife, particularly birds, react more to a visual stimulus associated with a noise rather than just a noise without an association to a visual source (Lamp 1989, Bowles 1995). The noise associated with the proposed small arms ranges may be heard at some distance from the range. However, due to the intervening vegetation, there would be no direct visual cue to the proposed weapons firing by a Tinian monarch or other bird, unless the bird was directly adjacent to the firing line of the range. Based on the information available on bird response to noise, impacts from the proposed action would be less than significant.

ALL WILDLIFE SPECIES. Potential direct and indirect impacts to all wildlife species may result from munitions, pollutants, non-native species, fire, recreation, and potential termination of agricultural leases that are currently held within the LBA. Stray ammunition may fall within the Surface Danger Zones (SDZs); however, the likelihood of any single animal being struck is negligible. Assuming that 0.01% of ammunition falls outside the range and in the SDZ, the estimated number of bullets is approximately 328 over the course of a year. Use of ammunitions may result in increases of contaminants in the soil and an increase in the runoff from the ranges, most likely in localized areas. Incidental spills of petroleum used for vehicles or other power equipment could also occur. However, Best Management Practices (BMPs) would control and reduce generation and migration of contaminants from the range area and periodical monitoring for metals contamination in areas surrounding ranges would be conducted (see also Section 4.2.2.1). With these BMPs impacts would be less than significant.

Species in areas surrounding the cleared ranges such as the Micronesian honeyeater and the Mariana fruit dove could be indirectly impacted by disturbance from range operations (impacts to Tinian monarchs were addressed above). These periods of disturbance would not be continuous due to periodic training. Information on the noise sensitivity of the bird species of concern is not available. However, there are other large areas of suitable habitat that could be utilized in adjacent areas. Based on this availability of habitat and total population and distribution for the species, impacts to these migratory birds from operations are considered to be less than significant.

Training activities would result in additional aircraft trips between Guam and Tinian with their associated personnel and equipment. The BTS is the most serious of potential non-native species that might be brought to Tinian. In addition, several non-native plant species in Micronesia (e.g., refer to Space and

Falenruw 1999) present on Guam that are previously unrecorded for Tinian could be introduced due to proposed training activities on Tinian. These and other species have the potential to degrade limestone forest habitat and other forested and shrub habitats that support Tinian monarch and other species. Impacts would be significant. To prevent non-native species, particularly BTS, from being imported to Tinian from Guam, a MBP is being developed to address potential invasive species impacts associated with this EIS as well as to provide a plan for a comprehensive regional approach. The MBP is specified in Section 10.2.2.3. DoD will implement specific biosecurity measures to ensure that risk from transporting invasive species to or from Guam and Tinian is controlled. With implementation of these measures, invasive species impacts would be less than significant.

Fire potential would be increased from firing range operations. Fire can result in direct effects to all wildlife through mortality from smoke inhalation or direct mortality. Native plants, animals, and their habitats on Tinian are adapted to a humid, tropical climate and are not adapted to a fire driven ecosystem (USFWS 2008). Grass fires are regular occurrences on Tinian, and there is greater danger during the dry season. Data cited in the 1997 Tinian INRMP (NAVFAC Pacific 1997) shows that the worst fire hazard exists during the driest months (May through July) of the dry season and during this short time 200 or more acres may burn each year. Information was presented for 1991 that 33 fires burned, the largest occurring in the month of March and two-thirds of the fires burned between 1 and 8 ac (0.4 and 3.2 ha), and approximately one-third burned 9 to 20 ac (3.6 to 8.1 ha). The alteration or removal of habitats by fire could reduce food sources or prevent or inhibit breeding and create competition for feeding and sheltering, particularly for species that establish discrete territories. Impacts would be significant.

Standard practice at Marine Corps firing ranges are specific training range regulations that address fire prevention and response for day-to-day operations. Units undergoing training at the ranges would be briefed by range control on requirements suitable to the conditions of the day and protocols should a fire occur (e.g., specifying how the range would shut down and how fire suppression action would be taken). In addition to these standard procedures, mitigation fire management plan would be prepared to address the potential for fires on Tinian as the result of live-fire training activities on the proposed ranges. The plan would provide background information and strategic planning for fire prevention. Information on this plan is provided under Conservation Measures (Section 10.2.2.3). With implementation of these practices, impacts would be less than significant.

There is currently 2,550 ac (1,032 ha) of land within the LBA being leased to residents on Tinian for agricultural use, primarily grazing. DoD would only terminate subleases in the LBA that are within the footprint and SDZ of the proposed ranges. The relocation of any leases are under the control of the CNMI government as they are responsible for non-federal land use decisions on Tinian. However, DoN would work with CNMI land use and natural resource officials to ensure that native forest habitat concerns for wildlife and all protected species are taken into account. With this measure, impacts would be less than significant.

Special-Status Species

Stray ammunition may fall within the SDZs; however, the likelihood of any single animal being struck is negligible. As described above, the estimated number of bullets that would fall on land within the SDZ is approximately 328 bullets over the course of a year. Impacts would be less than significant. The Mariana fruit bat and Micronesian megapode are not present in the proposed training area based on the most recent studies (USFWS 2009b) so they would not be affected by noise and activity, therefore impacts would be less than significant. Potential impacts to special-status species from pollutants, non-native species, fire, and recreation would be similar to that discussed above for wildlife and would be less than significant or mitigated to less than significant. Noise and activity impacts are discussed below.

MARIANA COMMON MOORHEN. Up to four Mariana common moorhens use the larger of the two Bateha wetlands located approximately 1,000 ft (305 m) to the northwest of the Platoon Battle Course (USFWS 1996). There is no documented use of the other areas identified as potential wetlands, although one small wetland that would be removed may hold water for at least short periods (refer to Chapter 4 for an additional discussion of wetlands). No noise studies have been conducted to measure responses of Mariana common moorhens to noise. However, given the distance and the likely infrequent use of the wetland by moorhens, noise and activity from operation of the ranges and support areas are unlikely to disturb the species. Impacts would be less than significant.

SEA TURTLES. Marines on liberty could have a significant impact on threatened green sea turtles in coastal areas if no educational or enforcement program was in place. The existing COMNAV Marianas Training Handbook (COMNAV Marianas Instruction 3500.4, June 2000) has specific prohibition on harassing or taking all sensitive species and military commanders would enforce these prohibitions. All Marines would also be made aware of the sensitive species present. Impacts would be less than significant.

ALL SPECIAL-STATUS SPECIES. Impacts that would potentially affect all special-status species are the same as those described above under wildlife.

10.2.2.2 Summary of Alternative 1 Impacts

Table 10.2-4 summarizes Alternative 1 impacts.

Table 10.2-4. Summary of Alternative 1 Impacts

Project Activities	*Project Specific Impacts*
Construction	Mixed introduced forest, shrub habitat, and tangantangan would be removed that is habitat for numerous native birds, including the Tinian monarch; approximately 1% of the Tinian monarch population on Tinian would be affecting resulting in a less than significant impact; due to the removal of a small amount of the previously designated FAA Mitigation Area. The FAA Mitigation Area would be reconfigured and increased in size.
Operation	The Mariana common moorhen and Tinian monarch would not be significantly impacted by noise from small arms range firing; the potential for fire and non-native species are significant but would be reduced to less than significant with the implementation of mitigation measures and BMPs; indirect potential significant impacts from termination of grazing leases and movement of grazing animals to other areas would be minimized by working with natural resource officials to ensure that native forest habitat concerns for all wildlife and protected species are taken into account.

10.2.2.3 Alternative 1 Proposed Mitigation Measures

Specific protection measures and general conservation measures that would be implemented are described as well as existing conservation measures that are relevant to the terrestrial natural resources that may be affected. Although BMPs are mentioned, they are not generally considered mitigation because they are actions, plans or Standard Operating Procedures that would be implemented as part of the proposed action regardless of impacts or project. A detailed description of BMPs and resource protection measures required by regulatory mandates can be found in Chapter 2 of Volume 7. A more detailed explanation of regulatory permitting requirements is in Volume 8.

Existing Conservation Measures

Environmental restrictions and requirements for training operations are included in the COMNAV Marianas Training Handbook (COMNAV Marianas Instruction 3500.4, June 2000). The instruction contains the following components: guidance for developing an Environmental Protection Annex in support of a major military exercise plan; training requirements; BTS control and interdiction; monitoring and monitoring reports; emergency procedures; environmental monitor checklists; and an environmental awareness pocket card. This instruction is currently being updated as part of the recent MIRC EIS/OEIS and BO to incorporate new requirements and information.

Project-Specific Protection Measures

The following are specific measures that would be taken to minimize potential impacts to wildlife and special-status species:

- The DoN would hire two full-time Biological Monitors during the construction phase for monitoring construction projects on both Guam and Tinian. The Biological Monitors would be responsible for oversight of avoidance, minimization, mitigation, and conservation measure implementation by the construction contractors for projects associated with the proposed action. The Biological Monitors would ensure that the construction contractor has clearly staked the project limits and the boundary remains in place throughout construction. In addition, the Biological Monitor would monitor construction activities to ensure all avoidance and minimization measures are being implemented by the construction contractor. The Biological Monitors would accurately map and prepare monitoring reports documenting actual impacts of proposed project construction.
- The Biological Monitors would assist with the review and compliance of these procedures and practices, conduct site visits, and provide expert knowledge to contractors and workers. Such advice and technical expertise provided by the Biological Monitor shall not relieve contractors of their reliabilities for compliance with relevant resource protection laws and regulations, including the ESA.
- Construction personnel would receive natural resource awareness briefings which address special-status species, avoidance measures and reporting requirements. This program would focus on the purpose for resource protection; construction contractor identification of sensitive resource areas in the field (e.g., areas delineated on maps and by flags or fencing); environmentally responsible construction practices and protection measures; protocol to resolve conflicts that may arise at any time during the construction process; and ramifications of noncompliance.
- Approximately 1 week prior to clearing vegetation a qualified biologist would survey to determine if the Mariana fruit bat is present. If present in the area, construction would be delayed until they left the area.
- If nesting Mariana common moorhens are present within the limits of construction, clearing and construction would be postponed until the chicks have fledged. If work stopped for more than 1 week, another survey would be conducted to ensure that no birds have begun to nest.
- If Micronesian megapodes are present within 492 ft (150 m) of the project site, the work would be postponed until the megapode has left the area. If megapodes are nesting within 984 ft (300 m) of the project site, the work would be postponed and the USFWS contacted immediately as no nesting is known to occur there.

- Upon termination of any agricultural leases in the leaseback area, DoN would work with CNMI land use and natural resource officials to ensure that native forest habitat concerns for ESA-listed species are taken into account.

Establish a Forest Mitigation Area

Due to the placement of the proposed firing ranges within portions of the current FAA Mitigation Area (refer to Figure 10.2-1), the DoN in coordination with the FAA and USFWS would revise the existing FAA Mitigation Area to encompass the central escarpment associated with Mt. Lasso to protect some of the largest remaining areas of intact native limestone forest on Tinian (Figure 10.2-3). The amount lost from proposed ranges, including a 100-m buffer around each range, would be replaced at a minimum replacement to lost ratio of 2:1. This revised and larger mitigation area would serve as important habitat for ESA-listed species (e.g., Micronesian megapode, Mariana fruit bat) and the delisted Tinian monarch, in particular increasing the acreage of native limestone forest, mixed introduced forest, and tangantangan within the proposed expanded FAA Mitigation Area.

Native Forest Enhancement Plan

The DoN would further minimize impacts to listed and other native species on Tinian by developing and implementing a Native Forest Enhancement Plan within the FAA Mitigation Area. The Native Forest Enhancement Plan would focus on improving the quality of native forest habitat and result in the conversion of non-native habitats into native forest types for the benefit of listed species. Implementation of the plan would begin prior to any construction for new ranges on Tinian; therefore, the plan would be completed at least 1 year prior to the proposed onset of construction on Tinian.

Wildland Fire Management Plan and Resources

A Wildland Fire Management Plan would be developed and implemented. Although this plan is considered a conservation measure overall, some elements in the plan would be project-specific protection measures. This plan would include protocols for monitoring fire conditions and adjusting training as needed, location and management of fuels reductions, fire breaks, fire fighting roads, fire fighting water systems, burn hazard assessment response, on-call helicopter fire suppression, protocols for using units to be briefed by range control on range restrictions, and protocols that will be implemented should a fire occur.

The Tinian Fire Department maintains a 300-gallon (1,136-liter) pump truck and fire crew to respond to wildland fires that would augment military fire response efforts. The Tinian Fire Department also maintains a 750-gallon (2,839-liter) pumper truck and crew in San Jose to respond to and provide fire service for the southern, more developed portion of the island, and backup support to West Field. A military request for the use of these assets would be made through the West Field command post during major exercises.

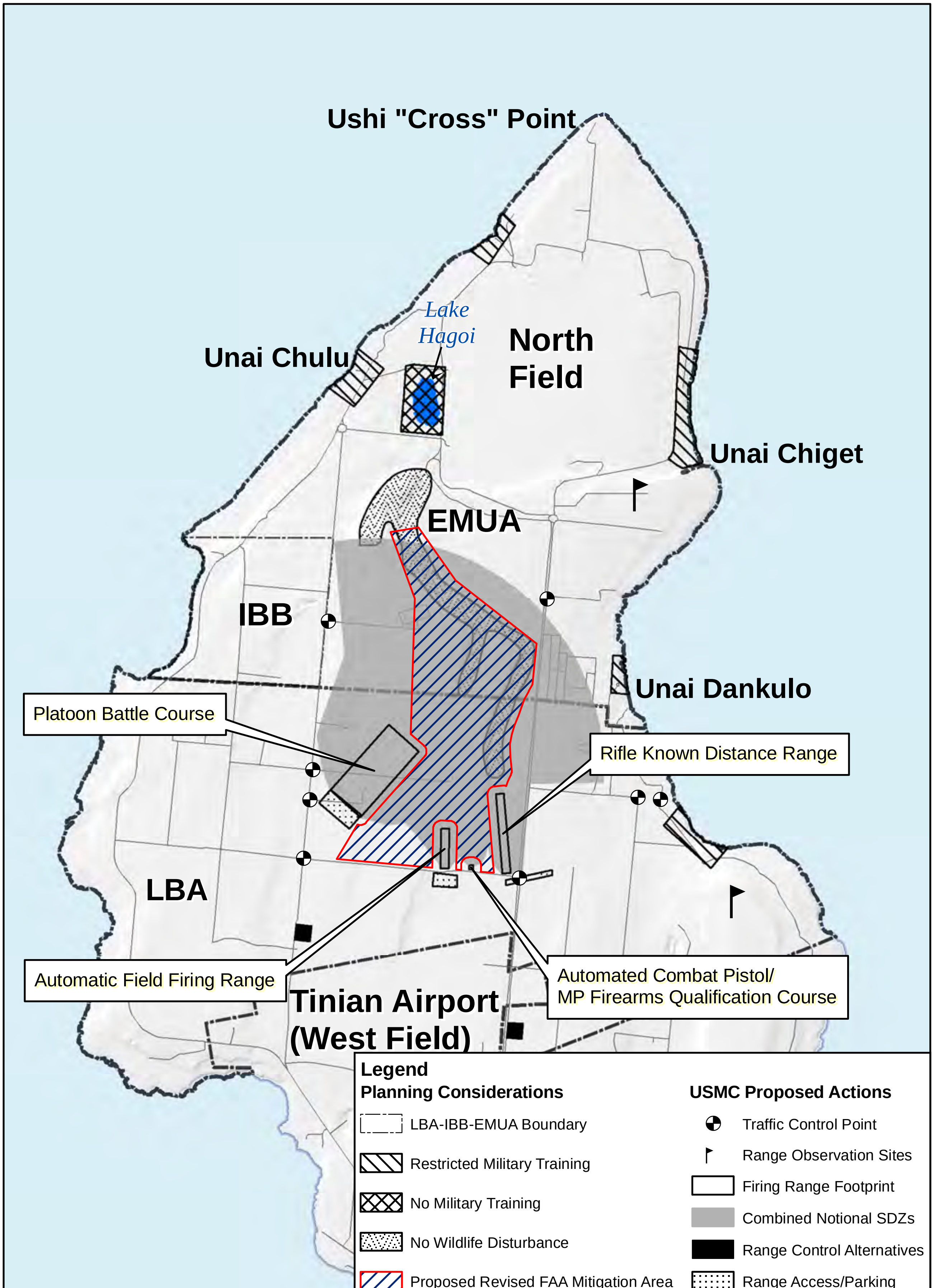

Figure 10.2-3
Tinian Range Training Area - Proposed Revised FAA Mitigation Area
Based on 100-m Buffer around Each Range for Alternative 1

Miles 0 0.5 1
0 0.7 1.4 Kilometers
N W E S

Invasive Species Issues and the Micronesia Biosecurity Plan

The MBP is being developed to address potential invasive species impacts associated with this EIS as well as to provide a plan for a comprehensive regional approach. The MBP would include risk assessments for invasive species throughout Micronesia and procedures to avoid, minimize, and mitigate these risks. It is being developed in conjunction with experts within other federal agencies including the National Invasive Species Council, U.S. Department of Agriculture Animal and Plant Health Inspection Service (USDA-APHIS), the U.S. Geological Survey, and the Smithsonian Environmental Research Center. The plan is intended to be a comprehensive evaluation of risks in the region, including all Marine Corps and Navy actions on Guam and Tinian. It would include control measures to prevent BTS movement off Guam and management within Guam. For additional information on the MBP and existing and interim measures for invasive species control, please refer to Volume 2, Chapter 10, Section 10.2.2.6. DoD will implement interim biosecurity measures to ensure that risk from transporting invasive species to or from Guam and Tinian is controlled.

Specific procedures are already in place or will be in place in conjunction with requirements under the MIRC BO for BTS interdiction and would be continued. The DoD would use the existing dog and handler team for Tinian to conduct all BTS interdiction activities on Tinian for proposed new actions. The current BTS interdiction quarantine facility on Tinian is surrounded by a typhoon proof snake barrier. This facility is adequate for the current import rate of cargo onto Tinian. All military related cargoes (construction and training equipment, vehicles, materials, and supplies) from the proposed project would be inspected by USDA-APHIS and Wildlife Services and determined to be clean prior to leaving the quarantine and inspection areas for work or training on Tinian and for shipment off Tinian.

Habitat Monitoring

Ongoing long-term habitat monitoring on DoD lands on Tinian would continue.

10.2.3 Alternative 2

10.2.3.1 Tinian

Construction

Vegetation

Vegetation that would be removed for construction of ranges and other facilities is shown in Table 10.2-5 and Figure 10.2-4. Vegetation removed includes mixed introduced forest, tangantangan, and shrub/grassland. No limestone forest would be removed. Impacts to vegetation would be less than significant. The vegetation to be removed serves as potential habitat for all the sensitive animal species that are addressed under the special-status species section below.

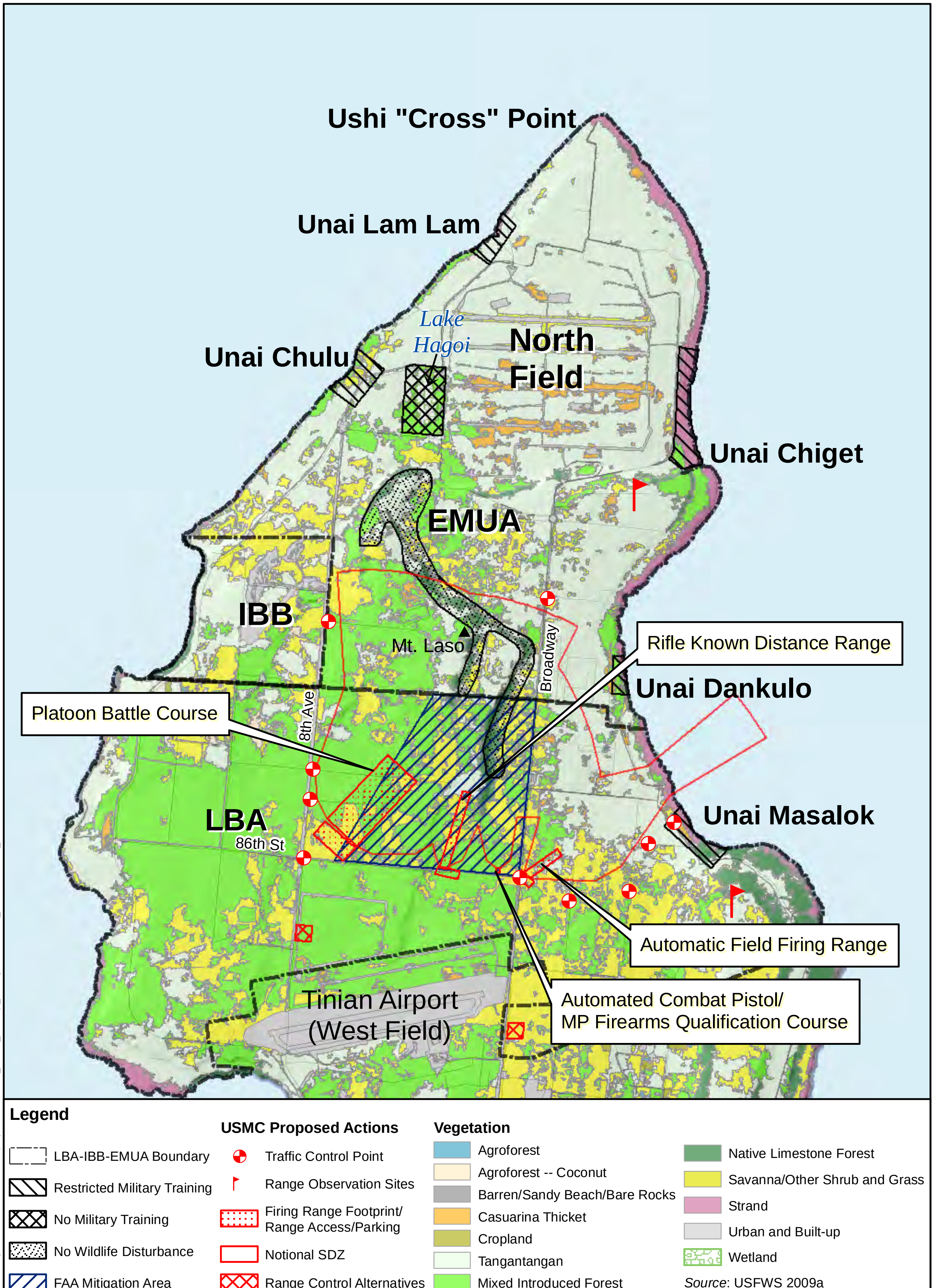

Figure 10.2-4
Vegetation Impacts - Range Training Area Alternative 2

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Table 10.2-5. Potential Impacts to Vegetation Communities within the Tinian MLA with Implementation of Alternative 2 (ac [ha])

Parcel and Activity	*Mixed Introduced Forest*	*Tangantangan*	*Other Shrub and Grass*	*Developed*
Construction Areas (vegetation removed)				
Platoon Battle Course	93 (38)	0	44 (18)	0
Ranges	9.6 (3.9)	6.9 (2.8)	22 (8.9)	0
Range Control	9.0 (3.6)	0	9.8 (4.0)	1.0 (0.4)
Range Support Areas	9.1 (3.7)	0	30 (12)	1.4 (0.6)
Total area removed	**121 (49)**	**6.9 (2.8)**	**106 (43)**	**1.4 (0.6)**

Wildlife

TINIAN MONARCH. The Tinian monarch is likely to be present in all areas surrounding the proposed ranges and range support areas. Potential habitat for the species would be cleared including 121 ac (49 ha) of mixed introduced forest and lesser amounts of shrub and tangantangan (Table 10.2-6). The MLA encompasses roughly 75% of the current monarch habitat on the island and supports about 70% of the total monarch population. Based on densities estimated by USFWS (2009b), the number of Tinian monarchs that would potentially be displaced through construction would be 297 birds. With a total population estimated at 40,000 birds, project construction would impact 0.7% of the current population. Based on territory densities estimated by USFWS (2009b), the number of Tinian monarch territories that would be lost through construction would be 149 (refer to Table 10.2-4).

Table 10.2-6. Potential Direct Impacts to the Tinian Monarch with Implementation of Alternative 2

Habitat Type	*Habitat Removed (ac [ha])*	*Monarch Density (# per ha)**	*Total Potential Birds in Removed Habitat*	*Max. Territories (# per ha)**	*Total Potential Territories in Removed Habitat*
Mixed Introduced Forest	121 (49)	5.82	285	2.9	142
Tangantangan	6.9 (2.8)	4.36	12	2.5	7
Totals	**128(52)**	NA	**297**	NA	**149**

Legend: NA = Not Applicable.
Source: *USFWS 2009b.

The placement of ranges under Alternative 2 does not meet the requirements set out in the "Dedication of Tinian Military Retention Area Land for Wildlife Conservation" (Government of CNMI and U.S. Navy 1999) whereby a 936-ac (379-ha) FAA Mitigation Area is established for the protection of "endangered and threatened wildlife, particularly the Tinian Monarch" with the provision that it is the right of the U.S. military to "use the premises for low-impact military training and for other purposes that do not disrupt the habitat and living conditions of the Tinian Monarch." As discussed above for wildlife, approximately 108 ac (44 ha) of the 936-ac (379-ha) FAA Mitigation Area would be removed (Figure 10.2-5). In addition, a zone 328-ft (100-m) wide surrounding the perimeter of the range footprint areas is assumed to be directly impacted by noise and activity from construction (Table 10.2-7).

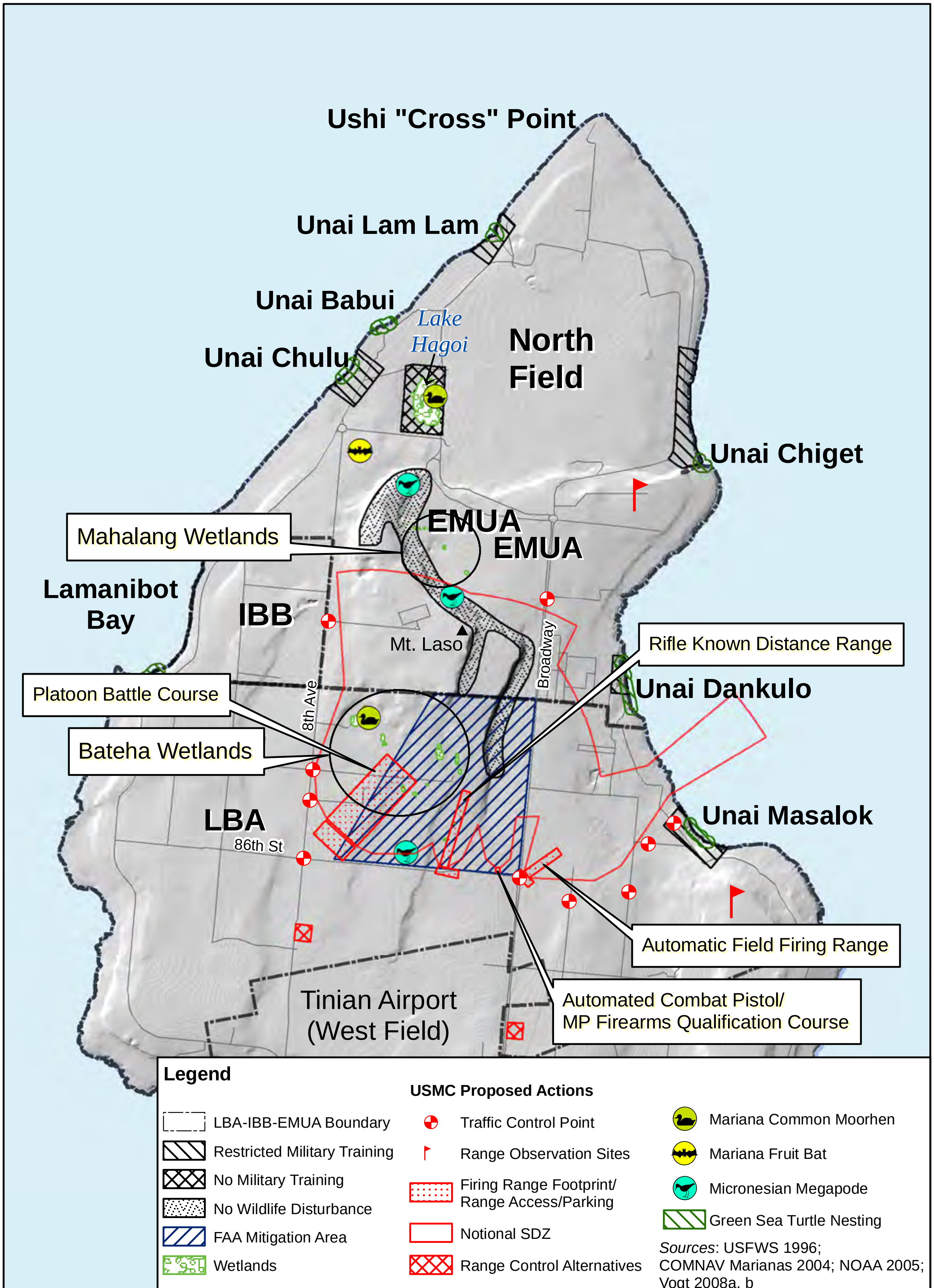

Figure 10.2-5
Special-Status Species Impacts - Range Training Area Alternative 2

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Table 10.2-7. Potential Indirect Impacts to Habitat surrounding the Proposed Ranges with Implementation of Alternative 2

Project	*Forested Habitat Affected - 100 m Buffer (ac [ha])*
Platoon Battle Course	71 (29)
KD Range	49 (20)
Field Firing Range	25 (10)
Combat Pistol/Qual Course	8.5 (3.4)
Range Control/Bivouac Areas	24 (10)
Totals	**178 (72)**

As compensation for the removal of a portion of the FAA Mitigation Area, including the construction footprint and the surrounding zone impacted by noise and activity, additional mitigation area would be established and other conservation measures would be implemented, as described in Section 10.2.2.3. With this mitigation, impacts from removal of a portion of the FAA Mitigation Area would be less than significant.

ALL OTHER WILDLIFE SPECIES. Approximately 108 ac (44 ha) of the 936-ac (379-ha) FAA Mitigation Area that was previously designated in the Lease Back Area (LBA) just south of the EMUA boundary would be removed (Figure 10.2-5).

Based on the honeyeater population density estimate of 1.0 birds per ac (0.41 per ha; USFWS 2009b) and the loss of 128 ac (52 ha; refer to Table 10.2-2) there would be a loss of habitat for up to 21 birds. Based on the fruit dove population density estimate of 0.8 birds per ac (0.33 birds per ha; USFWS 2009b) and the loss of 128 ac (52 ha) there would be a loss of habitat for up to 17 birds.

Other impacts from construction would be the same as for Alternative 1. Long-term, permanent impacts to populations or distributions of wildlife from construction would not likely result. Impacts to wildlife would be less than significant.

NON-NATIVE WILDLIFE. Movement of construction personnel, equipment, and supplies could result in the movement and spread of invasive plant and animal species to Tinian. Impacts would be the same as for Alternative 1. Impacts from non-native species such as the BTS would be significant but are biosecurity measures are included (see Section 10.2.3.3) to reduce this threat to less than significant.

Special-Status Species

Direct impacts to special-status species includes the removal of habitat and subsequent fragmentation of remaining habitat. Figure 10.2-5 shows general locations of special-status species in relation to the proposed ranges.

MARIANA FRUIT BAT. The fruit bat was not documented in 2008 surveys on Tinian (USFWS 2009b). Based on this finding, no proposed removal of limestone forest vegetation, and because of the relatively small amount of vegetation community types that would be removed compared to what is available, construction would have a less than significant impact on the fruit bat.

MARIANA COMMON MOORHEN. One area of 0.3 ac (0.12 ha) identified as a wetland (Figure 10.2-5; also see Chapter 4) is located approximately 375 ft (114 m) north of the proposed Platoon Battle Course. There is no evidence that this potential wetland is being used by the moorhen. A wetland approximately 1,800 ft (549 m) to the northwest has been used by up to four moorhens (USFWS 1996). The estimated maximum numbers of moorhens using the Bateha wetlands is four birds (USFWS 1996). Although construction would result in noise and activity, the distance to this wetland and the temporary nature of the work would result in less than significant impacts to moorhens.

MICRONESIAN MEGAPODE. Although not observed in 2008 surveys, several individual birds were documented on Tinian in 1999 in the Maga area, northwest of Mount Lasso where there is native limestone habitat that is generally preferred by the species. A single bird has been detected just west of the proposed rifle known distance range in 1995. However, surveys in 2001 (Witteman 2001) and in 2008 (USFWS 2009b) in this same area did not detect any megapodes. Proposed construction under Alternative 1 would be at least 8,500 ft (2,591 m) from the most recent sightings at the Maga location. If a megapode were within the direct action area it should be able to successfully disperse to adjacent unoccupied habitats. Impacts would be less than significant.

SEA TURTLES. There are no proposed activities in Alternative 2 that occur in beach areas. Impacts would be less than significant.

MICRONESIAN GECKO. This species is uncommon but has been collected in 2008 in a limestone forest area and it is likely to be present only in limestone forest areas (USFWS 2009b). Since no clearing would occur in limestone forest (except possibly unmapped small, isolated areas) and the species is unlikely to be found in other vegetation types, and because of the relatively small amount of vegetation community types that would be removed compared to what is present on Tinian, construction would have a less than significant impact on this species.

TREE SNAILS. The federal ESA candidate humped tree snail has occurred historically on Tinian but is now thought extirpated (USFWS 2007); recent surveys in likely habitat areas did not find this species (report in preparation). There would be no impact on this species.

<u>Operation</u>

Vegetation

Impacts would be the same as for Alternative 1.

Wildlife

Overall, impacts would be the same as for Alternative 1. However, due to the different configuration of the ranges under Alternative 2, the potential area of noise increases would be more than double than that under Alternative 1. The area within the PK-15 (met) 104 dB noise contour contains 624 ac (252 ha) of forest consisting of the following subtypes: limestone forest – 3.4 ac (1.4 ha); mixed introduced forest – 574 ac (232 ha); and tangantangan - 47 ac (19 ha). The area within the 65 dB ADNL noise contour contains 2,878 ac (1,165 ha) of forest consisting of the following subtypes: limestone forest – 29 ac (12 ha); mixed introduced forest – 2,397 ac (970 ha); and tangantangan - 452 ac (183 ha).

Special-Status Species

Impacts would be the same as described for Alternative 1.

MARIANA COMMON MOORHEN. As noted above under construction, the nearest wetland with evidence of use by moorhens is approximately 1,800 ft (549 m) to the northwest. The estimated maximum numbers of moorhens using the Bateha wetlands is four birds (USFWS 1996). Although operations would result in noise and activity, the distance to this wetland would result in impacts that are less than significant.

SEA TURTLES. Impacts would be the same as for Alternative 1.

ALL SPECIAL-STATUS SPECIES. Other indirect impacts would be the same as for Alternative 1.

10.2.3.2 Summary of Alternative 2 Impacts

Table 10.2-8 summarizes Alternative 2 impacts.

Table 10.2-8. Summary of Alternative 2 Impacts

Activity	*Project Specific Impacts*
Construction	Mixed introduced forest, shrub, and tangantangan would be removed that is habitat for numerous native birds, including the Tinian monarch. Approximately 0.7% of the Tinian monarch population on Tinian would be impacted. A small amount of the previously designated FAA Mitigation Area would be removed.
Operation	The CNMI-listed Tinian monarch would not be significantly impacted by noise from range small arms firing; the potential for fire and non-native species are significant but would be reduced to less than significant with the implementation of mitigation measures and BMPs: indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas would be minimized by working with natural resource officials to ensure that native forest habitat concerns for all wildlife and protected species are taken into account.

10.2.3.3 Alternative 2 Proposed Mitigation Measures

The proposed mitigation measures would be the same as described for Alternative 1. The configuration of the revised FAA Mitigation Area (refer to Figure 10.2-3) would be adjusted based on the layout of the Alternative 2 ranges but would include a minimum 2:1 replacement ratio.

10.2.4 Alternative 3

10.2.4.1 Tinian

Construction

Impacts from Alternative 3 would be identical to Alternative 2 with the following exceptions.

Vegetation

Vegetation that would be removed for construction of ranges and other facilities is listed in Table 10.2-9 and shown in Figure 10.2-6. Vegetation removed includes mixed introduced forest and tangantangan, as well as some shrub/grassland and Casuarina thicket. No limestone forest would be removed. The vegetation to be removed serves as potential habitat for wildlife species that are addressed under the special-status species section below.

Table 10.2-9. Potential Impacts to Vegetation Communities within the Tinian MLA with Implementation of Alternative 3 (ac [ha])

Parcel and Activity	*Mixed Introduced Forest*	*Tangantangan*	*Shrub and Grass*	*Developed*
Construction Areas (vegetation removed)				
Platoon Battle Course	93 (38)	0	44 (18)	0
Ranges	34 (14)	6.9 (2.8)	8.7 (6.9)	1.4 (0. 6)
Range Control	9.0 (3.6)	0	9.8 (4.0)	1.0 (0.4)
Range Support Areas	19 (7.7)	0	26 (11)	2.3 (0.9)
Total area removed	**155 (63)**	**6.9 (2.8)**	**89 (36)**	**4.7 (1.9)**

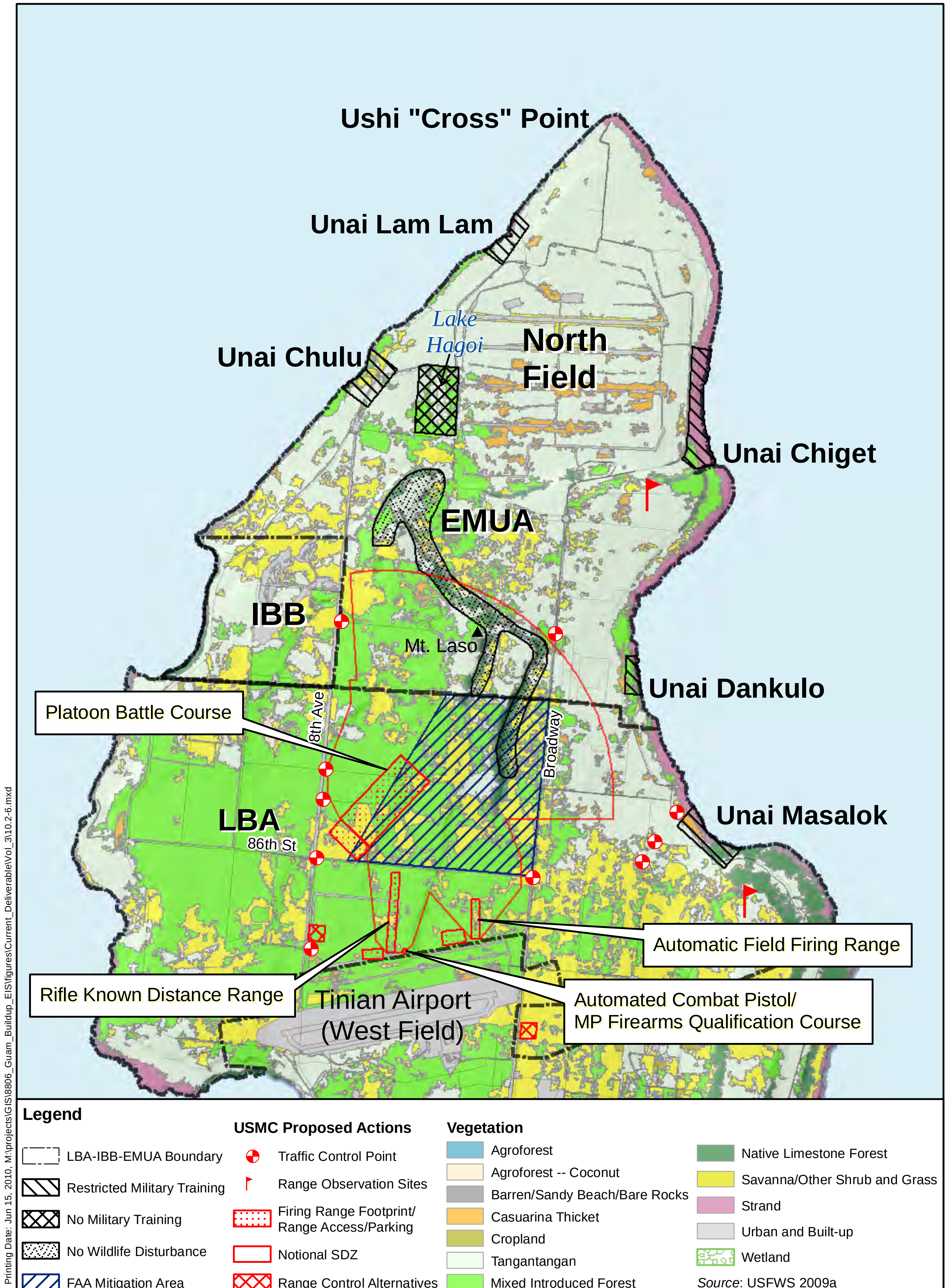

Figure 10.2-6
Vegetation Impacts - Range Training Area Alternative 3

Wildlife

TINIAN MONARCH. The Tinian monarch is likely to be present in all areas surrounding the proposed ranges and range support areas. Potential habitat for the species would be removed including 155 ac (63 ha) of mixed introduced forest and lesser amounts of shrubs and tangantangan (Figure 10.2-7 and Table 10.2-10). The MLA encompasses roughly 75% of the current monarch habitat on the island and supports about 70% of the total monarch population. Based on densities estimated by USFWS (2009b), the number of Tinian monarchs that would potentially be displaced through construction would be 379 birds (Figure 10.2-6 and Table 10.2-10). With a total population estimated at 40,000 birds, project construction would impact 0.9% of the current population. Based on territory densities estimated by USFWS (2009b), the number of Tinian monarch territories that would be lost through construction would be 190 (Figure 10.2-7 and Table 10.2-10).

Table 10.2-10. Potential Direct Impacts to the Tinian Monarch with Implementation of Alternative 3

Habitat Type	*Habitat Removed (ac [ha])*	*Monarch Density (# per ha)**	*Total Potential Birds in Removed Habitat*	*Max. Territories (# per ha)**	*Total Potential Territories in Removed Habitat*
Mixed Introduced Forest	155 (63)	5.82	367	2.9	183
Tangantangan	6.9 (2.8)	4.36	12	2.5	7
Totals	**162 (66)**	NA	**379**	NA	**190**

Note: NA- Not Applicable.
Source: USFWS 2009b.

The placement of ranges under Alternative 2 does not meet the requirements set out in the "Dedication of Tinian Military Retention Area Land for Wildlife Conservation" (Government of CNMI and U.S. Navy 1999) whereby a 936-ac (379-ha) FAA Mitigation Area is established for the protection of "endangered and threatened wildlife, particularly the Tinian Monarch" with the provision that it is the right of the U.S. military to "use the premises for low-impact military training and for other purposes that do not disrupt the habitat and living conditions of the Tinian Monarch." As discussed above for wildlife, approximately 82 ac (33 ha) of the 936-ac (379-ha) FAA Mitigation Area would be removed. In addition, a zone 32-ft (100- m) wide surrounding the perimeter of the range footprint areas is assumed to be directly impacted by noise and activity from construction (Table 10.2-11).

Table 10.2-11. Potential Indirect Impacts to Habitat Surrounding the Proposed Ranges with Implementation of Alternative 3

Project	*Forested Habitat Affected - 100 m Buffer (ac [ha])*
Platoon Battle Course	69 (28)
KD Range	65 (26)
Field Firing Range	44 (18)
Combat Pistol/Qual Course	11 (4.5)
Range Control/Bivouac Areas	24 (10)
Totals	**213 (86)**

As compensation for the removal of a portion of the FAA Mitigation Area, including the construction footprint and the surrounding zone impacted by operational noise and activity, the mitigation area would be reconfigured and expanded and other conservation measures would be implemented, as described in Section 10.2.2.3. With this mitigation, impacts from the removal of a portion of the FAA Mitigation Area would be less than significant.

OTHER WILDLIFE SPECIES. Approximately 82 ac (33 ha) of the 936-ac (379-ha) FAA Mitigation Area that was previously designated in the Lease Back Area (LBA) just south of the EMUA boundary would be removed (refer to Figure 10.2-7).

Based on the honeyeater population density estimate of 0.41 birds per ha (USFWS 2009b) and the loss of 66 ha (refer to Table 10.2-10), there would be a loss of habitat for up to 27 birds. Based on the fruit dove population density estimate of 0.33 birds per ha (USFWS 2009b) and the loss of 66 ha (refer to Table 10.2-10), there would be a loss of habitat for up to 22 birds.

Other impacts from construction would be the same as for Alternative 1. Long-term, permanent impacts to populations or distributions of wildlife would not likely result. Impacts to wildlife would be less than significant.

NON-NATIVE WILDLIFE. Movement of construction personnel, equipment, and supplies could result in the movement and spread of invasive plant and animal species to Tinian. Impacts would be the same as for Alternative 1. Impacts from non-native species such as the BTS would be significant but are biosecurity measures are included (see Section 10.2.4.3) to reduce this threat to less than significant.

Special-Status Species

Direct impacts to special-status species includes the removal of habitat and subsequent fragmentation of remaining habitat. Figure 10.2-7 shows general locations of special-status species in relation to the proposed ranges.

MARIANA FRUIT BAT. The fruit bat was not documented in 2008 surveys on Tinian (USFWS 2009b). Based on this finding, no proposed removal of limestone forest vegetation, and because of the relatively small amount of vegetation community types that would be removed compared to what is available, construction would have a less than significant impact on the fruit bat.

MARIANA COMMON MOORHEN. One area 0.3 ac (0.12 ha) identified as a potential wetland (see Figure 10.2-7; also see Chapter 4) is located approximately 375 ft (114 m) north of the proposed Platoon Battle Course. There is no evidence that this potential wetland is being used by the moorhen. A wetland approximately 1,800 ft (549 m) to the northwest is used by up to four moorhens (USFWS 1996). The estimated maximum numbers of moorhens using the Bateha wetlands is four birds (USFWS 1996). Although construction would result in noise and activity, the distance to the wetland and the temporary nature of the work would result in impacts that are less than significant.

MICRONESIAN MEGAPODE. Although not observed in 2008 surveys, several individual birds were documented on Tinian in 1999 in the Maga area, northwest of Mount Lasso where there is native limestone habitat that is generally preferred by the species. One bird was detected in 1995 approximately 1,300 ft (396 m) northeast of the proposed rifle known distance range. Surveys in 2001 (Witteman 2001) and in 2008 (USFWS 2009b) in this same area did not detect any megapodes. Proposed construction under Alternative 1 would be at least 8,500 ft (2,591 m) from the most recent sightings at the Maga location. If a megapode were within the direct action area it should be able to successfully disperse to adjacent unoccupied habitats. Impacts would be less than significant.

SEA TURTLES. There are no proposed activities in Alternative 3 that occur in beach areas. Impacts would be less than significant.

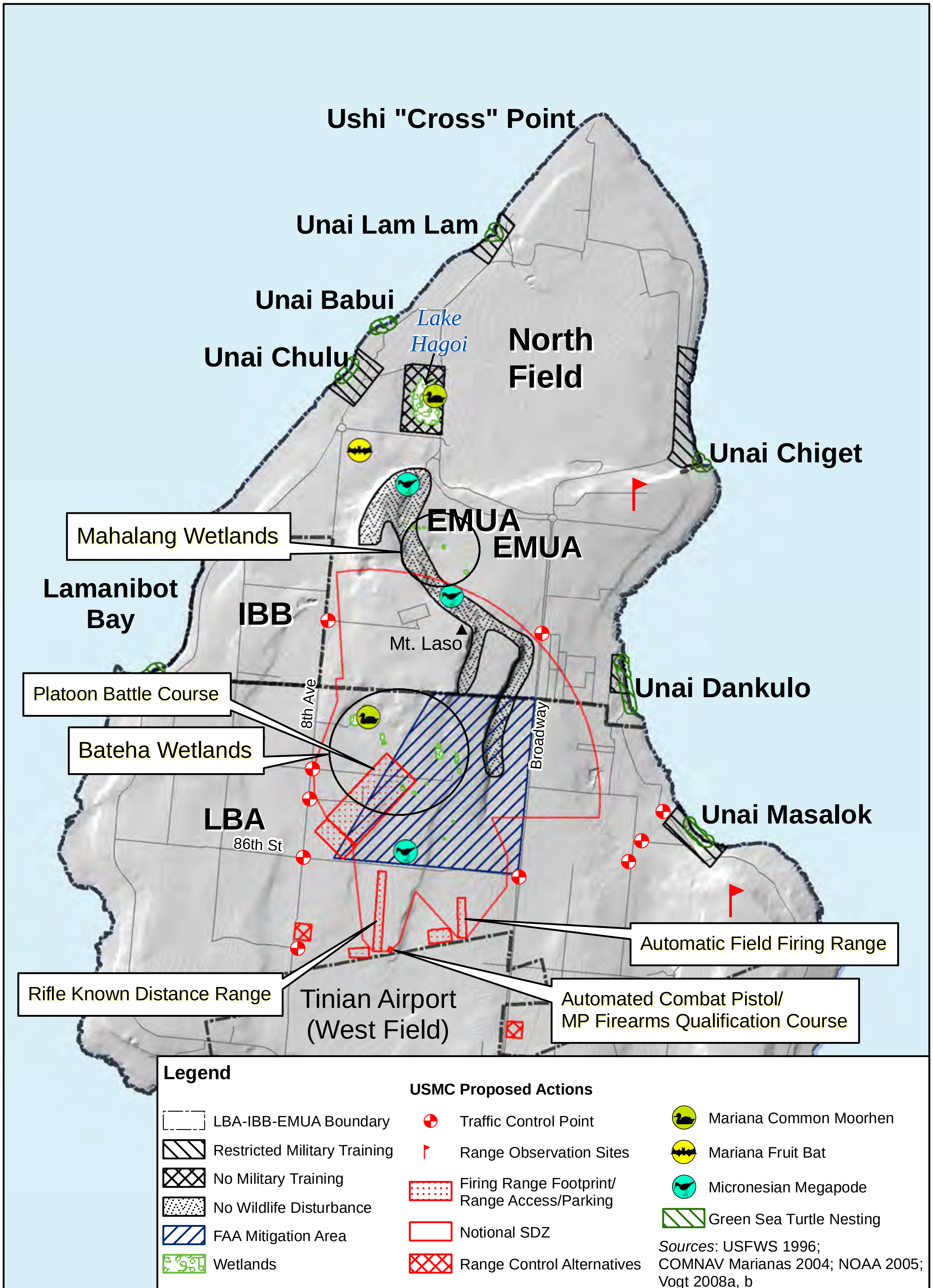

Figure 10.2-7
Special-Status Species Impacts - Range Training Area Alternative 3

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MICRONESIAN GECKO. This species is uncommon but has been collected in 2008 in a limestone forest area and it is likely to be present only in limestone forest areas (USFWS 2009b). Since no clearing would occur in limestone forest (except possibly unmapped small, isolated areas) and the species is unlikely to be found in other vegetation types, and because of the relatively small amount of vegetation community types that would be removed compared to what is present on Tinian, construction would have a less than significant impact on this species.

TREE SNAILS. The federal ESA candidate humped tree snail has occurred historically on Tinian but is now thought extirpated (USFWS 2007); recent surveys in likely habitat areas did not find this species (report in preparation). Impacts would be less than significant.

Operation

Vegetation

Impacts would be the same as for Alternative 1.

Wildlife

Overall, impacts would be the same as for Alternative 1. However, due to the different configuration of the ranges under Alternative 3, the potential area of noise increases would be slightly more than that under Alternative 1. The area within the PK-15 (met) 104 dB noise contour contains 836 ac (338 ha) of forest consisting of the following subtypes: mixed introduced forest – 835 ac (338 ha); and tangantangan – 0.8 ac (0.3 ha). The area within the 65 dB ADNL noise contour contains 1,431 ac (579 ha) of forest consisting of the following subtypes: limestone forest – 2 ac (0.8 ha); mixed introduced forest – 1,364 ac (552 ha); and tangantangan - 65 ac (26 ha).

Special-Status Species

Impacts would be the same as described for Alternative 1.

MARIANA COMMON MOORHEN. The Mariana common moorhen may use the Bateha wetland approximately 1,800 ft (549 m) to the northwest of the Platoon Battle Course. This location is outside the PK-15 (met) 104 db noise contour determined for small arms firing. Based on the distance from the firing ranges, impacts would be less than significant.

SEA TURTLES. Impacts would be the same as for Alternative 1.

ALL SPECIAL-STATUS SPECIES. Other indirect impacts would be the same as for Alternative 1.

10.2.4.2 Summary of Alternative 3 Impacts

Table 10.2-12 summarizes Alternative 3 impacts.

Table 10.2-12. Summary of Alternative 3 Impacts

Activities	*Project Specific Impacts*
Construction	Mixed introduced forest, shrub, and tangantangan would be removed that is habitat for numerous native birds, including the Tinian monarch. Approximately 0.9 % of the Tinian monarch population on Tinian would be impacted. A small amount of the previously designated FAA Mitigation Area would be removed.
Operation	The Tinian monarch would not be significantly impacted by noise from the small arms range; the potential for fire and non-native species are significant but would be reduced to less than significant with the implementation of mitigation measures and BMPs; indirect impacts from termination of grazing leases and movement of grazing animals to other areas would be minimized by working with natural resource officials to ensure that native forest habitat concerns for wildlife and protected species are taken into account.

10.2.4.3 Alternative 3 Proposed Mitigation Measures

Proposed mitigation measures would be the same as described for Alternative 1. The configuration of the revised FAA Mitigation Area (refer to Figure 10.2-3) would be adjusted based on the layout of the Alternative 3 ranges but would include a minimum 2:1 replacement ratio.

10.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. Existing operations on Tinian would continue. Therefore, the no-action alternative would not have significant impacts to terrestrial biological resources.

10.2.6 Summary of Impacts

Table 10.2-13 summarizes the potential impacts with implementation of each action alternative and the no-action alternative.

Table 10.2-13. Summary of Impacts – Construction and Operation

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Vegetation			
LSI • No primary limestone forest would be removed	LSI • No primary limestone forest would be removed	LSI • No primary limestone forest would be removed	NI
Wildlife			
SI-M Less than significant direct impact to the Tinian monarch and other native birds	SI-M Less than significant direct impact to the Tinian monarch and other native birds	SI-M Less than significant direct impact to the Tinian monarch and other native birds	NI
Wildlife and Special-Status Species			
SI-M • Potential significant indirect impacts from wildfire, mitigated to less than significant • Potential significant impacts from introduction of non-native species such as BTS, mitigated to less than significant • Indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas, mitigated to less than significant • Significant impacts from removal of a part of the previously designated FAA mitigation area, mitigated to less than significant	SI-M • Potential significant indirect impacts from wildfire, mitigated to less than significant • Potential significant impacts from introduction of non-native species such as BTS, mitigated to less than significant • Indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas, mitigated to less than significant • Significant impacts from removal of a part of the previously designated FAA mitigation area, mitigated to less than significant	SI-M • Potential significant indirect impacts from wildfire, mitigated to less than significant • Potential significant impacts from introduction of non-native species such as BTS, mitigated to less than significant • Indirect significant impacts from termination of grazing leases and movement of grazing animals to other areas; mitigated to less than significant • Significant impacts from removal of a part of the previously designated FAA mitigation area, mitigated to less than significant	NI

Legend: LSI = Less than significant impact, SI-M = Significant impact mitigable to less than significant, NI = No impact.

10.2.7 Summary of Proposed Mitigation Measures

Table 10.2-14 summarizes the proposed mitigation measures.

Table 10.2-14. Summary of Proposed Mitigation Measures

Alternatives 1, 2, and 3	*No-Action Alternative*
Vegetation	
• None specifically for vegetation	None
Wildlife and Special-Status Species	
• The DoN would hire two full-time Biological Monitors during the construction phase on Guam and Tinian. The biological monitors would be responsible for oversight of avoidance, minimization, mitigation, and conservation measure implementation by the construction contractors for projects associated with the proposed action.	None
• Approximately 1 week prior to clearing vegetation a qualified biologist would survey the project site for the occurrence of ESA-listed species and if present, the work would be postponed.	
• If nesting Mariana common moorhens are present within the limits of construction, clearing and construction would be postponed until the chicks have fledges. If work stopped for more than 1 week, another survey would be conducted to ensure that no birds have begun to nest.	
• Construction personnel would receive natural resource awareness briefings which address special-status species, avoidance measures and reporting requirements.	
• Upon termination of any agricultural leases in the leaseback area, DoD would work with CNMI land use and natural resource officials to ensure that native forest habitat concerns for ESA-listed species are taken into account.	
• A Tinian Native Forest Enhancement Plan would be prepared by the DoN.	
• To compensate for the removal of a portion of the existing FAA Mitigation Area, the mitigation area would be expanded and reconfigured and the replacement would be at a minimum 2:1 ratio.	
• The U.S. Forest Service (USFS) has developed a fire management plan that the DoD will use to develop a military Instruction to implement fire management actions on DoD land. The Instruction would also include BMPs such as for cleaning gear and equipment to prevent the spread of non-native invasive species resulting from wildfire suppression.	
• The DoN is developing a MBP and would implement a biosecurity program and specific biosecurity measures to ensure that risk from transporting invasive species to or from Guam and Tinian is controlled (refer to Volume 2, Chapter 10, Section 10.2.2.6 for a further description of these measures).	
• If Micronesian megapodes are present within 492 ft (150 m) of the project site, the work would be postponed until the megapode has left the area. If megapodes are nesting within 984 ft (300 m) of the project site, the work would be postponed and the USFWS contacted immediately as no nesting is known to occur there.	

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CHAPTER 11. MARINE BIOLOGICAL RESOURCES

11.1 AFFECTED ENVIRONMENT

As described in Volume 1 of this Environmental Impact Statement (EIS), no Marine Corps relocation and/or training activities are planned for the marine environment on Tinian (i.e. no in-water construction, dredging, or training activities and/or land-based construction activities are being proposed that would affect the marine environment). The only potential impacts are associated with range surface danger zones (SDZs) extending over the marine environment and potential runoff from land-based activities affecting the nearshore environment. Volume 2, Chapter 16, Section 16.1.6 includes a discussion of coral as it relates to an overall increased human population as a result of the proposed action. A baseline assessment of the marine biological resources near Tinian is provided below.

11.1.1 Definition of Resource

For the purpose of this EIS, marine biological resources are defined as those marine-related organisms (marine flora and fauna), their behaviors, and their interactions with the environment that may be directly or indirectly affected by the proposed action within the established marine region of influence (ROI). The ROI is defined as the nearshore waters out to the 164- feet (ft) (50-meter [m]) isobath (depth line on a map of the ocean/sea). This ROI boundary was established due to the nature of the proposed action in the nearshore environment and clear distinction between marine mammals species inshore and offshore of this isobath.

The environmental analysis focuses on species or areas that are important to the function of the ecosystem, of special societal importance, or are protected under federal, state, commonwealth or territory law or statutes. For the purpose of this EIS, marine biological resources have been divided into four major categories: marine flora and invertebrates, fish and essential fish habitat (EFH), special-status species, and non-native species. A brief description of these resources is provided below; Volume 2, Chapter 11 provides a more detailed discussion.

11.1.1.1 Marine Flora, Invertebrates and Associated EFH

Examples of marine flora include macroalgae (or seaweeds), sea grasses, and emergent vegetation. Invertebrates may include gastropods (snails), cephalopods (squid and octopus), crustaceans (crabs and lobster), sponges, and coral. A description of marine flora, macroinvertebrates and associated EFH (including a brief description of corals that are addressed further under the EFH section) found in the Tinian area is provided below.

11.1.1.2 Essential Fish Habitat

The primary federal laws that make up the regulatory framework for fish and EFH include the Magnuson-Stevens Fishery Conservation and Management Act or Magnuson-Stevens Act (M-SA), Executive Order (EO) 12962, and the Endangered Species Act (ESA). EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Western Pacific Regional Fisheries Management Council [WPRFMC] 2009a). EFH for managed fishery resources is designated in the Fishery Ecosystem Plans (FEPs) prepared by the local regional fisheries management council - the WPRFMC, which manages the fisheries resources for Tinian and Commonwealth of the Northern

Mariana Islands (CNMI). A description of EFH (including a brief description of corals that are addressed further under the EFH section) found in the Tinian area is provided below in section 11.4.

11.1.1.3 Special-Status Species

As described in Volume 2, special-status species include ESA-listed and candidate species, marine mammals not listed under ESA, and species of concern that are found in the nearshore marine ROI. Table 11.1-1 lists those species evaluated for activities at Tinian. Brief species descriptions can be found in Volume 2, Chapter 11, Section 11.1.4, Guam Regional Environment, which includes the CNMI.

Table 11.1-1. Special-Status Marine Species Present in the ROI Around Tinian

Group	*Common Name/Chamorro Name*	*Status**	
		Federal	*CNMI*
Mammals	Common bottlenose dolphin/Toninos	MMPA	SOGCN
	Spinner dolphin/Toninos	MMPA	SOGCN
Reptiles**	Green sea turtle/Haggan bed'di	T	T
	Hawksbill sea turtle/Hagan karai	E	E

Legend: *E = endangered, T = threatened; SOGCN = Species of Greatest Conservation Need (Guam Division of Aquatic and Wildlife Resources [GDAWR] 2006), MMPA= Marine Mammal Protection Act
Sources: National Marine Fisheries Service (NMFS) 2009, United States (U.S.) Fish and Wildlife Service (USFWS) 2009. **Does not include nesting sea turtles.

Sea Turtles

All sea turtles that occur in the U.S. are listed under the ESA as either threatened or endangered. No critical habitat has been established for sea turtles in the continental U.S. (USFWS 2009). Two sea turtle species are known to occur in the coastal waters of Tinian. The threatened green sea turtle and the endangered hawksbill sea turtle are the only ESA-listed species that occur in the nearshore marine ROI. Nesting sea turtles are addressed in more detail in Chapter 10, Terrestrial Biological Resources.

Species of Concern

Species of concern are those species that NMFS has concerns about regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA. The goal is to draw proactive attention and conservation action to these species. One fish SOC has been indentified for the region, the Napoleon wrasse, but this species has not been sighted in surveys conducted at Tinian.

Marine Mammals

Marine mammals are discussed in this EIS because several species are known to occur or potentially occur in the waters around Tinian. Examples would be the recent photo-documentation sightings of short-finned pilot whales (*Globicephala macrorhyncus*) and false killer whales (*Pseudorca crassidens*) off-shore of Tinian and Humpback whales (*Megaptera novaeangliae*) off-shore of Saipan (CNMI CRMO 2009); although all sightings were outside the Tinian project area.

According to Navy (2005) Appendix B's figures and supporting text from the Marine Resource Assessment (MRA) for the Mariana Operating Area, spinner dolphins and common bottlenose dolphins are the only two marine mammals expected to regularly occur within the nearshore marine ROI (164-ft [50-m]) isobath of Tinian (refer to Table 11.1-1). These species and others are discussed proportionately to the degree of their presence in the ROI and potential effects from the proposed action.

11.1.1.4 Non-native Species

Non-native species include all marine organisms that have the potential to be introduced from one location or ecosystem to another where they are not native and may potentially cause harm to the receiving ecosystem. Since there is only minimal available information regarding non-native species on Tinian, the broader regional discussion of this topic presented in Volume 2, Chapter 11, Section 11.4.4 should be referenced for a comprehensive discussion of non-native species issues in CNMI. Most of the relevant site-specific research to date has been within Apra Harbor on Guam, so the topic is discussed most thoroughly in that section (Volume 2, Chapter 11, Section 11.2.7).

11.1.2 Region of Influence

The marine ROI, as previously discussed, encompasses the submerged lands offshore out to the 164-ft (50-m) isobath that may be directly or indirectly impacted by any component of the proposed action. Construction or training activities may impact biological resources from range SDZs extending over the marine environment and potential runoff from land-based activities affecting the nearshore environment. .

11.1.3 Study Areas and Survey Methods

Three small northern beaches (Unai Chulu, Unai Babui, Unai Dankulo) and Tinian Harbor were the focus of the baseline assessment for Tinian, as they were previously evaluated for Marine Corps amphibious training landing exercises and potential harbor improvements; although these actions are not currently part of the proposed action and alternatives.

Marine biological resources are assessed for potential impacts from the implementation of the proposed action within the nearshore marine ROI. This ROI boundary was established due to the nature of the proposed action in the nearshore environment and a clear distinction between marine mammals species inshore and offshore of the 50-m isobath, which is conservative. Because of either the location or the nature of the action, some components of the proposed action would have no impacts on the marine environment, and therefore no impact assessment is provided. In these cases, a brief explanation of why no assessment is required is provided in those site-specific sections.

In addition to existing marine biological resources data for the study areas, project-specific benthic studies and mapping efforts have either been performed, are ongoing, or are being planned for areas potentially impacted by the proposed action(s). Locations and methods for the survey efforts are provided in the respective references, in the EIS reference section, and/or are provided in Table 11.1-2. A summary of key marine biological surveys and related reports used as references for this Volume of the EIS are listed in Table 11.1-2.

Table 11.1-2. Summary of Marine Biological Surveys Occurring in the Study Areas

Reference	*Type of Work*	*Location*
MRC 1996	Marianas EIS, Marine Environmental Assessment	Guam and Tinian
CNMI MMT 2008	Marine Monitoring	Tinian, Unai Babui and Unai Dankulo
Navy 2007	Marine Mammal and Sea Turtle Survey and Density Estimates Report	Guam and the CNMI Islands
Marine Corps 2009	Marine Resource Surveys	Tinian, CNMI
Brainard 2008	NOAA Coral Reef Ecosystem Division (CRED) Mariana Archipelago Reef Assessment and Monitoring Program (MARAMP) research cruises	Guam and CNMI (Santa Rosa Reef, Galvez Bank, Rota, Aguijan, Tinian, and Saipan)

Legend: MRC= Marine Research Consultants, NOAA= National Oceanic and Atmospheric Administration, NAVFAC= Naval Facilities Engineering Command

11.1.4 Tinian

Information in Volume 2, Chapter 11, Section 11.1.4, Guam Regional Environment, is applicable to Tinian and CNMI. Additional island-specific information is provided below.

Coastlines within the study area are generally lined with rocky intertidal areas, steep cliffs and headlands, and the occasional sandy beach or mudflat. Water erosion of rocky coastlines has produced wave-cut cliffs, and sea-level benches (volcanic and limestone) and wave-cut notches at the base of the cliffs. Large blocks and boulders often buttress the foot of these steep cliffs in the Marianas. Wave-cut terraces also occur seaward of the cliffs (Navy 2005).

The North Equatorial Current that provides the bulk of water passing the Mariana archipelago is composed primarily of plankton-poor water; however, detailed information on the North Equatorial Current is lacking. Overall, the upper portions of the water column in the Western Pacific is nutrient depleted, which greatly limits the presence of organisms associated with primary productivity, such as phytoplankton. The region surrounding Tinian has elevated Chlorophyll α (primary production) concentration. These areas of localized increased primary production have been attributed to the interaction of island masses and currents, where the currents would eddy and concentrate phytoplankton (Navy 2005).

Tinian is composed primarily of uplifted limestone; therefore surface water percolation rates are high with no permanent rivers. Because the discharge to nearshore waters is limited, Tinian has extensive reef formations. Coral reef habitat totals approximately 19 square miles (mi) (49 square kilometers [km]) between the coastline and the 100-mm isobath (Brainard et al. 2008). The majority of Tinian's shoreline consists of low to high limestone cliffs with sea-level caverns, cuts, notches and or slumped boulders, commonly bordered by intertidal benches (Eldredge 1983, Navy 2005). Thirteen beach districts have been defined (Pultz et al. 1999): ten at west coast locations and three (one distinct and two discontinuous beach complexes) along the east coast. Beach deposits consist mainly of medium to coarse grain calcareous sands, gravel and rubble interspersed amongst exposed limestone rock (Navy 2005). All beaches reportedly support turtle nesting activities (Wiles et al. 1989, Pultz et al. 1999).

11.1.4.1 Marine Flora, Invertebrates, and Associated EFH

Information on marine flora and invertebrates, and associated EFH provided in Volume 2, Chapter 11, Section 11.1.4, Guam Regional Environment, is applicable to Tinian and CNMI. Island-specific information in addition to that section is provided below for marine flora, invertebrates and associated EFH.

Figure 11.1-1 shows an overview of sensitive marine biological resources, including benthic habitats associated with the study areas. These habitats are based on National Oceanic and Atmospheric Administration (NOAA) (2005) Environmental Sensitivity Mapping Index mapping and include:

- Coral Reef and colonized hardbottom that are broken into two density categories:
  - Lower Density Live Coral Cover (Sparse cover: 10% - <50%)
  - Higher Density Live Coral Cover (Patchy: 50% - <90% and Continuous: 90%-100%)
- Coralline Algae (one category):
  - Sparse (10% - <50%), patchy (50% - 90%), and continuous (90% - 100%) combined.
- Macroalgae, Turf Algae, and Seagrass (one separate category each):
  - All coverage percentages combined (sparse, patchy, and continuous) combined

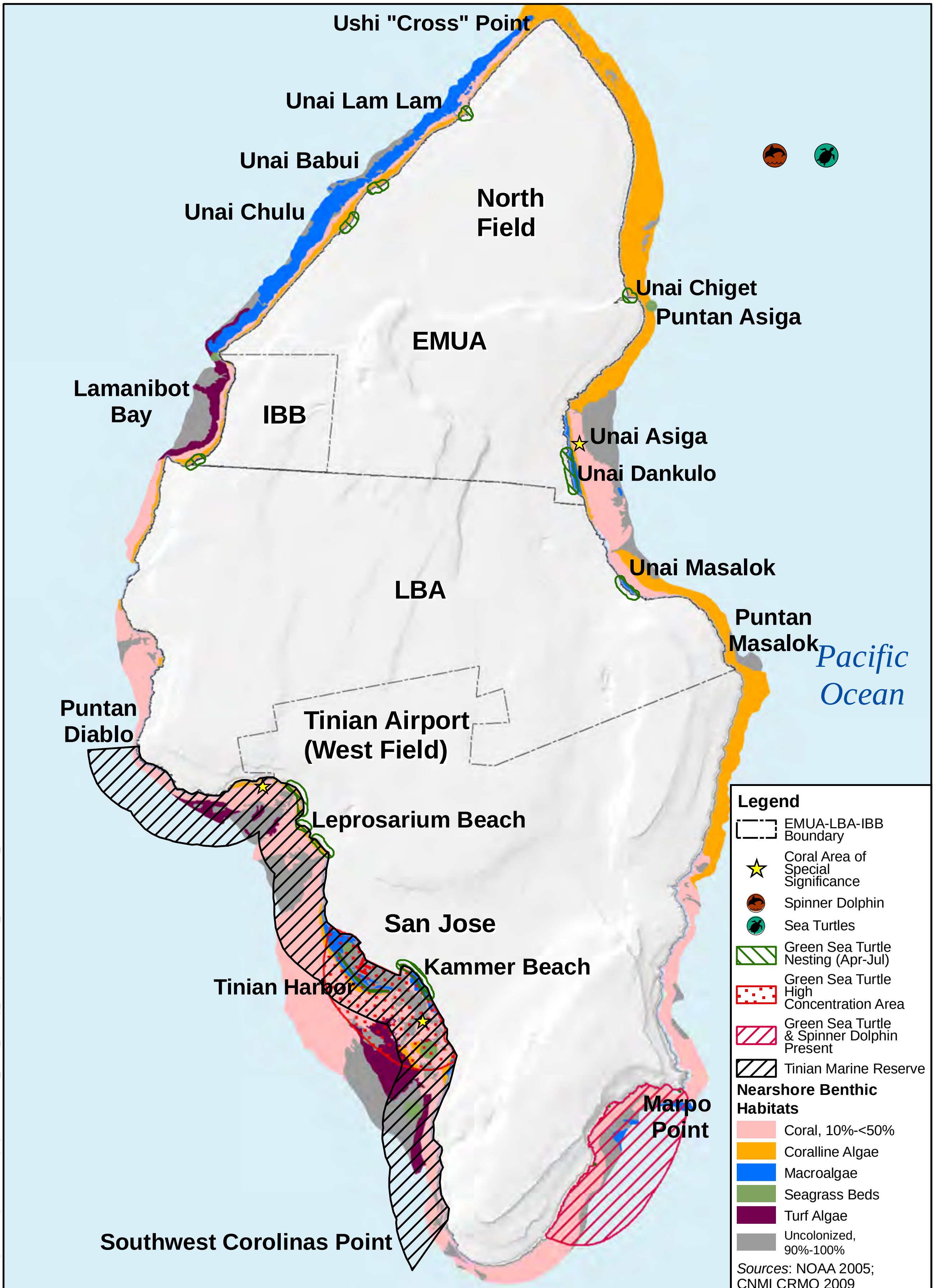

Figure 11.1-1
Nearshore Benthic Habitat and Special-Status Species - Tinian

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The north, east, and south coasts have very limited fringing or apron reef development that is most conspicuous at Unai Dankulo. Submarine topography appears mainly characterized by limestone pavement with interspersed coral colonies and occasional zones of submerged boulders. Reef composed of live corals is more prevalent at various west coast locations, with fringing coral reef habitats present inside Lamanibot Bay and a patch and small barrier reef system (altered as a breakwater for the harbor) located within the Tinian Harbor area (Eldredge 1983, Navy 2005). On the eastern side of the island, from the northeastern tip of the island, to north of Unai Asiga, coralline algae populate the fringing and fore reefs, and the insular shelf seaward of the fore reef. From Unai Asiga to south of Unai Masalok, coralline algae occupies the reef crest and corals are found along the fore reef and a large portion of the seaward shelf. From Unai Masalok to Puntan Masalok the shelf is composed of coralline algae. From Puntan Masalok to the southernmost point of Tinian the shelf is covered by coralline algae at the northern extent and a mixture of corals, macroalgae and uncolonized bottom along the remaining stretch of coast. Coralline algae occupy the entire shelf approximately 1.5 mi (2.4 km) north and south from Puntan Masalok where coral cover begins to dominate (refer to Figure 11.1-1). Fringing reefs with live coral cover reoccur south of Puntan Carolinas (Navy 2005, NOAA 2005).

An oval-shaped, offshore, submerged reef 2.2 mi by 0.6 mi (3.5 km by 1 km) composed primarily of coralline algae is located approximately 1.7 mi (2.7 km) southeast of the southernmost point of Tinian (NOAA 2005). NOAA (2005) determined that the typical coral cover around Tinian ranged from 10 to 50%. Coral cover is 14% and 59% on reefs at Kammer Beach. Dominant coral species in terms of cover are *Goniastrea retiformis* at Kammer Beach, and *Porites rus* at Two Coral Head. Coral cover is much higher at Two Coral Head compared to Kammer Beach due to fewer predator-resistant coral species located at Kammer Beach (Quinn and Kojis 2003).

Corals are a main constituent of the forereef and insular shelf (refer to Figure 11.1-1) (Navy 2005, NOAA 2005). Surveys conducted in 1994 report that the inner reef flat supports an extensive (50 to 70% coral cover) and diverse reef community (25 coral species) (MRC 1999). On the reef front, there is a spur-and-groove system down to a depth of 33 ft (10 m) seaward with benthic substrate composed of carbonate pavement. Both the spur-and-groove system and the fore reef pavement are densely populated by corals (36 species of corals). The passage of a typhoon in December 1997 severely altered the reef flat coral community diversity and cover. Coral cover on the reef flat was reduced from an original 50 to 70% cover to 2% cover. No branching corals remained on the reef flat following the typhoon (MRC 1999). The recent benthic habitat mapping of the CNMI by NOAA (2005) reflects the change in reef flat composition. In general, since NOAA (2005) shows relatively abundant coral cover on the reef front, the forereef has possibly retained some of its pre-December 1997 characteristics. The impacts of corallivorous predators on corals have most likely altered the coral composition and cover on the fore reef (Quinn and Kojis 2003).

<u>Marine Floral and Invertebrate Communities</u>

The island of Tinian is surrounded by reefs, but lacks a true lagoon complex. The lagoons of Tinian, excepting two off of the Leprosarium at the southwestern edge of the leaseback area and the northern region of the Tinian Harbor area, are all adjacent to military-leased land (Navy 2005, NOAA 2005).

Tinian possesses seagrass beds along the northwestern, the northeastern, the southwestern and the eastern coastlines (Navy 2005) (refer to Figure 11.1-1). *Enhalus acoroides*, a seagrass species reported from Unai Chiget reef (and mapped also at Unai Masalok and Lamonibot Bay in the Integrated Natural Resources Management Plan [INRMP]) (Commander of the Navy Region [COMNAV] Marianas 2004). *Halophila* *minor* and *Halodule uninvervis* are found within the area encompassed by the Tinian Harbor (CNMI CRMO 2009).

No mangrove forests are located on Tinian and are restricted to Saipan within the CNMI.

As described above, Unai Chulu, Unai Babui, and Unai Dankulo are three small beaches with nearshore reefs located within ROI. These beaches, along with Tinian Harbor, have been evaluated for amphibious training landing exercises, and although are not currently part of the proposed action, are addressed in this EIS. Unai Chulu and Unai Babui are located on the northwestern side of Tinian and Unai Dankulo on the east side of the island, north of Puntan Masalok. A narrow fringing reef composed of coralline algae borders the carbonate sand beaches of Unai Chulu and Unai Babui (refer to Figure 11.1-1) (Navy 2005, NOAA 2005, Marine Corps 2009). Shore access to the ocean is limited to a few steep trails in fissures along the cliffs. In most places along this coast, no reef flats exist; instead the substratum drops quickly from the cliff base to a depth of about 23 ft (7 m) into steep spur and groove formations characterized by high benthic species diversity and ample fish habitat (Oceanit 2006).

Corals are discussed in the EFH section, below. Marine Corps (2009) provides the following algae and non-coral invertebrate information unless otherwise stated:

Unai Chulu

Landward of the fringing reef is a reef flat in a water depth of 1.6 ft (0.5 m). Within 66 ft (20 m) seaward of the shoreline, the reef flat substrate includes sand, rubble, and outcrops of a fossil reef.

Live cover in the inner reef flat is mostly composed of turf algae and the red crustose coralline alga *Hydrolithon onkodes*, reportedly accounts for 56% of the observed algae. Forty-eight genera of marine algae were identified on the reef flat, comprising 76.85% of the cover. This was reported as the highest percent cover of the three beaches evaluated.

Thirty-nine genera of algae were identified at the Unai Chulu reef slope. The dominant species included red crustose coralline algae (*Hydrolithon onkodes, Lythophyllum pygmaeum,* and *Pneophyllum conicum)* and accounted for 49% of the observed marine algae on the reef slope. Turf alga, *Halimeda gracilis*, was also a major component of the community. Alga taxa richness was reported to positively correlate with depth, as deeper sites had higher richness than shallower sites. Green algae (*Halimeda*) was not present at sites shallower than 16 ft (<5 m), but were represented at deeper survey locations by up to five species. Algal cover on the reef bottom did not change with depth.

The Unai Chulu reef flat was represented by 28 taxa in five phyla of non-coral macro-invertebrates. Echinoderms and tube worms were the most commonly observed with echinoderms accounted for 83% of the invertebrates.

The Unai Chulu reef slope contained nine observed taxa in six phyla. Echinoderms, along with mollusks and polychaetes accounted for over 95% of all observed non-coral invertebrates on the reef slope. No spatial pattern in overall taxa richness or density was observed for either the Unai Chulu reef flat or reef slope.

Unai Babui

The reef morphology off Unai Babui is similar to that of Unai Chulu except that the spur-and-groove system was more developed at Unai Babui (MRC 1999). The short, narrow reef flat ranges in depth from zero to approximately 7 ft (2 m) and the reef crest is shallow, except where cut perpendicularly by deeper channels in the reef. This channel was reported to have a high density of coral colonies.

The Unai Babui reef flat was reported to contain approximately 24 genera of marine algae. The green alga *Caulerpa cupressoides*, foraminiferan *Baculogypsina sphaerulata*, and brown alga *Turbinaria ornata* were the dominant species, accounting for approximately 32% at the reef flat Uani Babui reef flat site. Percent cover was reported to be high variability, suggestive of a heterogeneous algal community.

The Unai Babui reef slope was reported to have 42 genera of marine algae. The encrusting red (Rhodophyta) coralline alga *Hydrolithon onkodes* accounting for 21% of the alga cover at most sites. The reef slope algal community was dominated primarily by three alga, *H. onkodes*, turf algae, and another encrusting red coralline alga, *Lithophyllum pygmaeum*, accounting for 49% of the algae observed on the Unai Babui reef slope. No trend was reported apparent from south to north on the reef slope for either the number of taxa or density. Deeper sites were reported to have higher algal cover and greater taxa richness than shallower sites.

Tube worms, the sea cucumber *Holothuria atra*, and the cone snail *Conus flavidus* accounted for 69% of the observed non-coral invertebrates within the 22 taxonomic groups identified.

The Unai Babui reef slope non-coral community was more diverse than the reef flat community, comprised of 90 taxa in seven phyla. The three most common phyla included Echinodermata, Polychaeta, and Mollusca, which accounted for 93% of all individuals; Echinoderms accounted for over 50%.

Unai Dankulo

Unai Dankulo, also know as Long Beach, is the location of Tinian's largest beach and an area of reef designated as a coral area of special significance by NMFS (refer to Figure 11.1-1). A fringing reef borders the white carbonate beach. It is fronted by a large reef flat that extends approximately 1,300 ft (400 m) off shore and varies in depth from zero to 7 ft (2 m). Except where cut by deeper channels, the Unai Dankulo reef has a shallow crest that drops quickly to a depth of 23-33 ft (7-10 m).

The Unai Dankulo reef flat had 35 genera of marine algae. Algal cover on the reef slope and reef flat were reportedly similar, but the composition of the communities differed. The reef flat contained mostly turf algae and red coralline algae (primarily *Pneophyllum conicum* and *Hydrolithon onkodes*). The foraminiferan *Baculogypsina sphaerulata*, was also common.

In contrast, 53 genera of marine algae were found on the Unai Dankulo reef slope. This was primarily red coralline algae, including *H. onkodes*, *P. conicum*, and *Lithophyllum pygmaeum*, and turf algae. Deeper sites tended to have more diversity than shallower sites. Shallower sites had a lower diversity of green algae (*Chlorophyta*).

On the Unai Dankulo reef flat, there were 28 taxa in 4 phyla of non-coral macro-invertebrates observed. Echinoderms accounted for 85% with two echinoderm taxa, *Echinothrix diadema* and *Holothuria atra* the most commonly observed. *E. diadema* accounted for 61% of all non-coral invertebrates.

The Unai Dankulo reef slope had a reported 104 taxa in 6 phyla. The Unai Dankulo reef slope had a relatively even distribution of organisms compared with other areas surveyed. Echinoderms were the most dominant phyla on the reef slope, accounting for 48% of all observed. Sponges and Bryozoans were rare in the community. No spatial pattern in overall density was reported for either Unai Dankulo reef flat or reef slope non-coral invertebrate communities. However, a significant negative correlation between depth and taxa richness was reported on the reef slope.

Tinian Harbor

Tinian Harbor is a small commercial port located in a large sheltered embayment on the southwest coast of Tinian (refer to Figure 11.1-1). The harbor consists of an entry channel and basin dredged to 26-33 ft (8-10 m) fronting the main quay and a shallower lagoon-like area to the northwest. This portion of the harbor is 16 ft (5 m) deep with piers for smaller crafts. A rock and metal breakwater along the reef flat margin provides protection from wave action and ocean swell. The harbor bottom near the small boat piers is mostly sand with patches of coral.

Tinian Harbor was reported to have 21 taxa in 16 genera of marine algae at the sites surveyed. The most common algae at the sites were: the green alga *Halimeda opuntia*; the brown algae *Dictyota* sp. and *Padina* sp.; and "fleshy" coralline algae reportedly occurring in more than a third of all quadrats surveyed. The reported relative abundance estimates for each taxa had high variability is suggestive of a heterogeneous algal community.

The Outer Harbor reportedly contained 22 genera of marine algae. Algal abundance was relatively higher outside vs. inside the harbor. It was reported that crustose coralline algae occurred in nearly three-quarters of all quadrats and, along with "fleshy" coralline algae, were the dominate taxa on the Outer Harbor reefs. Outer Harbor reefs showed less variability in algal cover the Inner Harbor sites. The most common algae observed during the CRED Rapid Ecological Assessment (REA) was the algae in the genus *Amphiroa*, turf algae, and *Cyanobacteria.*

Coral reef formations found off the Tinian Harbor included barrier reefs, fringing reefs, and a broad shelf area 305-ft [1,000-m]) wide (Eldredge 1983, NOAA 2005). The largest amount of coral cover on Tinian is found along the outer edges of the reef (forereef and terrace) (Navy 2005). Fringing and fore reefs less than 61-ft (200-m) wide occur immediately next to the western shoreline of Tinian.

11.1.4.2 Essential Fish Habitat

Information on EFH is provided in Volume 2, Chapter 11, Section 11.1.4, Guam Regional Environment, and is applicable to Tinian and CNMI. Island-specific information in addition to that section is provided below for EFH. Tinian is within the jurisdiction of the WPRFMC, which has designated the marine waters around Tinian as EFH, and adopted a precautionary approach to EFH designation due to the lack of scientific data (WPRFMC 2009a). Table 11.1-3 summarizes and Figure 11.1-2 depicts the EFH and Habitat Area of Particular Concern (HAPC) designations for Tinian. EFH for Coral Reef Ecosystem Management Unit Species (CREMUS) is the EFH type with the most Management Unit Species (MUS) in the waters of Tinian, and includes all the waters and habitats at depths from the sea surface to 328 ft (100 m) extending from the shoreline (including state and territorial lands and waters) to the outer boundary of the Exclusive Economic Zone (refer to Volume 2, Chapter 11 for a detailed description). HAPC within submerged lands around Tinian includes seamounts and banks to depths of 3,281 ft (1,000 m), escarpments and slopes between 131 and 919 ft (40 and 280 m), bottom habitat down to depths of 328 ft (100 m) (Table 11.1-3). Refer to Section 11.1.4.2 and the FEP for Mariana Archipelago (WPRFMC 2009a) for a description of the FEP and detailed listing of all FEP MUS.

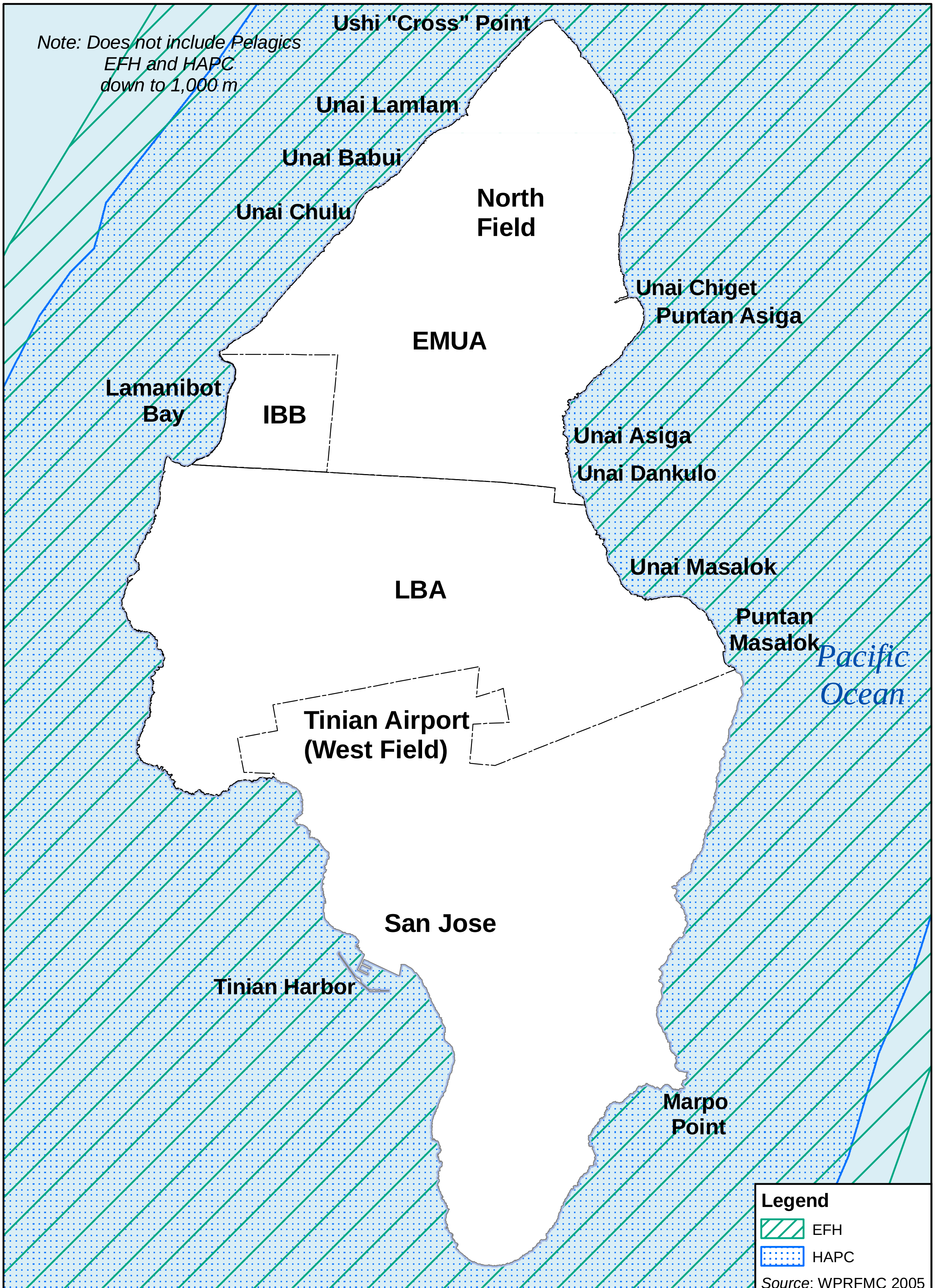

Figure 11.1-2
Essential Fish Habitat and Habitat Area of Particular Concern for all Designations on Tinian

Table 11.1-3. Tinian Essential Fish Habitat and Habitat Area of Particular Concern

FEP MUS Group	*EFH (Juveniles and Adults)*	*EFH (Eggs and Larvae)*	*HAPC*
Coral Reef Ecosystems	Water column and benthic substrate to a depth of 328 ft (100 m)	Water column and benthic substrate to a depth of 328 ft (100 m)	All MPAs identified in an FEP, all Pacific Remote Island Areas (PRIAs), many specific areas of coral reef habitat (see FEP)
Bottomfish	Bottomfish: Water column and bottom habitat down to 1,312 ft (400 m)	Bottomfish: Water column down to 1,312 ft (400 m)	Bottomfish: All escarpments and slopes between 131-919 ft (40-280 m)
Crustaceans	Bottom habitat from shoreline to a depth of 328 ft (100 m)	Water column down to 492 ft (150 m)	None
Pelagics	Water column down to 3,281 ft (1,000 m)	Water column down to 656 ft (200 m)	Water column above seamounts and banks down to 3,281 ft (1,000 m)

Note: All areas are bounded by the shoreline and the outer boundary of the EEZ, unless otherwise indicated.
MPA = marine protected area
Source: WPRFMC 2009a.

EFH for at least one life stage of a managed species group extends from the shoreline to the outer extent of the Exclusive Economic Zone from the surface to a water depth of 3,281 ft (1,000 m) and includes bottom habitat to a depth of 1,312 ft (400 m).

HAPC within submerged lands around Tinian includes seamounts and banks to depths of 3,281 ft (1,000 m) and escarpments and slopes between 131 and 919 ft (40 and 280 m) (refer to Table 11.1-3). Refer to Section 11.1.4.2 and the FEP for Mariana Archipelago (WPRFMC 2009a).

The Division of Fish and Wildlife is the Commonwealth-level agency that is in charge of designating and overseeing marine managed areas in the CNMI. The Protected Areas Program of the Division of Fish and Wildlife has identified six sites as MPAs; five occur around the island of Saipan, and one on Rota. Tinian has a limited take zone being proposed for its coastal waters. The Tinian Fish Reserve, proposed in 2003 under the CNMI House Bill #13-110, is still under debate. No specific HAPC site is identified at Tinian.

Data compiled from both the CNMI Marine Monitoring Team (MMT) (2008) and NOAA (Brainard 2008) show within site variability by depth for coral reef organisms. Trends found elsewhere in the Marianas suggest that reef flat communities would be less diverse than adjacent forereef slope communities and more heterogeneous in their distribution (NOAA 2008).

The CNMI, Coastal Resource Management Office (CRMO) has received a Proactive Species Conservation Grant through NOAA's Office of Protected Resources to study the distribution of the NMFS species of concern (SOC), Napoleon wrasse (*Cheilinus undulatus*) and NMFS candidate species, the bumphead parrotfish (*Bolbometopon muricatum*) around Saipan, Tinian, Rota and Agijuan. These fish are also designated EFH CREMUS. With a better understanding of population numbers and habitat use, CRM hopes to develop a set of management plans for these species. Currently, there are no documented observations of these SOCs on Tinian (NOAA 2005, CNMI MMT 2008, Brainard 2008).

Coral Reef Communities

Marine Corps (2009) provides the following coral and coral reef community information for marine areas around Tinian unless otherwise identified, which is relevant for the EFHA.

Unai Chulu

The Unai Chulu reef flat reportedly contained 15 coral species in seven genera. The coral genus *Acropora* was the most common, resulting from high *Acropora verweyi* densities at one site location. This site had high densities of *Leptastrea purpurea* in a transitional area between the reef flat and the reef slope. Other than this transition area, there is no apparent variability in the reef flat coral data.

The coral community on the Unai Chulu reef slope is diverse with at least 79 species in 24 genera. It appears to be a typical spur and groove coral community, and is dominated primarily by species of the genera *Goniastrea*, *Favia*, and *Galaxea*, which accounted for 52% of all observed colonies.

No trend was reported from reef slope for either the number of taxa or density. However, a correlation with depth was reported as the lower taxa richness and colony densities were reported on the shallower reef slope sites. Certain types of coral – *Pocillopora*, *Acropora*, and *G. retiformis* – were more prevalent at shallower sites, while other types – *Platygyra varians*, *L. purpurea* and *Favia* (*F. matthaii* and *F. stelligera*) – were less prevalent. Corals varied widely in size on the reef flat and reef slope.

Unai Babui

The Unai Babui reef flat had three coral colonies records of a single coral, *Porites lutea*. There appeared to be a gradual change in coral abundance and richness, with higher diversity and coral colony density on the southern end. Survey sites to the south of the beach were not performed due to the rough sea conditions; however these reef flat areas appeared to have better developed coral communities. The coral community on the Unai Babui reef slope had 71 species in 28 genera. The community appeared to be indicative of a typical spur and groove coral community, with *Favia* and *Goniastrea* corals accounting for nearly half of all observations.

No trends were reported on the reef slope for either the number of taxa or coral densities, however, a correlation with depth was observed. Shallower sites (i.e. closer to the reef crest/flat) tended to have lower taxa richness and colony density of *Goniastrea retiformis*, *Favia matthaii* (complex), and *Galaxea fascicularis.* This community was thought to be transitional between the spur and groove community found at the deeper survey sites and the reef crest and reef flat community. Corals colonies showed a wide range of sizes. Of the coral colonies observed on the reef slope, 57 percent were reported to be <2 in (5 cm) in diameter and 96% of coral colonies were <8 in (20 cm) in diameter. There were three coral colonies observed that measured approximately 80 cm. Considering the low density of coral colonies on the reef flat, size data were not examined for this zone.

Unai Dankulo

The Unai Dankulo reef flat reportedly had the highest coral density and richness of all the reef flats surveyed. The dominant corals included *Favia matthai* (complex) and *Goniastrea retiformis*, each accounting for 21% of the observed corals. Four species of *Acropora* were observed at multiple sites on the Unai Dankulo reef flat, in contrast to the Unai Babui and Unai Chulu reef flats. Two possible explanations include: 1) the extended reef flat at Unai Dankulo may have provided safe opportunity to survey areas nearer the reef crest where *Acropora* was present, and/or 2) the Unai Dankulo reef flat community is influenced by different environmental factors than the other reef flats.

The coral community on the Unai Dankulo reef slope was composed of 80 species in 24 genera, the highest richness found for a single area in this study. The dominant coral taxa on the reef slope were *F. matthai* (complex) and *G. retiformis*, comprising 22% and 16% of the corals, respectively. These relative contributions to the coral community were similar to those reported on the reef flat, and highlight greater similarity between the Unai Dankulo reef flat and slope than was seen at either Unai Babui or Unai Chulu.

Coral diversity tended to increase with depth on the reef slope. The deeper sites had more occurrences of *Acropora*, *Cyphastrea*, and *Montipora*. However, there was no observable relationship between depth and coral colony density.

Coral colonies varied widely in size on both the reef flat and reef slope. On the reef flat, coral colonies tended to be more evenly distributed among the size classes than those observed at Unai Chulu (insufficient corals were measured on the Unai Babui reef flat for comparison). Coral colonies <2 in (5 cm) in diameter comprised 43% of all colonies on the Unai Dankulo reef flat, compared to 67% at Unai Chulu. Two coral colonies >40 in (100 cm) were measured on the reef flat transects. A similar trend in coral colony size frequency was observed on the reef slope. Coral colonies <2 in (5 cm) in diameter comprised 51% of all colonies on the Unai Dankulo reef slope, with many colonies occupying larger size classes.

<u>Finfish Communities</u>

Marine Corps (2009) provides the following finfish community information for marine areas around Tinian unless otherwise identified.

Unai Chulu

There were 15 finfish families, comprised of 45 species, recorded on the Unai Chulu reef flat. Damselfish and wrasses were the most common accounting for 93% of all fish observed on the reef flat. The numerically dominant damselfish contributed relatively little to the fish biomass. Wrasses and surgeonfish contributed the most to fish biomass on the reef flat. The reef slope contained 33 finfish families consisting of 167 species. As on the reef flat, damselfish and wrasses were the most numerous fish, accounting for 59% of all finfish counts. Silversides were also numerically abundant on the reef slope, but they were patchily distributed; large schools (>200 individuals/100 m^2) were reported at 12% (2 of the 17) of the reef slope sites. Again, both damselfish and silversides contributed relatively little to the fish biomass; surgeonfish contributed the most to fish biomass on the reef slope. The highest density of large fish (>8 in length [>20 cm]) was highest on the Unai Chulu reef slope. Surgeonfish and parrotfish families were the most abundant. Napoleon wrasse and bumphead parrotfish were not seen at Unai Chulu, and sharks and rays were rare. Only one white tip reef shark (*Triaenodon obesus*) was observed.

On the whole, fish and invertebrate taxa richness on the reef slope was reported to be 3.8 times that of the reef flat. The opposite was true for the algal community, which was richer on the reef flat compared to the reef slope. No consistent pattern was reported for algae, coral, fish, and non-coral invertebrates. Algal cover on the reef bottom was similar between the reef flat and reef slope. There was a greater density of non-coral invertebrates' reef flats, but the opposite was true for fish biomass and coral densities.

Unai Babui

At Unai Babui, 12 finfish families comprised of 35 species were observed on the reef flat. Damselfish and chubs were the most common, accounting for over 92%. However, a few large surgeonfish present at two survey sites made them the dominant contributor to fish biomass. Fish on the reef flats displayed high spatial variability. Schooling surgeonfish occurred over large areas of the reef and were reported observed within one third of the reef flat transects. The other commonly observed fish taxa tended to have more uniform distributions. Twenty nine fish families consisting of 148 species were observed on the Unai Babui reef slope. The most numerous fish on the reef slope were silversides and damselfish. These two families accounted for over 69% of the observed reef fish density on the reef slope, but they accounted for only about 6% of the observed biomass. However, high variability in silverside density (2,400 silversides/100 m^2 at one survey site) skewed the reported results. When silversides were excluded from the estimation, the average density of reef fish dropped, and damselfish and wrasses accounted for 82% of all observed individuals. However, the larger bodied surgeonfish and wrasses, accounted for over 50% of the biomass. Large finfish were relatively rare. The most common finfish, surgeonfish followed by parrotfish, averaged >8 in (>20) cm in length. No sharks or rays were observed at this site. The Napoleon wrasse and bumphead parrotfish were also not reported during Unai Babui transects.

Unai Dankulo

Seventeen families of fish comprised of 63 species were observed on the Unai Dankulo reef flat. While damselfish and wrasses were reported to be the most numerous finfish (57% and 34%), wrasses and parrotfish contributed the most to biomass at 49% and 25% of the total finfish biomass, respectively, on the reef flat. On the reef slope, there were 28 finfish families, consisting of 140 species reported at Unai Dankulo. The most numerous finfish were silversides and damselfish, accounting for over 65% of all observed individuals on the reef slope. However, schooling silversides as seen at Unai Babui, had a patchy distribution (2000 silversides/100 m^2 at one survey site) and skewed the overall density estimate. When silversides are excluded from the overall density computation, the average density of reef fish dropped, and damselfish and wrasses then account for 70% of all observed individuals. The numerically dominant damselfish; however, contributed only about 5% of the observed reef slope fish biomass. Surgeonfish and parrotfish contributed the most to fish biomass at 42% and 15% of the total, respectively. Large fish (>8 in length [>20 cm]) were more common on the Unai Dankulo reef slope that at other beach areas. Surgeonfish and parrotfish, were the most abundant families, with only two other fish families, wrasses and snappers (Lutjanidae), represented in this category. No sharks or rays were observed at Unai Dankulo. The Napoleon wrasse and bumphead parrotfish were also not seen at Unai Dankulo.

<u>Summary</u>

Benthic survey data from the CNMI MMT (2008) and NOAA CRED (Brainard 2008) as summarized by Marine Corps (2009) were used to compare the coral reef communities among the three northern beaches. For the purposes of assessing EFH resources at the various Tinian sites, these survey data are described below.

The quadrat data in the form of percent reef bottom cover of all sessile organisms showed that Unai Chulu and Unai Babui were similar in cover, where Unai Dankulo was significantly different from both. Both sessile and finfish species showed a significant windward-leeward difference in their biomass by taxa. As with the benthic community, there was considerable finfish species overlap observed at the three survey areas and the observed difference was attributable to small shifts in species composition among the many observed.

Corals from the genus *Favia* were the dominant species reported for the CNMI MMT at Unai Chulu and Babui monitoring sites located at approximately 26 ft (8 m) in depth. The coral genera *Pavona* and *Montipora* are common at Unai Dankulo, but at Unai Babui, *Goniastrea* and *Platygra* are common. Echinoderms are dominant among non-coral invertebrates at the sites during all sampling years.

The most commonly observed coral genera during the NOAA CRED survey performed at Unai Chulu and Babui at depths of 40 ft (12 m), were *Favia*, *Astreopora*, and *Porties*. These genera are typically associated with spur and groove habitat in the Mariana Islands. Fish diversity was similar across all REA sites, but abundance varied widely between years and by site. Surgeonfish, parrotfish, wrasses, and soldierfish dominated the northern REA sites.

The Unai Dankulo reef slope had 2.4 times the taxa richness of the reef flat, and had the highest overall taxa richness of any area surveyed. Densities of fish and corals were higher on the reef slope than the reef flat, but no trend was apparent for algal cover and non-coral invertebrate densities.

Tinian Harbor

There were 15 coral genera reported within the Inner Harbor; a single taxa, *Leptastrea purpurea*, accounted for 60% of the observed colonies and along with *Pocillopora damicornis* represented 72% of all observed colonies.

There were 27 coral genera reported from the Outer Harbor reefs, including the ocean side of the breakwater. While coral diversity was comparable to reef slope sites surveyed on the northern beaches, the coral density was lower. The coral community was not dominated by any single taxonomic group, however, *Goniastrea retiformis* accounted for 24% of all observed colonies. Coral colonies >16 in (>40 cm) accounted for 9% of the observed colonies. In contrast, coral colonies in the Inner Harbor were heavily skewed toward small size classes, with 62% of colonies <0.78 in (<2 cm) and 81% of all observed colonies being <2 in (<5 cm).

The Inner Harbor had a rich fish community; 101 fish taxa in 28 families were found within Tinian's Inner Harbor. Damselfish and wrasses were numerically dominant, accounting for over 64% of all observed individuals. While parrotfish were less dominant numerically, they were the primary contributor to biomass, accounting for 32% of the fish biomass at Inner Harbor sites, over twice that attributable to any other fish family. Parrotfish and mullets were numerically the most commonly observed large fish in the Inner Harbor, but densities of large fish were lower at Inner Harbor than at Outer Harbor sites.

One hundred and twenty-eight fish species in 26 genera were found in the Outer Harbor. Three families, wrasses (26% of individuals), damselfish (26% of individuals), and surgeonfish (22% of individuals) accounted for the 74% of the fish observed in the Outer Harbor. These same families also contributed 64% to the overall fish biomass. Large fish were relatively rare; the most common fish 8 in (>20 cm) in length were parrotfish. However, large emperors and triggerfish were dominant in terms of biomass. A small school of barracuda was observed at one Outer Harbor site, but because they were small and rare at the Outer Harbor, they were not significant contributors to the fish biomass.

No sharks or rays were observed at Tinian Harbor. The Napoleon wrasse (designated a NMFS SOC and CREMUS) and bumphead parrotfish (designated a NMFS candidate species and CREMUS) were not seen in Tinian Harbor.

11.1.4.3 Special-Status Species

As noted in Section 11.1.1.3, this section includes USFWS ESA-listed and candidate species and marine mammals not listed under ESA. The Napoleon wrasse is a NMFS SOC, and the bumphead parrotfish is a NMFS candidate species. Although these fish have not been reported to occur at Tinian, they are described in the EFH section, above. Detailed descriptions of all potentially affected special-status species, including life history information, are included in Volume 9, Appendix G.

The threatened green sea turtle and the endangered hawksbill sea turtle are the only two ESA-listed species that are anticipated to occur in the nearshore marine environment and adjacent beaches. The Navy, in cooperation with the USFWS and Guam Division of Aquatic and Wildlife Resources, monitors for sea turtle nesting on Navy land throughout the sea turtle nesting season (April – July for the green sea turtle and January – March for the hawksbill sea turtle).

The spinner dolphin and common bottlenose dolphin are the only two marine mammals anticipated in the nearshore (<164-ft [50-m] isobath) ROI for the study areas (Navy 2005). Table 11.1-1 shows the special-status species that are addressed in this EIS.

Eighty-two coral species were identified as NMFS candidate species for potential listing, some of which occur in the ROI (NMFS 2010; WPRFMC 2009a). As candidate species are afforded no special protection, they would not be analyzed for potential impacts in this EIS; corals are considered EFH, so corals are considered in the EFH analysis.

The special-status species are briefly described below and in more detail in Volume 2, Chapter 11, Section 11.1.4.3. Information about these species, including status, habitat preferences, distribution, behavior, and life history can be found in Volume 9, Appendix G.

Green Sea Turtles

The threatened green sea turtle is by far the most abundant sea turtle found around Tinian. The green sea turtle occurrences are concentrated in nearshore waters of Tinian (Navy 2005). The number of green sea turtles inhabiting Tinian's nearshore environment is estimated to total approximately 800 turtles. Green sea turtle density at Tinian is estimated to be twice that of Saipan and nearly an order of magnitude greater than Rota, Aguijan, and FDM (Kolinski et al. 2004).

The green sea turtle nests on Tinian and all beaches reportedly support turtle nesting activities (Pultz et al. 1999). For successful nesting, green sea turtles require deep sand beaches with open ocean exposure and minimal disturbance. Beaches where green sea turtles have nested include Unai Masalok, Unai Dankulo, Unai Lamlam, Unai Babui, Unai Chulu, Unai Dunk Coke, Unai Barcinas, and Leprosarium Beach (COMNAV Marianas 2004). Green sea turtle nesting activity occurs as early as late January and ends in mid-July on most of Tinian's sandy beaches (Kolinski et al. 2001). The beaches that occur on Tinian are surveyed for sea turtle activity (i.e., crawls, nests, potential nests, body pits and hatching tracks) from February through August. Between 1999 and 2005, no nesting activity was noted in 2001 and 2003, while 2005 had the highest number of beach crawls (13) and the highest number of nests (6) (Kolinski et al. 2005). Nesting sea turtles are discussed further in the Terrestrial Biological Resources, Chapter 10.

Hawksbill Sea Turtles

The endangered hawksbill turtle has been sighted in the waters offshore, but is not known to nest on the island. The hawksbill sea turtle occur in nearshore waters of Tinian (Navy 2005).

Common Bottlenose Dolphin

There is no occurrence on record for this species in the Marianas, but this is within the known distribution range for the species. Bottlenose dolphins occur from the coastline to the 6,562 ft (2,000 m) isobaths (Navy 2005).

Spinner Dolphins

The spinner dolphin is expected to regularly occur all around Tinian (Navy 2005).

11.1.4.4 Non-native Species

Marine organisms, pathogens, or pollutants may be taken up with ship ballast water (or attached to vessel hulls) and be transferred to a different location or ecosystem and cause harm to the receiving ecosystem.

These organisms and pollutants are in greater concentration within 6 km (3 nautical miles) of the coast (COMNAV Marianas 2007).

Information is limited for Tinian. However, U.S. Army Corps of Engineers (USACE) (2009) reports a new non-native species of algae described as *Gracilaria* that has been intentionally introduced into Tinian Harbor and that an abalone species has also been introduced. The Tinian Mayor's office, together with the Northern Marianas College Cooperative Research Extension & Education Services' staff, attended specialized training on abalone (*H. asinine*) nursery and grow-out culture and seaweed (*Gracilaria*) farming (NMC-CREES 2009).

Balazs et al. (1987) identified ten genera of algae that he considered to be preferred forage for green sea turtles in Hawaii, *Gracilaria* was listed as one of these algal species. *Gracilaria salicornia* is native to other parts of the Pacific and was introduced as a potential species for aquaculture in 1971 in Hawaii. It reproduces vegetatively and fish do not seem to prefer as forage. *Gracilaria* responds moderately to nitrogen, but once established, becomes very competitive. It exhibits 3-D growth form and is not limited by space (ANTSF 2009).

Most of the marine non-native species survey work, although limited, has been conducted in Apra Harbor and is discussed in Volume 2, Chapter 11.

A Micronesia Biosecurity Plan (MBP) is being developed to address potential invasive species impacts associated with this EIS as well as to provide a plan for a comprehensive regional approach. The MBP would include risk assessments for invasive species throughout Micronesia and procedures to avoid, minimize, and mitigate these risks. It is being developed in conjunction with experts within other federal agencies including the National Invasive Species Council, U.S. Department of Agriculture Animal and Plant Health Inspection Service, the U.S. Geological Survey, and the Smithsonian Environmental Research Center. The plan is intended to be a comprehensive evaluation of risks in the region, including all Marine Corps and Navy actions on Guam and Tinian and specifically those being proposed in this EIS. The DoN would implement applicable DoD portions of the plan and would collaborate with other government agencies and groups on full implementation of the plan throughout the region. Because some actions proposed in this EIS would occur prior to finalizing the MBP, interim measures are also proposed in this EIS to address invasive species that would supplement existing practices.

11.2 ENVIRONMENTAL CONSEQUENCES

11.2.1 Approach to Analysis

11.2.1.1 Methodology

The methodology for identifying, evaluating, and mitigating impacts to marine biological resources was based on federal laws and regulations including the ESA, MMPA, Magnuson-Stevens Fishery Conservation and Management Act or Magnuson-Stevens Act (M-SA), Section 404(b)(1) Guidelines (Guidelines) of the Clean Water Act (CWA), and Executive Order (EO) 13089, *Coral Reef Protection*. Significant marine biological resources include all special-status species including species that are ESA-listed as threatened and endangered or candidates for listing under ESA, species protected under the MMPA, or species with designated EFH or HAPC established under the M-SA. The M-SA defines EFH as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." 'Waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish. 'Substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities. 'Necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem, and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle (16 United States Code [USC] 1801 et seq.). Additionally, at least one or more of the following criteria established by the NMFS must be met for HAPC designation: 1) the ecological function provided by the habitat is important, 2) the habitat is sensitive to human-induced environmental degradation, 3) development activities are, or would, stress the habitat type, or 4) the habitat type is rare. It is possible that an area can meet one HAPC criterion and not be designated an HAPC. The WPRFMC used a fifth HAPC criterion, not established by NMFS, that includes areas that are already protected, such as Overlay Refuges (WPRFMC 2009a).

The Guidelines of the CWA Section 404(b)(1) are federal regulations developed between the U.S. Environmental Protection Agency (USEPA) and U.S. Department of the Army (Army). Specifically, Section 404(b)(1) of the CWA stipulates that no discharge of dredged or fill material into waters of the U.S., which include wetlands, shall be permitted if there is a practicable alternative which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant environmental consequences. Furthermore, an alternative is considered practicable if it is available and could be implemented after taking into consideration cost, existing technology, and logistics in light of overall project purposes. The Section 404 evaluation process considers the potential impacts to the aquatic system by the discharge of the dredged or fill materials into waters of the U.S. and articulates procedures to be used in the determination to demonstrate CWA compliance, with the objective to restore and maintain the chemical, physical, and biological integrity of the Nation's waters, including special aquatic sites (SAS). The review process includes the type and level of mitigation necessary to minimize unavoidable impacts of the proposed action. The guidelines are binding on the USACE as the agency charged with implementing the Section 404 permitting program. The USACE is prohibited from issuing a permit for any discharge of dredged or fill material in waters of the U.S. that does not comply with the guidelines.

SAS are those sites identified in 40 CFR 230, Subpart E (i.e., sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes). They are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region.

In general, the main intentions of the three federal acts listed above are as follows:

- The ESA establishes protection over and conservation of threatened and endangered species and the ecosystems upon which they depend, and requires any action that is authorized, funded, or carried out by a federal entity to ensure its implementation would not jeopardize the continued existence of listed species or adversely modify critical habitat.
- The MMPA was established to protect marine mammals by prohibiting take of marine mammals without authorization in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.
- The M-SA requires NMFS and regional fishery management councils to minimize, to the extent practicable, adverse effects to EFH caused by fishing activities. The M-SA also requires federal agencies to consult with NMFS about actions that could damage EFH.
- The CWA Guidelines set forth a goal of restoring and maintaining existing aquatic resources, including SAS (i.e. coral reefs, wetlands etc.).

The ESA, MMPA, and M-SA require that NMFS and/or the USFWS be consulted when a proposed federal action may adversely affect an ESA-listed species, a marine mammal, EFH or HAPC. In addition, while all habitats are important to consider, 'coral reef ecosystems' are perhaps the most important habitats and the analysis is included under EFH. As a note, EO 13089 also mandates preservation and protection of U.S. coral reef ecosystems that are defined as "… those species, habitats and other natural resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction and control of the United States." This guidance is intended to clarify and reemphasize the protection afforded the Nation's valuable coral reef ecosystems under the CWA Section 404 regulatory program, the Marine Protection, Research, and Sanctuaries Act (MPRSA) Sections 102 and 103 provisions, Rivers and Harbors Act (RHA) Section 10 requirements, and federal projects conducted by the USACE.

In regard to dredging activities, USACE first makes a determination that potential impacts have been avoided to the maximum extent practicable (striving to avoid adverse impacts); remaining impacts would be mitigated the extent appropriate and practicable by requiring steps to reduce impacts; and finally, compensate for aquatic resource values. This sequence is considered satisfied where the proposed mitigation is in accordance with specific provisions of a USACE- and USEPA-approved comprehensive plan that ensures compliance with the compensation requirements of the Guidelines.

11.2.1.2 Determination of Significance

This section analyzes the potential for impacts to marine biological resources from implementation of the action alternatives and the no-action alternative. Factors considered in the analysis of potential impacts to marine biological resources include: 1) importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource, 2) proportion of the resource that would be affected relative to its occurrence in the region, 3) sensitivity of the resource to proposed activities, and 4) duration of ecological ramifications. The factors used to assess the significance of the effects to marine biological resources include the extent or degree that implementation of an alternative would result in permanent loss or long-term degradation of the physical, chemical, and biotic components that make up a marine community. The following significance criteria were used to assess the impact of implementing the alternatives:

- The extent, if any, that the action would diminish suitable habitat for a special-status species or permanently lessen designated EFH or HAPC for the sustainment of managed fisheries.
- The extent, if any, that the action would disrupt the normal behavior patterns or habitat of a federally listed species, and substantially impede the DoN's ability to either avoid jeopardizing or to conserve and recover the species.
- The extent, if any, that the action would diminish population sizes or distribution of special status species or designated EFH or HAPC.
- The extent, if any, that the action would be likely to jeopardize the continued existence of any special-status species or result in the destruction or adverse modification of habitat of such species or designated EFH or HAPC.
- The extent, if any, that the action would permanently lessen physical and 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 result in a 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 be inconsistent with the goals of the DoN's Integrated Natural Resources Management Plan (INRMP).

The MMPA generally defines harassment as Level A or Level B, and these levels are defined uniquely for acts of military readiness such as the proposed action. Public Law (PL) 108-136 (2004) amended the MMPA definition of Level A and Level B harassment for military readiness events, which applies to this action.

- Level A harassment includes any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild.
- Level B harassment is now defined as "any act that disturbs or is likely to disturb a marine mammal or marine mammal stock by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behaviors are abandoned or significantly altered." Unlike Level A harassment, which is solely associated with physiological effects, both physiological and behavioral effects may cause Level B harassment.

ESA specifically requires agencies not to "jeopardize" the continued existence of any ESA-listed species, or destroy or adversely modify habitat critical to any ESA-listed species. Under Section 7, "jeopardize" means to engage in any action that would be expected to reduce appreciably the likelihood of the survival and recovery of a listed species by reducing its reproduction, numbers, or distribution. Section 9 of the ESA defines "take" as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect.

Effects determinations for EFH are either "no adverse effect on EFH" or "may adversely affect EFH" (WPRFMC 2009a). Pursuant to 50 CFR 600.910(a), an "adverse effect" on EFH is defined as any impact that reduces the quality and/or quantity of EFH. Adverse effects to EFH require further consultation if they are determined to be permanent versus temporary (NMFS 1999). To help identify DoN activities falling within the adverse effect definition, the DoN has determined that temporary or minimal impacts are not considered to "adversely affect" EFH. 50 CFR 600.815(a)(2)(ii) and the EFH Final Rule (67 FR 2354) were used as guidance for this determination, as they highlight activities with impacts that are more than minimal and not temporary in nature, opposed to those activities resulting in inconsequential changes to habitat. Temporary effects are those that are limited in duration and allow the particular environment to recover without measurable impact (67 FR 2354). Minimal effects are those that may result in relatively small changes in the affected environment and insignificant changes in ecological functions (67 FR 2354). Whether an impact is minimal would depend on a number of factors (DoN 2010):

- The intensity of the impact at the specific site being affected
- The spatial extent of the impact relative to the availability of the habitat type affected
- The sensitivity/vulnerability of the habitat to the impact
- The habitat functions that may be altered by the impact (e.g., shelter from predators)
- The timing of the impact relative to when the species or life stage needs the habitat

The analysis of potential impacts to marine biological resources considers direct and indirect impacts. The *Council on Environmental Quality (CEQ)*, *Section 1508.08 Effects,* defines direct impacts as those which are caused by the action and occur at the same time and place, while indirect impacts occur later in time or farther removed in distance, but are still reasonably foreseeable.

Direct impacts may include: removal of coral and coral reef habitat (a CWA special aquatic site), "taking" of special-status species, increased noise, decreased water quality, and/or lighting impacts resulting from construction or operation activities.

Indirect impacts, for the purposes of this evaluation, may include any sedimentation/siltation of coral reef ecosystems resulting from construction or operational activities (i.e. dredging, resuspension of sediment via prop wash), or recreational activities in the vicinity of the resource that may lead to impacts to special-status species and EFH.

If marine resources could be significantly impacted by proposed project activities, potential impacts may be reduced or offset through implementation of appropriate Best Management Practices (BMPs) or mitigation measures.

11.2.1.3 Issues Identified during Public Scoping Process

The following analysis focuses on possible effects to marine biological resources that could be impacted by the proposed action. As part of the analysis, concerns relating to marine biological resources that were mentioned by the public, including regulatory stakeholders, during scoping meetings were addressed. A general account of these comments includes the following:

- Potential impacts to endangered species (including nesting habitats), species of concern, and federal trust species such as corals and marine mammals.
- Potential impacts from military expansion from all project sites on the marine resources, including removal or disturbance of the marine habitat.
- Impacts to culturally significant marine-related areas for subsistence fishing and beliefs.
- Increased land runoff impacting beaches and marine life (erosion and sediment stress).
- Increased anthropogenic factors impacting the coral reef ecosystem and concerns about the education and training that would be provided for newly arriving military and their dependents regarding reef protection.
- Impacts to coral reef ecosystems regarding amphibious landing craft operations.
- Mitigation measures and non-structural alternatives to avoid and minimize impacts to coral reefs.

11.2.2 Alternative 1 (Preferred Alternative)

11.2.2.1 Tinian

Activities associated with Alternative 1 have the potential to impact the quality and quantity of the surface runoff during both the construction and operational phases of the project. Both construction activities as well as long-term training activities may cause erosion and sedimentation that can degrade coastal waters and potentially impact nearshore marine biological resources. In addition, the action alternatives would increase the potential for leaks and spills of petroleum, oil, lubrications, hazardous waste, pesticides, and fertilizers. These potential impacts may affect the coastal waters and in turn the biological resources and habitats. Potential impacts for each resource type are described below, grouped by construction versus operations activities.

<u>Construction</u>

There are no in-water construction, dredging, or training activities proposed for this study area. There are no land-based construction activities that would directly impact the marine environment. Land-based construction actions associated with Alternative 1 would occur more than 1 mile from the coastline. In addition, no construction would occur within the identified 100-year floodplain (Flood Zone A areas). While alterations to the watershed have the potential to result in indirect impacts that could alter the coastal water quality as described above (also refer to Chapter 4, Water Resources), these potential effects would be minimized by complying with all applicable orders, laws and regulations, including low impact development stormwater management strategies and BMPs (Volume 7). Supply barge traffic in Tinian

Harbor supporting construction activities would increase in the short-term; however, this activity would be limited to the project duration.

Marine Flora, Invertebrates and Associated EFH

There would be no adverse impacts to marine flora or invertebrates, as vessel traffic does not impact these resources, and indirect water quality impacts, if to occur, would be minimized by the use of BMPs. There would be no adverse effect on associated EFH.

Essential Fish Habitat

There would be no adverse effect on fish or EFH, as fish are highly mobile and would not be significantly disturbed by a temporary increase in vessel traffic. Any potential indirect water quality impacts would be minimized by the use of BMPs. There would be no adverse effect on EFH.

Special-Status Species

There would be no significant impacts to special-status species. The action may affect, but is not likely to adversely affect ESA-listed sea turtles, no serious injury or mortality of any marine mammal species is reasonably foreseeable, and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks with implementation per Section 3 [16 USC 1362] of MMPA would occur.

Non-native Species

Any potential introduction/transport of non-native species from one area to another may be lessened or even prevented through appropriate implementation and management of BMPs and existing USCG and DoN policies (refer to Volume 7). Additionally, the DoN would prepare the MBP with the overall goal to identify terrestrial and marine biosecurity risks associated with Marine Corps relocation and training activities on Guam and the CNMI posed by transportation and commerce to and within Micronesia and Hawaii, and to document prevention, control and treatment measures that can be incorporated by civilian and military operations. Volume 7 includes a more detailed description of the MBP .

Therefore, Alternative 1 would result in less than significant impacts to marine biological resources.

Operation

There would be no maritime training on Tinian. Training activities associated with Alternative 1 would occur more than one mile from the coastline. The transport of 200-400 Marines to Tinian from Guam for the proposed 1 week per month company-level training exercises would be via air transport. The estimated sorties associated with the notional airlift requirements are provided in Table 11.2-1. No SDZs extend overwater for this Alternative.

Marine Flora, Invertebrates and Associated EFH

Based on compliance with all federal, CNMI, and military orders, laws, and regulations, there would be negligible impacts to marine flora, invertebrates or associated EFH, and no adverse effect on associated EFH.

Essential Fish Habitat

Based on compliance with all federal, CNMI, and military orders, laws, and regulations, there would be negligible impacts to EFH, and no adverse effect on EFH organisms or habitat.

Special-Status Species

Based on compliance with all federal, CNMI, and military orders, laws, and regulations, there would be no significant impacts to special-status species. Activities associated with the operation phase of Alternative 1 would have no affect on ESA-listed sea turtles, no serious injury or mortality of any marine mammal species is reasonably foreseeable, and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks with implementation per Section 3 [16 USC 1362] of MMPA would occur.

Table 11.2-1. Daily and Annual Use of Proposed Small Arms Qualification Ranges on Tinian

<table>
<tr><th rowspan="3">Range</th><th rowspan="3">Weapon</th><th rowspan="3">Ammunition Type</th><th colspan="3">Typical Use Estimate</th><th colspan="3">Ammunition Expenditure Estimates</th></tr>
<tr><th rowspan="2">Crews or Personnel</th><th rowspan="2">Hours</th><th rowspan="2">Days Per Yr(a)</th><th colspan="2">Busy Day (b)</th><th rowspan="2">Annual(d)</th></tr>
<tr><th>Day</th><th>Night(c)</th></tr>
<tr><td>Known Distance</td><td>Rifle</td><td>5.56 mm</td><td>100</td><td>8:00 -12:00
7:00- 9:00</td><td>80</td><td>12,000</td><td>0</td><td>960,000</td></tr>
<tr><td rowspan="2">Automated Combat Pistol/ Military Police Firearms Qualification</td><td>Pistol (M9)</td><td>9 mm</td><td>100</td><td>8:00-10:00
7:00- 9:00</td><td>60</td><td>3,750</td><td>1,250</td><td>300,000</td></tr>
<tr><td>45</td><td>.45caliber</td><td>50</td><td>8:00-10:00
7:00- 9:00</td><td>20</td><td>3,750</td><td>1,250</td><td>100,000</td></tr>
<tr><td rowspan="2">Platoon Battle Course</td><td>Rifle</td><td>5.56 mm</td><td>120</td><td>8:00-4:00
7:00- 1:00</td><td>80</td><td>6,750</td><td>2,250</td><td>720,000</td></tr>
<tr><td>SAW</td><td>5.56 mm</td><td>40</td><td>8:00-4:00
7:00- 1:00</td><td>80</td><td>2,250</td><td>750</td><td>240,000</td></tr>
<tr><td>Field Firing Range</td><td>Rifle</td><td>5.56 mm</td><td>120</td><td>8:00-4:00
7:00- 1:00</td><td>80</td><td>9,000</td><td>3,000</td><td>960,000</td></tr>
<tr><td colspan="8">Total</td><td>3,280,000</td></tr>
</table>

Legend: mm = millimeters; SAW = Squad Assault Weapon.
Notes:
[a] The figures for number of days of use are determined based on an estimated use of the ranges up to 16 weeks per year (1 week per month plus 1 additional week per quarter), 5 days per week. Range use would occur periodically throughout the year, with no predictably busy or non-use periods.
[b] Estimates based on the maximum number of shooters per day who could make use of each proposed range (calculated by multiplying the number of firing points or lanes by the number of firing relays), firing the number of rounds prescribed for a standard string of fire. This estimate is consistent with the ammunition allocation for the relocated Agreed Implementation Plan units.
[c] Night refers to non-daylight hours that are generally 7:00 p.m. – 6:00 a.m. on Tinian.
[d] The estimate of annual numbers of rounds expended is consistent with the Agreed Implementation Plan ammunition allocation.

Non-native Species

No major conduit would exist from the implementation of Alternative 1 for introduction of non-native species into the marine environment with appropriate maritime policies. There would be no significant impacts on resources from non-native species associated with training activities for Alternative 1.

Training activities associated with Alternative 1 would result in less than significant impacts to marine biological resources.

11.2.2.2 Summary of Alternative 1 Impacts

Table 11.2-2 summarizes the Alternative 1 Impacts.

Table 11.2-2. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	There may be negligible short-term and localized impacts from increased turbidity in coastal waters from increased runoff to all marine biological resources. Short-term and localized disturbances to marine biological resources residing in Tinian Harbor, particularly in the form of increased noise levels, may occur from increased barge traffic. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7.
	Operation	There would be negligible impacts to all marine biological resources with the implementation of BMPs described in Volume 7. .

11.2.2.3 Alternative 1 Proposed Mitigation Measures

As described above, any potential introduction/transport of non-native species from one area to another may be lessened or even prevented through appropriate implementation and management of BMPs and existing USCG and DoN policies (refer to Volume 7). Additionally, the DoN would prepare the MBP with the overall goal to identify terrestrial and marine biosecurity risks associated with Marine Corps relocation and training activities on Guam and the CNMI posed by transportation and commerce to and within Micronesia and Hawaii, and to document prevention, control and treatment measures that can be incorporated by civilian and military operations. Volume 7 includes a more detailed description of the MBP.

No additional mitigation measures are identified under Alternative 1.

11.2.3 Alternative 2

11.2.3.1 Tinian

<u>Construction</u>

Impacts to marine biological resources resulting from the implementation of Alternative 2 are similar to the impacts discussed under Alternative 1 (Section 11.2.2.1), and are described below.

Marine Flora, Invertebrates and Associated EFH.

Based on compliance with all federal, CNMI, and military orders, laws, and regulations, there would be negligible impacts to marine flora or invertebrates, and no adverse effect on associated EFH.

Essential Fish Habitat

Based on compliance with all federal, CNMI, and military orders, laws, and regulations, there would be negligible impacts to EFH, and no adverse effect on EFH.

Special-Status Species

Based on compliance with all federal, CNMI, and military orders, laws, and regulations, there would be no significant impacts to special-status species; the action would have no affect on ESA-listed sea turtles, no serious injury or mortality of any marine mammal species is reasonably foreseeable, and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks with implementation per Section 3 [16 USC 1362] of MMPA would occur.

Non-native Species

No major conduit would exist from the implementation of Alternative 2 for introduction of non-native species into the marine environment with appropriate maritime policies. There would be no significant impacts on resources from non-native species associated with training activities for Alternative 2.

Operation

Impacts to marine biological resources resulting from the implementation of Alternative 2 are similar to the impacts discussed for Alternative 1 (Section 11.2.2.1), with the exception of a small SDZ area proposed to extend over Unai Dankulo Beach for Alternative 2. While ground disturbing activities would occur within the range, the SDZ is largely unaffected by the range, and is a safety feature left in its natural state.

Alternative 2 would require restricted access to the waters and shoreline encompassed by the SDZs during operation of the Platoon Battle Course. Restricted access to the coastal areas during range operations would result in positive impacts to marine organisms.

Marine Flora, Invertebrates and Associated EFH

Based on compliance with all federal, CNMI, and military orders, laws, and regulations, there would be negligible impacts to marine flora or invertebrates, and no adverse effect on associated EFH. Restricted access to the coastal areas during range operations would result in a positive impact to marine flora, invertebrates and EFH.

Essential Fish Habitat

Based on compliance with all federal, CNMI, and military orders, laws, and regulations, there would be negligible impacts to EFH, and no adverse effect on EFH organisms or habitat. Restricted access to the coastal areas during range operations would result in a positive impact to EFH.

Special-Status Species

Based on the probability analysis performed in Volume 2, Chapter 11, Section 11.2.2.2 (Munitions Strike Probability), adverse impacts to marine mammals or sea turtles from range munitions are extremely unlikely. In addition, general maritime measures and range operations in place by the military include lookouts to keep vessels out of the SDZs and trained personnel to sight marine mammals or sea turtles.

Based on compliance with all federal, CNMI, and military orders, laws, and regulations, there would be no significant impacts to special-status species; the action may affect, but is not likely to adversely affect ESA-listed sea turtles, no serious injury or mortality of any marine mammal species is reasonably foreseeable, and no adverse effects on the annual rates of recruitment or survival of any of the species and stocks with implementation per Section 3 [16 USC 1362] of MMPA would occur.

Restricted access to the coastal areas during range operations would result in a positive impact to special-status species. Unai Dankulo, a sea turtle nesting beach, would be designated a restricted area, and therefore lead to positive impacts to nesting sea turtles.

Non-native Species

No major conduit would exist from the implementation of Alternative 2 for introduction of non-native species into the marine environment with appropriate maritime policies. There would be no significant impacts on resources from non-native species associated with training activities for Alternative 1.

Alternative 2 would result in less than significant impacts to marine biological resources overall, with a positive impact to Unai Dankulo, a sea turtle nesting beach onshore and a coral area of special significance offshore, from restricted access during range operations.

11.2.3.2 Summary of Alternative 2 Impacts

Table 11.2-3 summarizes Alternative 2 impacts.

Table 11.2-3. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	There may be negligible short-term and localized impacts from increased turbidity in coastal waters from increased runoff to all marine biological resources. Short-term and localized disturbances to marine biological resources residing in Tinian Harbor, particularly in the form of increased noise levels, may occur from increased barge traffic. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7.
	Operation	There would be negligible impacts to all marine biological resources with the implementation of BMPs described in Volume 7. A beneficial impact to sea turtles and a coral area of special significance associated with Unai Dankulo may occur during range training operations and the respective coastal area restricted access.

11.2.3.3 Alternative 2 Proposed Mitigation Measures

No additional mitigation measures, from those identified for Alternative 1, are identified for Alternative 2.

11.2.4 Alternative 3

11.2.4.1 Tinian

Construction

Impacts to marine biological resources resulting from the implementation of Alternative 3 are similar to the impacts discussed under Alternative 1 (Section 11.2.2.1). Therefore, Alternative 3 would result in less than significant impacts to marine biological resources.

Operation

Impacts to marine biological resources resulting from the implementation of Alternative 3 are similar to the impacts discussed under Alternative 1 (Section 11.2.2.1), as no SDZs extend over the marine environment. As stated under Alternative 1, based on compliance with all federal, the CNMI, and military orders, laws, and regulations, impacts would be negligible. Therefore, there would be no impacts to marine flora and invertebrates, no adverse effects to fish and EFH, no significant impacts to special-status species (i.e. the action would not "jeopardize" or "take" an ESA-listed or marine mammal species per ESA Section 7 and 9 or Section 3 [16 USC 1362] of MMPA), and no major conduit exists for introduction of non-native species into the marine environment with appropriate maritime policies.

Therefore, Alternative 3 would result in less than significant impacts to marine biological resources.

11.2.4.2 Summary of Alternative 3 Impacts

Table 11.2-4 summarizes Alternative 3 impacts.

Table 11.2-4. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	There may be negligible short-term and localized impacts from increased turbidity in coastal waters from increased runoff to all marine biological resources. Short-term and localized disturbances to marine biological resources residing in Tinian Harbor, particularly in the form of increased noise levels, may occur from increased barge traffic. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7.
	Operation	There would be negligible impacts to all marine biological resources with the implementation of BMPs described in Volume 7.

11.2.4.3 Alternative 3 Proposed Mitigation Measures

No additional proposed mitigation measures, from those identified for Alternative 1, are identified for Alternative 3.

11.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. Existing operations on Tinian would continue. Therefore, the no-action alternative would not have significant impacts to marine biological resources.

11.2.6 Summary of Impacts

Table 11.2-5 summarizes the potential impacts. A text summary is provided below.

Table 11.2-5. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Marine Flora, Invertebrates and Associated EFH			
LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7.	NI • No impact
Essential Fish Habitat			
LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7. • Positive impact to coral area of special significance off Unai Dankulo due to restricted coastline access during range operations.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7. • Positive impact to coral area of special significance off Unai Dankulo due to restricted coastline access during range operations.	NI • No impact

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Special Status Species			
LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7. • Positive impact to sea turtles due to restricted coastline access (and Unai Dankulo nesting beach) during range operations.	LSI • Less than significant impacts from runoff causing turbidity in coastal waters from construction and operation activities and increased supply barge traffic in Tinian Harbor supporting construction activities. These short-term and localized impacts would be reduced through implementation of BMPs described in Volume 7. • Positive impact to sea turtles due to restricted coastal access (and Unai Dankulo and Masalok nesting beaches) during range operations.	NI • No impact
Non-native Species			
LSI • Less than significant impact as no maritime construction or operations are planned and construction vessels would comply with USCG and DoN requirements for ballast water and hull management policies, with the implementation of Alternative 1.	LSI • Less than significant impact as no maritime construction or operations are planned and construction vessels would comply with USCG and DoN requirements for ballast water and hull management policies, with the implementation of Alternative 1.	LSI • Less than significant impact as no maritime construction or operations are planned and construction vessels would comply with USCG and DoN requirements for ballast water and hull management policies, with the implementation of Alternative 1.	NI • No impact

Legend: LSI = Less than significant impact, NI = No impact.

Many of the action alternatives have the potential to impact the quality and quantity of the surface runoff, during both the construction and operational phases of the project. Both construction activities as well as long-term training activities may cause erosion and sedimentation that can degrade coastal waters and potentially impact nearshore marine biological resources. In addition, the action alternatives would increase the potential for leaks and spills of petroleum, oil, and lubrications, hazardous waste, pesticides, and fertilizers. These potential impacts may affect the coastal waters and in turn the biological resources and habitats. The action alternatives; however, would be conducted in accordance with all applicable orders, laws, and regulations that would reduce their potential for impact on marine biological resources from runoff within the nearshore environment. A beneficial impact on sea turtles may be seen during training activities due to restricted access along the coastal areas and sea turtle nesting beach in the area.

Additionally, considering that Alternative 2 would have some access restrictions placed on the coastal areas during range training operations, this could provide some added protection to nesting sea turtles and coral and coral reef ecosystem offshore.

Therefore, the alternatives would result in less than significant impacts to marine biological resources, with Alternative 2, having positive impacts on special-status species and EFH.

11.2.7 Summary of Proposed Mitigation Measures

Table 11.2-6 summarizes the proposed mitigation measures for all alternatives.

Table 11.2-6. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Marine Biological Resources		
• DoN would prepare an MBP with the overall goal to identify terrestrial and marine biosecurity risks associated with Marine Corps relocation and training activities on Guam and the CNMI posed by transportation and commerce to and within Micronesia and Hawaii, and to document prevention, control and treatment measures that can be incorporated by civilian and military operations. Volume 7 includes a more detailed description of the MBP.	• Same	• Same

CHAPTER 12. CULTURAL RESOURCES

12.1 AFFECTED ENVIRONMENT

12.1.1 Definition of Resource

Cultural resources are defined as any district, site, building, structure, or object considered to be important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. Cultural resources include pre-Contact (before European Contact) and post-Contact archaeological resources, architectural resources, and traditional cultural properties. The cultural resources discussed in this chapter include those that meet the specific criteria of the National Historic Preservation Act (NHPA) and its associated regulations. However other cultural resources such as plants, animals, or geological materials may be important to a culture, but are not eligible under the NHPA. Impacts to these resources are discussed as impacts under NEPA. Information on traditionally used plants and animals is presented in Volume 9, Appendix G.

Pre-Contact and post-Contact archaeological resources are area locations (sites) where human activity measurably altered the earth or left deposits of physical remains. Archaeological resources can be identified and evaluated for significance according to each site's cultural importance, integrity, and ability to yield information. Architectural resources are standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance. Traditional cultural properties are resources associated 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. In general, specific locations of archaeological sites are not revealed to the public because of the concern of vandalism. Therefore, figures with specific locations of archaeological sites are not presented in this chapter. However, figures with commonly known sites are presented in Chapter 9, Recreational Resources.

12.1.1.1 Regulatory Review

Archaeological and architectural resources determined to be significant under cultural resource legislation such as the NHPA and the Archaeological Resources Protection Act are subject to protection or consideration by a federal agency. Other laws and Executive Orders (E.O.) may apply, such as the Abandoned Shipwreck Act of 1987; Historic Sites Act of 1935; Archeological and Historic Preservation Act of 1974; Abandoned Shipwreck Act of 1987; E.O. No. 11593 Protection and Enhancement of the Cultural Environment (1971); and E.O. No. 13287 Preserve America (2003). Additional regulations include Curation of Federally-Owned and Administered Archeological Collections (36 CFR 79), Preservation of American Antiquities (43 CFR 3), and National Historic Landmarks Program (36 CFR 65).

For the purposes of the NHPA, significant cultural resources, or historic properties, are those that are listed or eligible for listing on the National Register of Historic Places (NRHP). The criteria for significance are contained in Federal Regulation 36 Code of Federal Regulations (CFR) 60.4 and include:

A. are associated with events that have made a significant contribution to the broad pattern of history, or
B. are associated with the lives of persons significant in the past, or

C. embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value or represent a significant and distinguishable entity whose components may lack individual distinction, or
D. has yielded, or may be likely to yield information important in prehistory or history.

According to National Register Bulletin 15, How to Apply the National Register Criteria for Evaluation (National Park Service [NPS] 2002), a cultural resource must meet at least one of the NRHP significance criteria (A, B, C, or D) and must also retain integrity in order to be listed on or determined eligible for listing on the NRHP.

Determinations of eligibility can be made either by submitting appropriate documentation to the Keeper of the National Register of Historic Places or through consensus between the federal agency and the Historic Preservation Officer (HPO). That consensus can be informed by input from other stakeholders. Section 106 of the NHPA requires federal agencies to consider the effects of their actions on NRHP-listed or eligible cultural properties. The implementing regulations for Section 106 (36 CFR§800) specify a consultation process to assist in satisfying this requirement, while Section 110 of the NHPA includes responsibilities for stewardship. This approach is in accordance with the Secretary of the Navy's Instruction 4000.35A, Department of Navy (DoN) Cultural Resources Program and Marine Corps Order (MCO) P5090.2A, Ch 2, Chapter 8, Cultural Resource Management.

National Historic Landmarks (NHL) are cultural resources of national historic importance and are automatically listed on the NRHP. Under the implementing regulations for Section 106 (36 CFR Part §800.10), special consideration to minimize harm to an NHL is required and both the Advisory Council for Historic Preservation and the Secretary of the Interior are consulted if any adverse effects would occur to such resources.

Historic properties usually must be at least 50 years old; however, certain structures at technical or scientific facilities associated with important periods such as the Cold War, the Space Age, or the Nuclear Age, may be considered to be eligible for listing on the NRHP. Guidelines for determining the significance of traditional cultural properties are contained in Bulletin 38: Guidelines for Evaluating and Documenting Traditional Cultural Properties (NPS 1998); however, in order to be considered a historic property under the NHPA, they must meet the criteria in 36 CFR 60.4.

Laws related to management and preservation of cultural resources in the Commonwealth of the Northern Mariana Islands (CNMI) include Public Law 3-39, the Commonwealth Historic Preservation Act of 1982 which promotes the preservation of the historic and cultural heritage of the Northern Mariana Islands and prohibits the removal of historic properties and artifacts from the Island; Public Law 3-33 that established a permit and penalty process for the excavation and removal of human remains; and Public Law 10-71 that amended the Commonwealth Historic Preservation Act of 1982 to increase the membership of the Review Board and increase the monetary penalty for violations of the Act. Federal agencies are required to comply with federal laws, which supersede local laws. NHPA requirements are met on all federal lands and lands managed by federal agencies; while the Archaeological Resource Protection Act only applies to federally owned lands. Procedures for reburial and reburial of human remains have been developed through consultation with the CNMI HPO and adopted as SOP in ICRMPs. Standard operating procedures for the discovery of human remains in the CNMI is included in Volume 9, Appendix G,.

Section 106 also provides guidelines for public involvement for federal undertakings. Meetings to solicit public input started in 2007. Several agency meetings were held in Guam and Saipan beginning in 2007 and continuing until 2009. These meetings were attended by the Guam SHPO, CNMI HPO, and representatives from the NPS. Ten public meeting were held in conjunction with this EIS. Public meetings were held in both Tinian and Saipan during the scoping process prior to the release of the EIS. Additional meetings were held after the Draft Environmental Impact Statement (EIS) was published (refer to Volume 9, Appendix G, Cultural Resources). Public and agency input from the early meetings helped shape the Area of Potential Effects and were conducted to identify and evaluate previously unknown historic properties. As part of the Section 106 consultation process for the proposed action, a Programmatic Agreement (PA) that outlines a streamlined process for consultation and procedures for future survey, evaluation, or mitigation for adverse effects, is being developed.

12.1.1.2 Research Methodology

The region of influence (ROI) for cultural resources includes areas subject to construction, training maneuvers, firing and nonfiring ranges, road improvements, and landing zones (LZs), among other activities. Because the EIS is also used for Section 106 consultation, this section uses the term, Area of Potential Effects (APE) as defined under the NHPA. The APE is "the geographic area or areas within which the undertaking (project) may directly or indirectly cause changes to the character or use of historic properties, if they exist" (36 CFR 800.16(d)). This would include areas affected by setting (visual or audible), ground disturbance, or public access. The APE was defined during the consultation process early in the planning stages of this EIS in consultation with the CNMI HPO. Maps of the APEs for projects on Tinian are included in Volume 9, Appendix G, and Chapter 4, Cultural Resources. The methodology for identifying historic properties within the APE was based on a combination of existing data and completion of additional studies. DoN assessed the adequacy of existing data (Tomonari-Tuggle et al. 2007) and conducted extensive archaeological and architectural surveys in Tinian (Athens 2009), Pagan, and Sarigan (Athens 2009). These surveys and studies included:

- Surveying almost 5,000 acres (ac) (2,023 hectares [ha]) on Tinian with subsurface excavations at Unai Chulu and Unai Dankulo
- Surveying over 5,000 ac (2,023 ha) on Pagan
- Surveying the proposed IBB relocation area on Saipan (20 ac [8 ha])
- Updating all site forms and probability maps
- Conducting oral history studies for World War II (WWII) survivors on Tinian and Pagan
- Conducting interviews for traditional cultural property studies for Tinian and Pagan
- Preparing a Cultural Landscape Report for the NHL North Field on Tinian

Three types of data on traditional cultural properties on Tinian have been collected to identify traditional cultural properties in the study areas:

- Legendary association – myths, legends, or stories from the written record.
- Archaeological association – sites or other resources documented by archaeological investigations such as surveys, testing or excavations, or mitigation.
- Ethnographic association – information from the oral histories, as well as contemporary accounts from readily accessible sources, and current inventories of resources (marine or terrestrial) deemed important to traditional practices (Griffin et al. 2009a, b, c).

Additional information was provided by the Regional Integrated Cultural Resources Management Plan (ICRMP) for Commander of the Navy Region (COMNAV) Marianas Lands (Tomonari-Tuggle et al. 2005), a synthesis of Tinian during both pre-Contact and post-Contact periods (Welch and Tuggle 2008), and numerous survey reports.

12.1.1.3 Historical Overview

The Marianas oldest archaeological sites are from the Chamorro period of occupation, prior to western contact in 1521. On Tinian, few archaeological and architectural resources show evidence of the area's status as a colony of Spain and Germany, while numerous structures and relics attest to the island's role in WWII. Other areas on the island are important to people because of their historical and traditional use, both to the Chamorro and to former American, Japanese, Korean, and Okinawan residents. The following discussions provide a synopsis of the type of investigations undertaken in each area, the type and number of historic properties, and the potential for finding additional historic properties in the APE.

Pre-Contact in the Mariana Archipelago

At the time of western contact, the Mariana Islands were inhabited by a group of people that came to be known to the rest of the world as the Chamorro. Western Contact in this area is considered to be 1521, the year that Ferdinand Magellan landed on Guam after a 99-day voyage across the Pacific. The inhabitants of all of the Mariana Islands shared similar customs, technology, and artifact styles. They spoke a non-Oceanic Austronesian language with dialect differences between islands (Levesque 1995, as cited in Tomonari-Tuggle et al. 2007).

Chamorro is one of only two non-Oceanic languages within the Austronesian family in remote Oceania (the other is Palauan). Examination of Chamorro syntax, phonology, and lexicon, when compared with other Austronesian languages and discounting post-European contact influences, indicates divergence from a distant Austronesian ancestry prior to the development of more than 450 related Oceanic Austronesian languages in Melanesia, Micronesia, and Polynesia (Carson and Tuggle 2007). Linguistic evidence favors the central or northern Philippines as the most likely origin of populations initially settling the Mariana Islands.

Initial Settlement

According to archaeological data, the main Mariana Islands were settled by 1500 B.C. (Before Christ). However, some paleo-environmental and archaeological evidence suggests settlement of Saipan by as much as 300 to 900 years earlier. Two early dates, of 3470 B.P. (Before Present) and 3120 B.P., come from secure proveniences in two excavation units at the Achugao site at the Nansay Resort on the northwest coast of Saipan. These radiocarbon dates are associated with Marianas Red pottery. Similar types of pottery, associated with a charcoal date of 3210 B.P. were recovered at Chalan Piao on Saipan's southwest coast.

On the island of Tinian at Unai Chulu, 13 radiocarbon dates come from charcoal samples associated with Marianas Red pottery and incised sherds (Craib 1993, as cited in Tomonari-Tuggle et al. 2007), Jimenez et al. 1996, as cited in Tomonari-Tuggle et al. 2007). Collected from the earliest stratum, they confirm occupation of the area between 3,400 and 2,900 years ago. Sediment coring at Lake Hagoi, located 0.6 mile (mi) (1 kilometer [km]) inland from Unai Chulu, produced evidence clearly supporting the 3,400 year old date for early settlement of Tinian (Athens and Ward 1998). At an interval dated to approximately 3,500 years ago, the sediment core extracted from Lake Hagoi contained traces of charcoal and pollen from *Cocos nucifera*, which is interpreted as the earliest botanical evidence of human colonization.

Early Settlement: Pre-Latte Period

This period dates from the time of initial settlement to 1000 A.D. Moore (2002) subdivides the Pre-Latte Period into four phases based on pottery styles: Early Unai, Middle Unai, Late Unai, and Huyong.

Archaeological sites dating to the Pre-Latte Period is limited to several coastal and few inland sites. Early Mariana Islands sites are usually in coastal calcareous sand deposits and typically contain small numbers of pottery sherds associated with midden remains. The midden remains consist mainly of bivalve shells. Site integrity is frequently poor as a result of both natural shoreline processes reworking of the deposits and later human activities.

Due to poor site integrity, settlement pattern is difficult to ascertain. The basic settlement pattern appears to have been one of small population groups living along the sandy coasts, especially near coastal lagoons with easy access to marine resources (Graves and Moore 1985, in Tomonari-Tuggle et al. 2007). Caves and rock overhangs were used for shelter. Considering the great quantity of shellfish and reef fish remains found in coastal sites, it appears that subsistence practices for this early period focused on ocean resources, with an emphasis on exploitation of the shallow water, fringing reef, and lagoon areas. People used a mixture of hunting, fishing and collecting activities (Reinman 1977, Kurashina and Clayshulte 1983, Hunter-Anderson 1989, Burtchard 1991, as cited in Tomonari-Tuggle et al. 2007).

Sites from early in this period, also known as the Early Unai Phase, include Unai Chulu on Tinian and the Achuagao and San Roque sites on Saipan. Excavations at the Unai Chulu site on Tinian have yielded the most substantial body of data for interpreting the Early Unai Phase. The excavations have produced evidence of an intensive occupation, including postholes and hearths with substantial amounts of habitation debris indicating cooking, food storage, and tool manufacturing. The food debris includes marine shell, fish bone, bird bone, and charred plant remains. As is true of most early settlements on Pacific Islands, exploitation of birds was particularly important. The site also produced flaked and ground stone items, and implements and ornaments of bone and shell. Fishing gear includes 87 shell fishhook tabs and one fishhook, with nearly 3,000 fish bones providing evidence of the results of the fishing activities (Haun et al. 1999, as cited in Tomonari-Tuggle et al. 2005).

Sites from the next period, the Middle Unai Phase, include Mochong on Rota, Laulau on Saipan, and Taga on Tinian. As in the Early Unai Phase, remains of settlement are mainly evidenced by midden scatters, hearths, and occasional postholes, primarily in coastal caves and rock shelters. The most common Middle Unai sites are subsurface cultural deposits along the coastlines but a few inland sites have also been located.

The Late Unai Phase is characterized by the presence of large thick-walled shallow pan-like ceramic vessels. Late Unai sites occur throughout coastal and inland areas of Guam, Rota, Tinian, and Saipan and include both surface and subsurface scatters of artifacts and midden in diverse settings. The Huyong Phase exhibits a continuation of large flat-bottomed pans but they decline in frequency as pots with rounded bases and slightly incurved rims become more common. Surface and subsurface scatters of pottery and midden have been reported in both coastal and inland settings of Guam, Rota, Tinian, and Saipan.

Latte Period

The Latte Period is distinguished from earlier periods by the presence of latte stone structures. The earliest latte structures date to 1000 A.D. and are accompanied by a change in pottery technology. During this period populations increased and settlements expanded into areas outside of the optimal coastal environments. Latte Period sites are more abundant than Pre-Latte sites on all of the Mariana Islands.

Latte are large upright pillars of limestone or more infrequently basalt each topped by a semi-hemispherical capstone. These pillars were placed in two parallel rows of even numbered uprights forming a single set. *Latte*s served as foundations for house and storage structures of varying size.

Variation in the number and size of *latte* probably reflect differentiation in function, family size, and perhaps the status of the occupants. Burials are commonly associated with *latte* sets. Individuals were buried beneath the structure with the area demarcated by the pillars or adjacent to the structure. Residential material is also commonly found in excavation of *latte* sites.

Latte sites generally consist of clusters of up to 18 (although the Mochong site of Rota has at least 47 documented structures) individual structures forming hamlets or villages. They are most commonly found along the shorelines of all the major Mariana Islands. Marine resources, such as fish and shellfish provided the primary source of protein during this period. Shell middens contain gastropods or at earlier sites, bivalves. The difference in type of shell found in middens appears to relate to relative changes in sea levels that caused a reduction in mangrove forests supporting bivalve habitat. Other resources exploited include bird, fruit bats, lizards, turtles, and land snails.

<u>Post-Contact Period</u>

European Contact

Latte sets continued to be built into the contact period (the period between Magellan's landing and full Spanish colonization). Spanish-introduced materials are found at sites dating to this period including iron, fragments of glass, bones of cattle, pig, sheep and deer, and remains of maize.

Breadfruit, yams, and taro were the staple crops during this time period. Bananas and sugarcane were also important. Rice was also part of the diet. Fishing, gardening and collecting were all important sources of food.

Spanish Period (1668-1899)

In 1668 Catholic missionary activity was initiated on the northern Marianas. Opposition soon arose to the missionaries, which led to open revolt against the priests and Spanish troops. Sporadic conflicts continued until 1694, when, as a last measure, the inhabitants of all the islands were transported to either Saipan or Guam. Those who were initially moved to Saipan were moved to Guam in 1698. Tinian probably was depopulated by 1700. Only Rota maintained a small resident population throughout the period of *reduccion*.

The original Chamorro population in the Mariana Islands was estimated to be between 40,000 and 73,000. However, after two centuries of Spanish rule, including war, famine, and disease, that number was reduced to 600 in 1825 (Bowers 1950).

Tinian, once depopulated, was never again reoccupied by the Chamorro culture until after WWII. The Spanish used the island as a game preserve and sent regular expeditions there to hunt the feral pigs and cattle that ran wild after removal of the Chamorro population. In 1865, an Irishman leased Tinian and brought in 250 Carolinians from other Pacific Islands to hunt the cattle and pigs, collect trepans, also known as sea cucumbers which were highly prized in China, and raise fruits and vegetables for trade with Guam. The project was abandoned in 1878. This project had so depleted wild livestock on Tinian that hunting was prohibited for seven years. Then a group of 30 Chamorros were settled on the island to hunt the animals and to prepare the meat for shipment. Other Chamorros joined the group and a small village known as Taga developed near the harbor. The population at the end of the Spanish period was 95, of that 59 were Carolinians (Bowers 1950).

The Northern Marianas in the 20th Century

Spain lost all its colonies in the Pacific at the conclusion of the Spanish-American War in 1899. The Mariana Islands, with the exception of Guam, were sold to Germany. The Germans saw the islands as an opportunity to pursue aggressive economic and commercial endeavors they had already begun in the Marshall Islands and subsequently, Palau.

Germany's primary interest in the Mariana Islands was the development of a cash based agricultural economy based on copra production. Coconut trees were planted on Saipan as well as the smaller islands. In 1905 two typhoons devastated the young coconut plantations. The Germans were convinced that their economic gamble had failed (Jones and Tomonari-Tuggle 1994, as cited in Tomonari-Tuggle et al. 2007). German authority over the islands was brief, ending in 1914.

A Japanese naval squadron seized control of Saipan in 1914, along with other German possessions in Micronesia. Saipan was placed under military jurisdiction and German nationals were expelled. The League of Nations awarded Micronesia to Japan in 1921 with the stipulation that it not be fortified for military use.

The Japanese developed large-scale sugarcane production for trade on Saipan in 1922. Large tracts of lands were leased by the company and sublet to tenant farmers, most of whom were colonists from Japan, Okinawa, and Korea. Plantations were also developed on Tinian, Rota, and Aguijan. The pattern of Japanese occupation was best developed on Tinian. The island was divided into rectangular plots, 14.7 ac (6 ha) each that were leased by tenant farmers. The farm homes, constructed of wood and thatch or sheet metal, were destroyed during WWII but even today the ruins of cement cisterns and barns remain to mark the farm sites (Bowers 1950). Sugar cane fields occupied 68% of the arable land on Saipan, 80% on Tinian, and 33% on Rota. In 1944 the civilian population of Tinian was 17,900 with only 26 of those being Chamorro; most of the population was Japanese, Okinawan, or Korean.

Japanese war preparation brought further changes to Saipan, Tinian, and Rota. On Saipan, the sugar cane fields near Asurito were developed into an airfield, and two other airfields were quickly built at Marpi Point and on the coastal lowland between Chalan Konoa and Garapan. Two airfields were built on Tinian, and a third started. Around these fields, barracks and administrative buildings were built. Natives and imported labor were forced to work on Japanese military construction projects. The influx of Japanese troops brought housing pressures to the Northern Marianas. Native schools were closed and used to house Japanese troops.

WWII battles devastated large areas of Saipan and Tinian. In 1944, air strikes destroyed 150 Japanese planes in the battle for Saipan. From Saipan, U.S. forces began a bombardment of Tinian that ended with an invasion in July of 1944. Shortly thereafter, the construction of the Tinian airfields for the B-29 and supporting units began, one of the most intensive efforts in WWII. Tinian then served as a crucial locale for the bombing of Japan, culminating with the dropping of the A-bombs from planes based on Tinian that effectively ended the war. Figure 12.1-1 shows the Enola Gay during WWII.

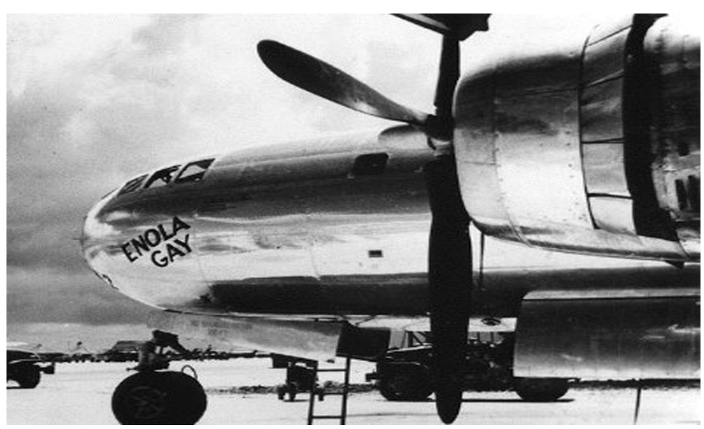

Figure 12.1-1. The Enola Gay at North Field, Tinian
Source: Mathewson 2000 (cited in Welch and Tuggle 2008).

After WWII, the U.S. continued administration of the Northern Marianas under a mandate of the United Nations. When the Japanese nationals were removed in January and February of 1946, Tinian, Saipan, and Rota were all occupied by American military personnel. Intensive military construction took place on all three islands.

Several villages have been resettled or established in the Northern Marianas since WWII; one on Tinian, five on Saipan, and one on Rota; two smaller settlements were attempted on Alamagan, and one on Agrihan. San Jose, Tinian, was resettled in 1947 by Chamorro immigrants from Yap Island, who first occupied the former Chulu camp used for Japanese prisoners. Tinian's population in 1949 was only 354, after swelling to almost 150,000 American troops during the war. Songsong, Rota, had a continuous native population for three centuries, but the community was destroyed by WWII. However, native inhabitants were eager to rebuild on the traditional site after the war and in 1950 it supported a population of about 680. In 1976, the Marianas signed an agreement with the U.S. and became the CNMI.

12.1.2 Tinian

Traditional resources such as plant species used by native populations include Ifit trees (*Intsia bijuga*) are used for timber, fuel wood, and craft wood. Dukduk (*Artocarpus mariannensis*) and da'ok (*Calophyllum inophyllum*) are used for canoe building, and breadfruit is highly prized. Historically introduced chili peppers are also harvested locally, as are native yams.

The Military Lease Area (MLA) on the island of Tinian is divided in two sections, the Exclusive Military Use Area (EMUA) in the north and the Lease Back Area (LBA) in the central part of Tinian. Five limestone terraces that formed on an eroded Eocene volcanic base rise in steps from the coastline to maximum height of 554 feet (ft) (169 meters [m]) above mean sea level. The terraces form level to undulating plains bounded by steep cliffs that occur along fault lines. Sink holes and caves occur in the limestone where it is exposed (refer to Chapter 3 for a discussion on geology and soils).

The key feature is North Field, a large abandoned WWII-era airfield and NHL that is still usable as a contingency landing field. The EMUA has two small sandy beaches: Unai Chulu on the northwest coast and Unai Dankulo, also known as Long Beach, on the east coast.

Tinian's cultural resources include pre-Contact Chamorro sites and many WWII-era sites and artifacts associated with the island's development by the Japanese and subsequent U.S. invasion and development. The House of Taga (Figure 12.1-2), with the largest erected *latte* stones in the Marianas, is in a park setting near Tinian Harbor. A large pre-*latte* complex is adjacent to Unai Chulu; other *latte* habitation sites with surface and subsurface deposits are found near Unai Babui, Unai Dankulo, and Tachogna Beach.

Figure 12.1-2. House of Taga *latte* set
Source: Welch and Tuggle 2008.

The following discussions detail the level of archaeological inventories in each area, the type and number of sites and structures eligible for inclusion on the NRHP, and the potential for finding NRHP-listed or NRHP eligible cultural resources in the impact areas.

12.1.2.1 North

MLA

Thirty-seven cultural resource investigations have been conducted on the MLA on Tinian and include overviews and assessments, Phase I surveys, testing, and excavations, and an architectural survey of WWII resources (Welch and Tuggle 2008). The systematic recording of archaeological remains on Tinian began in 1980. Since that time, archaeological surveys of varying intensities have covered the entire MLA, which represents approximately 62% of the island. Over 16,000 ac (6,475 ha) of the MLA have been surveyed at a high intensity, by systematic ground surveys with detailed site recording. Testing and/or intensive excavation have been part of six major studies. Extensive research in numerous archives in the U.S., Japan, and Micronesia, including reference to collections of historical maps and photographs, has supplemented the fieldwork. In addition, sites within the proposed locations of the training areas were resurveyed in 2008. Sites were re-recorded and excavations were conducted at Unai Chulu and Unai Dankulo (Athens 2009). A summary of surveys to date can be found in Table 12.1-1.

The first survey on Tinian Island was conducted between 1980 and 1984 by Denfeld. Subsequently, American Resources Group, Ltd. inventoried several relatively undisturbed parcels including areas landward of Unai Chulu and Babui on the west coast and Unai Dankulo and Masalok on the east coast (Moore et al. 1986). Additional site reviews and field data were collected in a number of historic preservation compliance studies including: Welch (1994), Welch and Tuggle (1998), Tuggle and Welch (1999), and Tuggle and Schilz (1999).

Table 12.1-1. Archaeological Surveys on Tinian within the MLA

Date of Work	*Reference*	*Type of Work*	*Location*
1980-84	Denfeld 1983**	Survey, historic overview	North Field
1982	Pangelinan 1982***	Survey	North Field
1984	Thompson 1984	Survey, NRHP nomination	North Field
1985	Jones 1991**	Historical architecture survey	MLA
1984-5	Moore et al. 1986	High intensity survey, with intensive testing	All beaches
1986	Donham 1986*	Survey, site recording	North end of North Field
1988	Haun 1988	Survey, site recording	North end of North Field
1989	Haun 1989*	Site recording	North end of North Field
1989	Haun and Donham 1989a*	Site recording	North end of North Field
1989	Haun and Donham 1989b*	Site recording	North end of North Field
1990	Haun et al. 1990	Survey, site recording	North end of North Field
1990-1	Dilli and Haun 1991*	Archival compilation	North Field
1992	Craib 1995	Low intensity survey	Unai Chiget, roadways
1994	Welch 1994**	Survey	Unai Chulu, Unai Dankulo
1994	Franklin and Haun 1995a**	Survey	Unai Dankulo
1994	Franklin and Haun 1995b*	Data recovery	Road corridor (8th Ave.)
1994	Craib 1999**	Low intensity survey (sample survey with sketch mapping); limited testing	Unai Dankulo
1994	Bouthilier 1999*	Historic architecture survey	Unai Chiget, Unai, Chulu, Unai, Babui, Unai, Dankulo, Unai, Masalok

Date of Work	Reference	Type of Work	Location
1994-5	Haun et al. 1999*	High intensity survey; intensive testing	Unai Chiget, Unai, Chulu, Unai, Babui, Unai, Lamlam
1994	Henry and Haun 1995**	Testing	Unai Chulu
1995	Bouthillier 1998	Recording historic period sites	EMUA
1995	Putzi et al. 1997*	High intensity survey	IBB
1996	Welch and Tuggle 1998	Site specific assessment	Tinian MLA
1994-96	Tuggle and Welch 1999	Site protection plan, selected site mapping	Tinian MLA
1997	Moore et al. 2002*	High intensity survey, limited testing	IBB
1997-98	Tuggle and Schilz 1999	Cultural Resources Management Plan	Tinian MLA
1998-99	Dixon et al. 2000*	Survey	IBB
1999	Dixon and Welch 2002*	High intensity survey	Tinian Int'l Airport
1999-2000	Allen et al. 2000* Allen and Nees 2001** Allen et al. 2002**	High intensity survey; testing and/or data recovery	Unai Masalok, Unai, Dankulo
1999-2000	Gosser et al. 2001** Gosser et al. 2002	High intensity survey; testing and/or data recovery	LBA
2000	Denfeld 2000*	WWII camps	Tinian MLA
2008	Athens 2009	High intensity survey, testing	Tinian MLA
2008	Griffin et al. 2009	Traditional Cultural Properties	Tinian MLA
2009	EDAW and AECOM 2010	Cultural Landscape Report	North Field NHL

Legend: IBB= International Broadcasting Bureau
Notes: *as cited in Tomonari-Tuggle et al. 2005
**As cited in Tomonari-Tuggle et al. 2007
***As cited in Welch and Tuggle 2008

Figure 12.1-3. Tinian, North Field 1945

The North Field NHL (Figure 12.1-3) is also located on the northwest portion of Tinian. It was designated as a National Historic Landmark by the NPS in 1987. The area has a B-29 airbase with four runways and includes the sites used to assemble and load the two atomic bombs used to end the war. The two bomb loading pits, many former Japanese military structures, coastal gun emplacements, and unit memorial plaques are some of the features in the Landmark District. The atomic bombs being developed at Los Alamos, especially *Fat Boy*, were too large and did not fit beneath the plane and had to be conventionally loaded into the B-29s. Experiments at Wendover Field, Utah explored different ways of loading the bombs, including tipping the plane on its side. The scientists and military advisors realized that a better method would be to lift the bomb into the bay of the plane, resulting in a "bomb-loading" pit that was designed and constructed at Wendover during the test program. Two similar pits were later constructed on Tinian. The pits were 10-ft (3-m) wide, 8-ft (5-m) deep and concrete lined with a hydraulic lift installed in the center of the bottom.

Tuggle (Athens 2009) defined a total of 160 NRHP-eligible site complexes in the MLA. Tuggle's site complexes are based largely on historic features rather than pre-Contact artifact distributions. Thus, many of the historic site complexes defined below have a pre-Contact component. Thirty-nine of Tuggle's (Athens 2009) site complexes are Japanese agricultural features (sometimes with associated structures).

Forty-six of Tuggle's site complexes are associated with U.S. Military activities, including North Field. Seventeen of the site complexes defined by Tuggle are associated with Japanese military activities (mostly Japanese defensive structures). Thirteen site complexes are associated with a railroad berm. Twelve sites are pre-Contact sites, some of which have *latte* stones. Eleven of the sites are roadways.

Other site types include a quarry/dump, a butchering facility, a sugarcane factory, a shrine, quarries, cemeteries, villages, and a well.

Prior to Tuggle's (Athens 2009) survey, a total of 310 NRHP-eligible sites were defined in the MLA. Eighty-four of these sites are Japanese agricultural features (sometimes with associated structures). Fifty-two of these sites are associated with U.S. Military activities. Seventy-one of these sites are associated with Japanese military activities (mostly Japanese defensive structures). Five sites are associated with a railroad berm. Fifty-nine sites are pre-Contact sites; some have *latte* stones. Five of the sites are roadways. Other site types include cisterns, artifact scatters, shrines, dumps, airplane wrecks, land boundary markers, and refuse pits/scatters.

Cultural resources in the LBA were identified in a series of surveys and motivated the DoN to implement various measures, such as a Memorandum of Agreement signed in 1994 prior to a large training exercise. To supplement these agreements, the DoN also developed an interpretive program and trail for north Tinian. The purpose was to inform the public of Tinian's cultural and natural resources and to instill an ethic that emphasizes preservation and protection.

Surveys on Tinian for the EIS were completed in 2008 (Athens 2009). Over 150 of previously known archaeological sites were re-recorded during the survey. Excavations were also conducted at Unai Chulu and Unai Dankulo.

An offshore survey was conducted near Unai Dankulo and Unai Chulu in 2008. No underwater resources were encountered during the survey at Unai Dankulo, but eight anomalies suggestive of cultural resources were encountered near Unai Chulu (Burns 2008). These anomalies are considered significant as Chulu was the primary U.S. invasion beach during WWII.

A traditional cultural property study was conducted on Tinian in 2008 (Griffin et al. 2008). The study identified 13 traditional cultural properties: Puntan Tahgong, Lamlam, Babui, Chulu, Sabanetan Famalaoan, Lasso Shrine, 86th Street Shrine, Chiget, Asahi Shrine, NKK Shrine, Dankulo, a petroglyph site, and Masalok.

In 2010, EDAW and AECOM documented and completed the resource assessment of North Field NHL for a Cultural Landscape Report. The purpose of the Cultural Landscape Report was to identify character-defining features of North Field and to provide a treatment plan for management of the cultural landscape.

IBB Facility

The IBB Facility is located on the western coast of Tinian between the EMUA and the LBA. The IBB is a part of the international broadcasting service of the U.S. Information Agency. The IBB provides radio and television broadcasts on news events and entertaining programming on the arts, business, science, government, medicine, and current affairs to a vast audience of citizens of other countries. Construction of the Mariana Relay Station started in 1997. According to a progress report prepared after construction of the complex began, construction of the facilities was scheduled to be completed in 1998 and scheduled broadcasting would begin in 1999.

Figure 12.1-4. Antenna Array of Mariana Relay Station
Source: Thursby 2008.

The IBB Mariana Relay Station consists of an antenna array and operations area (Figure 12.1-4). The antenna array includes eight pairs of high frequency curtain antenna. Each antenna comprises two vertical steel towers between 150 and 400 ft (122 m) tall. A curtain of horizontal and vertical cables is hung between the towers , which are also between 150 to 400 ft (46 to 122 m) apart (U.S. Army Corps of Engineers [USACE] 1995). The operations area includes a transmitter and administration building, maintenance and storage building, power plant, fuel storage tanks, and a security gatehouse. The buildings are one-story with concrete slab foundations, steel siding, and shallow-pitched roofs. Given its recent age and lack of exceptional significance the IBB Mariana Relay Station on Tinian is not eligible for inclusion in the NRHP (Thursby 2008).

Initial archaeological surveys of three alternative IBB station sites (Areas A, B, and C) in the MLA were conducted in 1995 and consisted of only small surveys within each area (Eblé et al. 1997). The portion of Area A was selected as the location of the relay station and subsequently received more intensive surveying in 1995, followed by additional survey and data recovery activities in 1997 (Moore et al. 2002, as cited in Tomonari-Tuggle et al. 2005) and in 1999 (Dixon et al. 2000, as cited in Tomonari-Tuggle et al. 2005). Approximately 60% of the IBB parcel has been surveyed (Welch and Tuggle 2008). Because of access restrictions, additional archaeological survey of the facility was not possible.

Nineteen historic properties have been documented in the IBB site. They include *latte* sites, WWII U.S. military and Japanese fortifications, and Japanese Colonial Period farms.

12.1.2.2 South

The southern portion of Tinian is outside of the MLA and has therefore seen fewer studies. Resources recorded in south Tinian include the House of Taga *latte* site and the Carolinas Rock Shelter.

An architectural survey and archival study was also conducted of Tinian Harbor. Tinian Harbor is more than one-half of a mile long and nearly one-fourth of a mile wide. It consists of a shallow inner basin and a 28-ft (8.5-m) deep outer basin, both were formed between the shore and a breakwater that protects the harbor. The 3,595-ft (1,096-m) long cellular, sheet-pile breakwater was built on top of a fringe reef. An unreinforced concrete slab covered the top of the cells that have limestone coral fill. A 1,210-ft (369-m) long single row of sheet piling extends from the northwest end of the cellular breakwater to the shore, enclosing the inner harbor.

After the capture of Tinian from the Japanese in early August 1944, the U.S. forces developed nearly the entire island into a base for the very long range aircraft, the B-29 Superfortress. Tinian; however, lacked a suitable harbor to handle cargo ships for offloading the men, equipment, and materials. Between November 1944 and March 1945, the 50th Naval Construction Battalion (Seabees) and the 301st Battalion built Tinian Harbor with permanent anchorages to accommodate berths for eight cargo ships.

Figure 12.1-5. Tinian Harbor, East Quay, Looking Southwest

Tinian Harbor is eligible for inclusion on the NRHP (Figure 12.1-5). The harbor is eligible under Criterion A for its vital role in the development of the B-29 air base on Tinian for the atomic bombing mission near the end of WWII, and Criterion C for embodying the design and construction methods of the Navy Seabees during WWII (Thursby 2008). As a whole, the harbor structures retain their integrity, although major portions of several of the individual structures are in poor condition and some material integrity has been degraded.

12.2 ENVIRONMENTAL CONSEQUENCES

12.2.1 Approach to Analysis

12.2.1.1 Methodology

The methodology for identifying, evaluating, and mitigating impacts to cultural resources has been established through federal laws and regulations including the NHPA and the Archaeological Resource Protection Act.

Under the NHPA, a historic property is a site, district, structure, object, or landscape that is either listed on or eligible for listing on the NRHP. A project is considered to affect an historic property if it alters the property's integrity or the characteristics that make the property eligible for inclusion on the NRHP. Adverse effects may include the following: physical destruction, damage, or alteration of all or part of the resources; alteration of the character of the surrounding environment that contributes to the resource's qualifications for the NRHP; introduction of visual, audible, or atmospheric elements that are out of character with the resource; neglect of the resource resulting in its deterioration or destruction; and transfer, lease, or sale of the property without adequate and legally enforceable restrictions or conditions to ensure long term preservation of the property's historic significance (36 CFR §800.5(a)(2)).

Analysis of potential impacts to historic properties considers both direct and indirect impacts. Direct impacts are those that may occur from the project, such as the destruction of the property" (NPS 1997:1. Indirect impacts "may be visual, audible, or atmospheric changes which effect the setting of the property" (NPS 1997:1). Cumulative impacts on historic properties under NEPA result from the incremental impact of the action when added to other past, present, and future actions. Cumulative impacts are discussed in Volume 7.

Vandalism is considered to be a significant impact because it damages the integrity of the site, which is the major determinant of NRHP-eligibility. Physical evidence left in historic properties is finite and cannot renew itself once it has been disturbed. For this reason, federal activities that open areas up to the public or that involve personnel traveling through an area may have an adverse impact, especially if vandalism to historic properties in the vicinity occurs. Determination of Significance under NEPA

For cultural resources, significance of impacts is assessed in terms of whether the proposed action would have an adverse effect on a historic property, as defined in 36 CFR 800. An adverse effect is one that alters or destroys the characteristics of the historic property or its integrity that make the property eligible for listing on the NRHP.

The ICRMP for DoN property on Tinian has established Standard Operating Procedures (SOPs) for protecting known historic properties; procedures for managing the inadvertent discovery of archaeological resources, inadvertent discovery of human remains, inadvertent disturbance to historic properties; and for distributing permits for archaeological investigations (Tomonari-Tuggle et al. 2005). These protective measures would continue to be implemented under any of the alternatives. Lands managed by the Marine Corps would comply with all cultural resources requirements in accordance with MCO P5090.2A, Ch. 2, Chapter 8: Cultural Resource Management on both federal and leased lands.

Agreements on limitations in training have also been made as part of the Mariana Islands Training Range Complex (MIRC) EIS/Overseas Environmental Impact Statement (OEIS) Programmatic Agreement (PA) (Navy 2009). The PA for the undertaking outlined in the MIRC EIS/OEIS (Navy 2009) contains the following provisions.

- Establishes the qualifications necessary for professionals performing the work
- Developed training constraint maps that show the locations of off limits or No Training areas and Limited Training areas
  - No Training areas are to be avoided, and no training exercises would occur within these areas
  - Limited Training areas are primarily designated as pedestrian traffic areas with vehicular access limited to designated roadways and/or the use of rubber tired vehicles
- Establishes the procedures for updating and disseminating training constraint maps and identifies quarterly site checks and reporting
- Identifies the procedures for the protection of resources and monitoring of military activities at Unai Chulu, Unai Dankulo, and Unai Masalok
- Identifies the procedures for activities associated with the Tinian (North Field) NHL
  - ongoing survey and evaluation to assess cumulative effects of training to the NHL
  - production of an annual report to the HPO and NPS

Training constraints on Tinian are included on Figure 12.2-1.

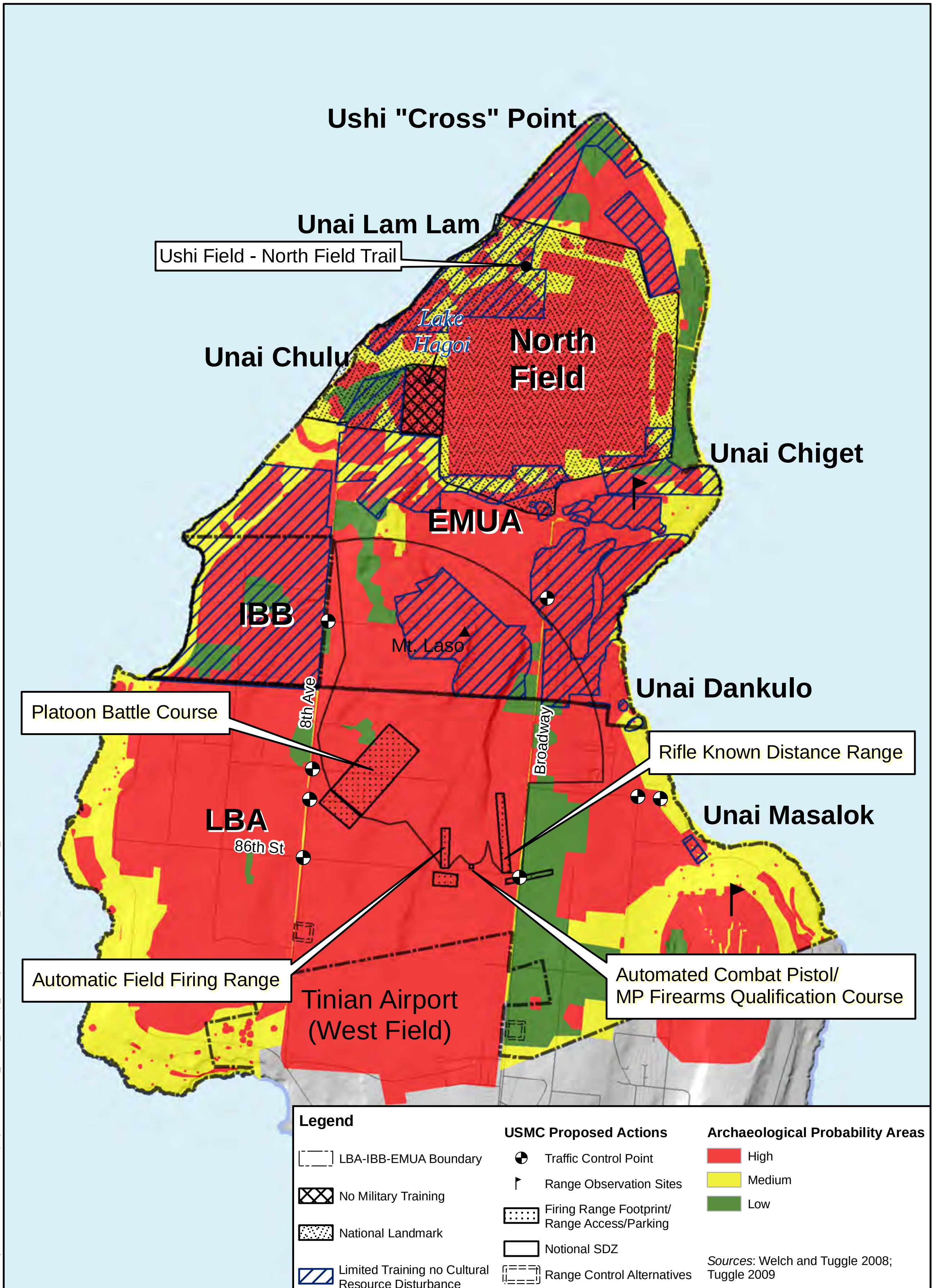

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Figure 12.2-1
Alternative 1 Proposed Ranges

As part of the Section 106 consultation process for this EIS, a PA for all military training activities, construction, and operations proposed under the proposed action that includes additional mitigation measures and procedures is being prepared. Current signatories to this PA are: the Department of Defense (DoD) (Joint Region Marianas; DoD Representative Guam, the CNMI, Federated States of Micronesia, and Republic of Palau; the Marine Corps; Navy; Army; Air Force), other federal agencies (Federal Highway Administration, Advisory Council for Historic Preservation, the NPS), and local government agencies (Guam SHPO, CNMI HPO). Stipulations in the PA include the following:

- DoD would ensure that the identification and evaluation of historic properties within the APE for the project is completed prior to the initiation of any part of the project with the potential to impact historic properties.
- For areas or properties that have not been inventoried for historic properties, the DoD would record surface sites and, when possible, areas would also be archaeologically sampled for subsurface sites when easily obtainable (i.e., without having to demolish existing facilities or infrastructure).
- Archaeological, architectural, and traditional cultural property maps have been generated for all current DoD land on the Island of Tinian.
- Any properties not evaluated shall be assessed for NRHP eligibility. These historic properties would be incorporated into existing (ICRMPs) as they are revised or updated or if a new ICRMP is developed in consultation with the appropriate HPOs.

In recognition of the significance that many historic properties within the APE has to various cultural groups, the DoD would afford access to historic properties to individuals and organizations that attach significance to these historic properties where security requirements are not prohibitive. The PA also provides stipulations for treatment in case of unexpected discoveries, the review process, and report requirements. The Cultural Landscape Report for the North Field NHL (AECOM 2010) contains additional long-term treatment procedures that would accommodate military training, public education and access, and preservation of the NHL.

12.2.1.2 Issues Identified During Public Scoping Process

The following analysis focuses on possible effects to cultural resources-archaeological, architectural, and traditional cultural properties that could be impacted by the proposal. As part of the analysis, concerns related to cultural resources that were mentioned by the public, including regulatory stakeholders, during the public scoping meetings were addressed. A general account of these comments including issues other than cultural resources are as follows:

- Access to cultural sites, natural resource collection areas, memorials, shrines, and locations where cultural ceremonies are held
- Construction impacts to cultural resources, tourism, and use of public roads
- Thorough and adequate data collection and curation/storage of artifacts
- Public participation in the planning process relating to cultural resources

12.2.2 Alternative 1 (Preferred Alternative)

Alternative 1 differs from the Alternatives 2 and 3 by dispersing the four firing ranges in the south-central MLA.

12.2.2.1 Tinian

Construction

The APE is not located within areas already designated as no training or limited training areas. All of the APE has been intensively surveyed for archaeological, architectural resources and traditional cultural properties (Griffin et al. 2009, Athens 2009, EDAW/AECOM 2010). A draft report of the archaeological survey was reviewed by the CNMI HPO in 2009. Concurrence on the results of the traditional cultural property study was received from the CNMI HPO on June 24, 2009. A Cultural Landscape Report for the North Field NHL was extensively reviewed by the CNMI HPO in 2009. Based on the results of these studies, ground excavation and soil removal associated with range construction have the potential to adversely impact historic properties in the project area, including site 5007 (Japanese fields, U.S. livestock reserves) (see Figure 12.2-1). The Rifle Known Distance (KD) Range project construction would also impact site 5022, TN0030 (U.S. West Field and remnant features in a small portion of the larger site), TN0619 (U.S. Fuel Farm remains), and TN0606 (Service Corps 87, 25).

The Automated Combat Pistol/Military Police (MP) Firearms Qualification Course project construction would impact site TN0606 (Service Corps 87, 25).

The Platoon Battle Course project construction would impact 178 ac (72 ha), including site TN0002 (former U.S. Camp Churo Cemetery), TN0034 (Japanese, Churo Village [Old Village]), 5007B (Japanese fields and structures), 5011 (Japanese railroad berm), 5009 (Japanese fields and structures), and 5012 (Japanese rockshelters).

The bivouac areas would impact site TN0030 (West Field) as Marines would be camping and using these areas for training purposes.

Operation

Operational activities (training and non-training related) associated with the Field Firing Range, the Rifle KD range, the Automated Combat Pistol/MP Firearms Qualification Course, and the Platoon Battle Course, including bivouac activities, would bring approximately 200 to 400 personnel into the area. While the addition of personnel may be seen as a conduit to site disturbance, disturbance to historic properties, whether inadvertent or intentional, of sites is an ongoing occurrence in the area even without military personnel present. However, the indirect disturbance to historic properties by increasing access to the sites is considered to be an adverse impact.

The Surface Danger Zones (SDZs) overlap limited training/No Cultural Resource Disturbance areas. Additionally, 55 sites and one traditional cultural property (Lasso Shrine) are located in the SDZs under Alternative 1. The sites include U.S. military sites, pre-Contact sites, shrines, Japanese fields and structures. Direct impacts within the SDZs are unlikely since few rounds (only 1 in 10,000) would fall outside of the range footprints. Any target rounds not captured in the range footprints due to deflection would not damage the site, because the distance of the round would reduce the velocity so much that it would not damage the artifacts or other remains. This area would not be cleaned up while the lease is in effect, and impacts due to munitions cleanup activities would not occur. Residents in the area may attempt to collect ammunition rounds within the SDZs and could damage historic properties in this area. However, a conservative estimate of projectiles and projectile fragments is not estimated to exceed 328 rounds annually (refer to Section 2.3.1.1) and impacts to historic properties would be negligible.

In addition, some military training exercises would result in temporary, short-term restriction of access in the range training area by civilians during activities in which public safety is a consideration. Limited access would occur along Broadway north of 86th Street and south of the Shinto Shrine American Memorial Circle on Broadway including all lands to the east, and east of 8th Avenue north of 86th Street and south of Mount Lasso. Access to traditional farms, or *lanchos*, would not be restricted. Access to North Field NHL and northern beaches via 8th Avenue would still be allowed during training activities. Training periods would be scheduled in advance with signs posted and published on a regular basis. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would safeguard the public by keeping them out of any areas where there are potential dangers while simultaneously maintaining access to areas where training is not being conducted. This would ensure access to the North Field NHL, northern beaches, and the IBB via 8th Avenue. Broadway would be closed during training. Therefore, access restrictions associated with Alternative 1 would be less than significant.

12.2.2.2 Summary of Alternative 1 Impacts

Alternative 1 would result in significant direct impacts to nine historic properties that archaeological sites and less than significant indirect impacts to 55 archaeological sitesone NHL, and one traditional cultural property. No historic properties that are architectural resources would be impacted by Alternative 1. Table 12.2-1 summarizes Alternative 1 impacts.

BMPs implemented to protect cultural resources include:

- For post review discoveries, an assessment would be made for NRHP eligibility in consultation with the Historic Preservation Office.

Table 12.2-1. Summary of Alternative 1 Specific Impacts

Area	*Impacts*	*Project Specific Impacts*
Tinian	Construction	Significant direct impacts to nine archaeological sites
	Operation	Less than significant indirect impacts to 55 archaeological sites, one NHL, and one traditional cultural property

12.2.2.3 Alternative 1 Potential Mitigation Measures

The significant impacts to the resources described above are mitigable to less than significant levels through the implementation of the mitigation measures described below. Direct impacts to historic properties in and around the firing range projects (TN0002, 5007, 5012, 5011, 5009, TN0619, 5022, TN0606, TN0034, TN0030) would be avoided or data recovery would take place. Ground penetrating radar, monitoring, and reburial (if burials are found) would take place at site TN0002 (former Camp Churo Cemetery). Mitigation to historic properties would be resolved through data recovery as these sites are eligible under Criterion D and recovery efforts would follow the ACHP guidance, “Resolving Adverse Effects through Recovery of Significant Information from Archeological Sites” (ACHP 1999). A table with the area, site number, impact, NRHP criteria of significance, and potential mitigation measures for each resource is included in Volume 9, Appendix G. DoD recognizes that mitigation associated with data recovery efforts for archaeological sites impacted by the Undertaking, would result in an increase in archaeological materials that need to be curated. This increased level of archaeological materials will require appropriate curatorial facilities as well as clearly defined procedures for the disposition of artifacts and, if encountered, the respectful and proper handling of human remains. DoD is committed to working with local, state and federal partners to maintain DoD archeological material collections on CNMI in facilities that meet federal standards and have appropriate capacity. Further, DoD is committed to ensuring the proper handling and disposition of human remains in accordance with federal statutes. For non-DoD archaeological material collections, DoD will follow local regulations regarding the handling and repatriation of cultural materials or human remains to the extent such local regulations are consistent with federal law and regulations on the subject. DoD is currently working on a capacity analysis of its current collections in Guam and CNMI, and will use that information to develop a plan for the initial and long-term curation needs associated with the Undertaking.

Once the alternative for this portion of the proposed action is selected and more detailed range designs are developed, it is anticipated that additional avoidance or minimization measures can be incorporated into range designs.. Operational impacts would be mitigated through historic property awareness training of personnel working in the area. Access restriction would be temporary, occurring for approximately 12 to 16 weeks per year. Access restrictions would be necessary because of public safety. Otherwise access to the areas within the SDZs would be open when the ranges are not in use. DoD has proposed to mitigate impacts to historic properties from limiting access on Broadway by the production of a Cultural Landscape Report, Thematic Synthesis Publications, and Historic Properties Pamphlet Driving Tour Update.

12.2.3 Alternative 2

Alternative 2 differs from Alternatives 1 and 3 by locating the SDZ for the Automatic Field Firing Range partially over Unai Dankulo and the ocean. All of the range footprints, the SDZ area, and the

12.2.3.1 Tinian

<u>Construction</u>

All of the APE has been intensively surveyed for archaeological, architectural resources and traditional cultural properties (Griffin et al. 2009, Athens 2009, EDAW/AECOM 2010). A draft report of the archaeological survey was reviewed by the CNMI HPO in 2009. Concurrence on the results of the traditional cultural property study was received from the CNMI HPO on June 24, 2009. A Cultural Landscape Report for the North Field NHL was extensively reviewed by the CNMI HPO in 2009. Based on the results of these studies, construction of the Platoon Battle Course project (Figure 12.2-2) would impact site TN0002 (former Camp Churo cemetery), 5007 (Japanese fields and structures), TN0034 (Japanese, Churo Village [Old Village]), 5009 (Japanese, farmstead), and 5021 (Japanese, farmstead).

The Rifle KD range project construction would impact site 5021 (Japanese fields; U.S. livestock reserve). The Automated Combat Pistol/MP Firearms Qualification Course project construction would impact site TN0606 (Service Corps 87, 25).

The Field Firing Range project construction would impact site TN0030 (West Field) as Marines would be camping and using these areas for training purposes.

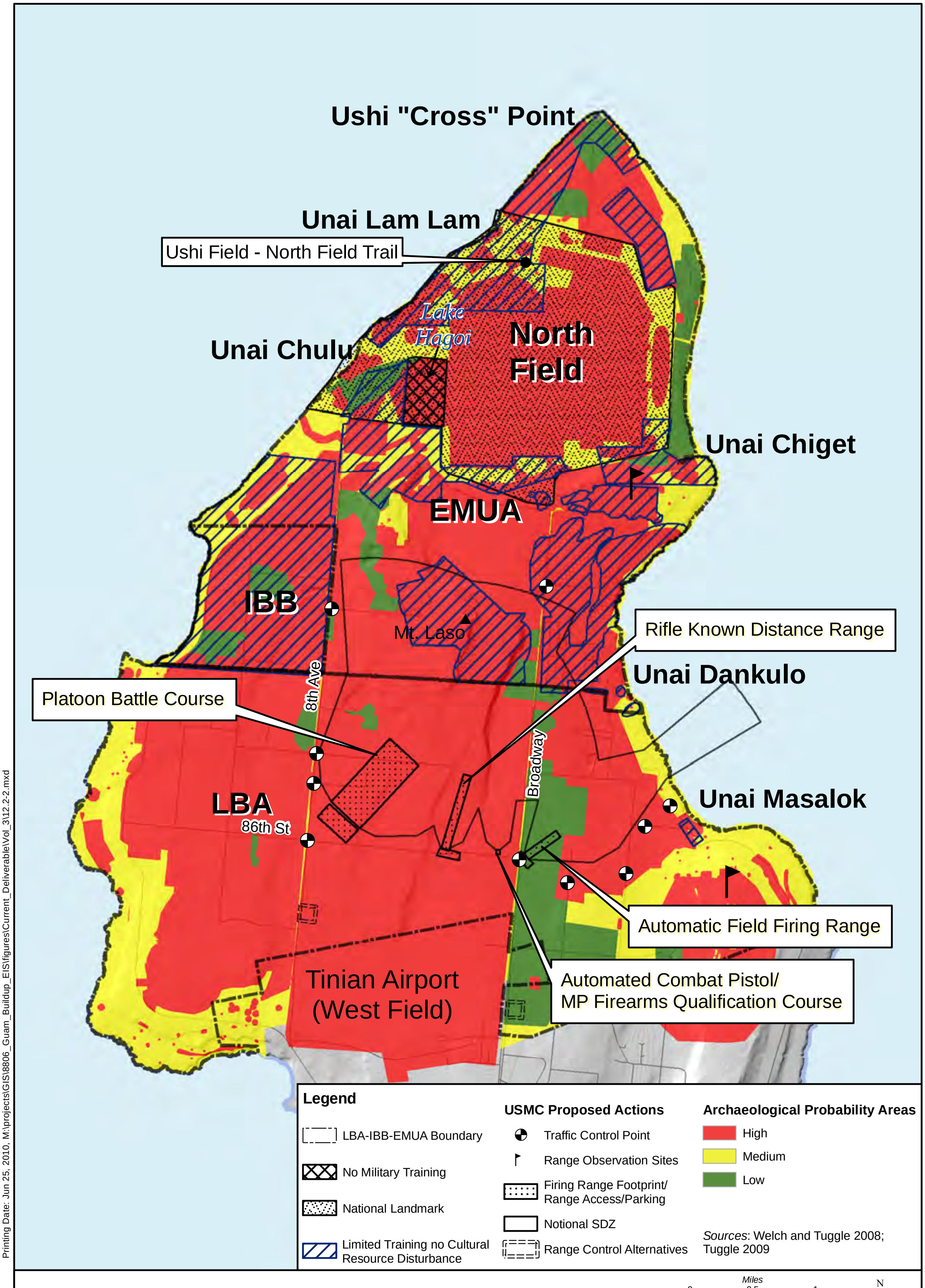

Figure 12.2-2
Alternative 2 Proposed Ranges

Operation

Operational activities (training and non-training related) associated with the Field Firing Range, the Rifle KD range, the Automated Combat Pistol/MP Firearms Qualification Course, and the Platoon Battle Course, including bivouac activities, would bring approximately 200 to 400 personnel into the area. While the addition of personnel may be seen as a conduit to site disturbance, vandalism of sites is an ongoing occurrence in the area even without military personnel present. As stated previously, the indirect disturbance to historic properties by increasing access to the sites is considered to be an adverse impact.

The SDZs overlap limited training/No Cultural Resource Disturbance areas. In addition, 52 archaeological sites are located in the SDZs for Alternative 2. These sites include U.S. military sites, pre-Contact sites, and Japanese fields and structures. Three traditional cultural properties are located in the SDZ, the Dankulo complex, a petroglyph site, and the Lasso Shrine. Direct impacts within the SDZs are unlikely since few rounds (only 1 in 10,000) would fall outside of the range footprints. Any target rounds not captured in the range footprints due to deflection would not damage the site, because the distance of the round would reduce the velocity so much that it would not damage the artifacts or other remains. This area would not be cleaned up while the lease is in effect, and impacts due to munitions cleanup activities would not occur. Residents in the area may attempt to collect ammunition rounds within the SDZs and could damage historic properties in this area. However, a conservative estimate of projectiles and projectile fragments is not estimated to exceed 328 rounds annually (see Section 2.3.1.1) and impacts to historic properties would be negligible.

Limited access would occur along Broadway north of 86th Street and south of the Shinto Shrine American Memorial Circle on Broadway including all lands to the east, and east of 8th Avenue north of 86th Street and south of Mount Lasso. Access to traditional farms, or *lanchos*, would not be restricted. Access to North Field NHL and northern beaches via 8th Avenue would still be allowed during training activities. Training periods would be scheduled in advance with signs posted and published on a regular basis. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would safeguard the public by keeping them out of any areas where there are potential dangers while simultaneously maintaining access to areas where training is not being conducted. This would ensure access to the North Field NHL, northern beaches, and the IBB via 8th Avenue. Broadway would be closed during training. Therefore, access restrictions associated with Alternative 2 would be less than significant.

12.2.3.2 Summary of Alternative 2 Impacts

Alternative 2 would result in significant direct impacts to seven historic properties and less than significant indirect impacts to 52 historic properties that are archaeological and three traditional cultural properties. No historic properties that are architectural resources, would be impacted by Alternative 2. Table 12.2-2 summarizes Alternative 2 impacts.

BMPs implemented to protect cultural resources would be the same as those described for Alternative 1.

Table 12.2-2. Summary of Alternative 2 Specific Impacts

Area	*Impacts*	*Project Specific Impacts*
Tinian	Construction	Significant direct and indirect impacts to seven archaeological sites.
	Operation	Less than significant indirect impacts to 52 archaeological sites, one NHL, and three traditional cultural properties within the SDZs.

12.2.3.3 Alternative 2 Proposed Mitigation Measures

Direct impacts to historic properties in and around the firing ranges (TN0002, TN0030, 5007, 5009, 5021, TN0606, TN0034) would be avoided or data recovery would take place in accordance with Section 106 consultation. A Ground Penetrating Radar study of the former Churo Camp Cemetery (TN0002) would be conducted prior to range construction in order to confirm the lack of human burials. Mitigation to historic properties would be resolved through data recovery as these sites are eligible under Criterion D and recovery efforts would follow the ACHP guidance, "Resolving Adverse Effects through Recovery of Significant Information from Archeological Sites" (ACHP 1999). A table with the area, site number, impact, NRHP criteria of significance, and potential mitigation measures for each resource is included in Volume 9, Appendix G.

DOD recognizes that mitigation associated with data recovery efforts for archaeological sites impacted by the Undertaking, would result in an increase in archaeological materials that need to be curated. This increased level of archaeological materials will require appropriate curatorial facilities as well as clearly defined procedures for the disposition of artifacts and, if encountered, the respectful and proper handling of human remains. DoD is committed to working with local, state and federal partners to maintain DoD archeological material collections on CNMI in facilities that meet federal standards and have appropriate capacity. Further, DoD is committed to ensuring the proper handling and disposition of human remains in accordance with federal statutes. For non-DoD archaeological material collections, DoD will follow local regulations regarding the handling and repatriation of cultural materials or human remains to the extent such local regulations are consistent with federal law and regulations on the subject. DoD is currently working on a capacity analysis of its current collections in Guam and CNMI, and will use that information to develop a plan for the initial and long-term curation needs associated with the Undertaking.

Once the alternative for this portion of the proposed action is selected and more detailed range designs are developed, it is anticipated that additional avoidance or minimization measures can be incorporated into range designs.

Operational impacts would be mitigated through historic property awareness training of personnel working in the area.

Access restriction would be temporary, occurring for approximately 12 to 16 weeks per year. Access restrictions would be necessary because of public safety. Otherwise access to the areas within the SDZs would be open when the ranges are not in use. DoD has proposed to mitigate impacts to historic properties from limiting access on Broadway by the production of a Cultural Landscape Report, Thematic Synthesis Publications, and Historic Properties Pamphlet Driving Tour Update.

12.2.4 Alternative 3

Alternative 3 differs from Alternatives 1 and 2 by the location of the Automatic Field Firing Range, the Automated Combat Pistol/MP Firearms Qualification Course, and the Rifle KD Range to the south.

12.2.4.1 Tinian

<u>Construction</u>

All of the APE has been intensively surveyed for archaeological, architectural resources and traditional cultural properties (Griffin et al. 2009, Athens 2009, EDAW/AECOM 2010). A draft report of the archaeological survey was reviewed by the CNMI HPO in 2009. Concurrence on the results of the traditional cultural property study was received from the CNMI HPO on June 24, 2009. A Cultural

Landscape Report for the North Field NHL was extensively reviewed by the CNMI HPO in 2009. Based on the results of these studies, construction of the Platoon Battle Course would adversely impact site TN00234 (Japanese Churo Village [Old Village]), TN0002 (former Camp Churo cemetery), 5007 (Japanese fields and structures), 5021 (Japanese farmstead), and 5009 (Japanese farmstead) (Figure 12.2-3). The Rifle KD Range project construction would impact site TN0030 (West Field). The Automated Combat Pistol/MP Firearms Qualification Course project construction would adversely affect site TN0030 (West Field).

The Field Firing Range project construction would take place in an area with historic properties. Ground excavation and soil removal have the potential to adversely affect site TN0030 (West Field). The bivouac areas would impact site TN0030 (West Field) as Marines would be camping and using these areas for training purposes.

Operation

Operational activities (training and non-training related) associated with the Field Firing Range, the Rifle KD range, the Automated Combat Pistol/ MP Firearms Qualification Course, and the Platoon Battle Course, including bivouac activities, would bring approximately 200 to 400 personnel into the area. While the addition of personnel may be seen as a conduit to site disturbance, vandalism of sites is an ongoing occurrence in the area even without military personnel present. As stated previously, the indirect disturbance to historic properties by increasing access to the sites is considered to be an adverse impact.

The SDZs overlap limited training/No Cultural Resource Disturbance areas. In addition, 55 archaeological sites are located in the SDZs for Alternative 3. These sites include U.S. military sites, pre-Contact sites, and Japanese fields and structures. Two traditional cultural properties are located in the SDZ, the Lasso Shrine and the 86th Street Shrine. Direct impacts within the SDZs are unlikely since few rounds (only 1 in 10,000) would fall outside of the range footprints. Any target rounds not captured in the range footprints due to deflection would not damage the site, because the distance of the round would reduce the velocity so much that it would not damage the artifacts or other remains. This area would not be cleaned up while the lease is in effect, and impacts due to munitions cleanup activities would not occur. Residents in the area may attempt to collect ammunition rounds within the SDZs and could damage historic properties in this area. However, a conservative estimate of projectiles and projectile fragments is not estimated to exceed 328 rounds annually (see Section 2.3.1.1) and impacts to historic properties would be negligible.

In addition, some military training exercises would result in temporary, short-term restriction of access in the training area by civilians during activities in which public safety is a consideration. Training periods would be scheduled in advance with signs posted and published on a regular basis. Limited access would occur along Broadway north of 86th Street and south of the Shinto Shrine American Memorial Circle on Broadway including all lands to the east, and east of 8th Avenue north of 86th Street and south of Mount Lasso. Access to traditional farms, or *lanchos*, would not be restricted. Access to North Field NHL and northern beaches via 8th Avenue would still be allowed during training activities. Training periods would be scheduled in advance with signs posted and published on a regular basis. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would safeguard the public by keeping them out of any areas where there are potential dangers while simultaneously maintaining access to areas where training is not being conducted. This would ensure access to the North Field NHL, northern beaches, and the IBB via 8th Avenue. Broadway would be closed during training. Therefore, access restrictions associated with Alternative 3 would be less than significant.

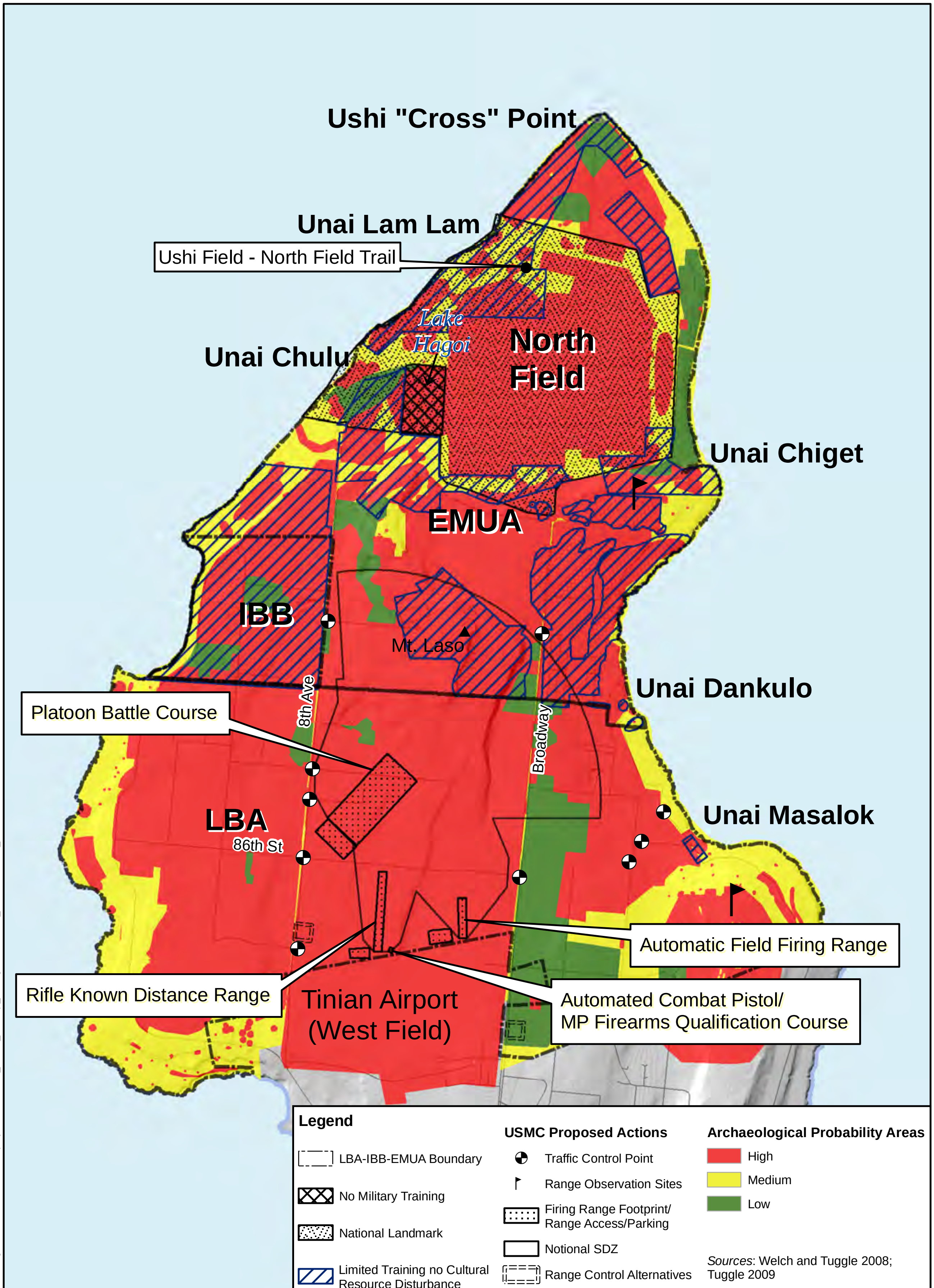

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Figure 12.2-3
Alternative 3 Proposed Ranges

12.2.4.2 Summary of Alternative 3 Impacts

Alternative 3 would result in significant direct impacts to six historic properties and less than significant indirect impacts to 55 historic properties, one NHLand two traditional cultural properties. No historic properties that are architectural resources would be impacted by Alternative 3. Table 12.2-3 summarizes Alternative 3 impacts.

BMPs implemented to protect cultural resources would be the same as those described for Alternative 1.

Table 12.2-3. Summary of Alternative 3 Specific Impacts

Area	*Impacts*	*Project Specific Impacts*
Tinian	Construction	Direct and indirect impacts to six archaeological sites
	Operation	Indirect less than significant impacts to 55 archaeological sites one NHL, and two traditional cultural properties.

12.2.4.3 Alternative 3 Proposed Mitigation Measures

Direct impacts to historic properties in and around the firing range projects (TN0002, TN0034, 5007, 5009, 5021, TN0030) would be avoided or data recovery would take place. A Ground Penetrating Radar study of the former Churo Camp Cemetery would be conducted prior to range construction to determine if any human burials are present. Mitigation to historic properties would be resolved through data recovery as these sites are eligible under Criterion D and recovery efforts would follow the ACHP guidance, "Resolving Adverse Effects through Recovery of Significant Information from Archeological Sites" (ACHP 1999). A table with the area, site number, impact, NRHP criteria of significance, and potential mitigation measures for each resource is included in Volume 9, Appendix G.

DOD recognizes that mitigation associated with data recovery efforts for archaeological sites impacted by the Undertaking, would result in an increase in archaeological materials that need to be curated. This increased level of archaeological materials will require appropriate curatorial facilities as well as clearly defined procedures for the disposition of artifacts and, if encountered, the respectful and proper handling of human remains. DoD is committed to working with local, state and federal partners to maintain DoD archeological material collections on CNMI in facilities that meet federal standards and have appropriate capacity. Further, DoD is committed to ensuring the proper handling and disposition of human remains in accordance with federal statutes. For non-DoD archaeological material collections, DoD will follow local regulations regarding the handling and repatriation of cultural materials or human remains to the extent such local regulations are consistent with federal law and regulations on the subject. DoD is currently working on a capacity analysis of its current collections in Guam and CNMI, and will use that information to develop a plan for the initial and long-term curation needs associated with the Undertaking.

Operational impacts would be mitigated through historic property awareness training of personnel working in the area.

Once the alternative for this portion of the proposed action is selected and more detailed range designs are developed, it is anticipated that additional avoidance or minimization measures can be incorporated into range designs.

Access restriction would be temporary, occurring for approximately 12 to 16 weeks per year. Access restrictions would be necessary because of public safety. Otherwise access to the areas within the SDZs would be open when the ranges are not in use. DoD has proposed to mitigate impacts to historic properties from limiting access on Broadway by the production of a Cultural Landscape Report, Thematic Synthesis Publications, and Historic Properties Pamphlet Driving Tour Update.

12.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. Existing operations at the proposed project areas would continue. Therefore, the no-action alternative would have no impact on historic properties.

12.2.6 Summary of Impacts

Table 12.2-4 summarizes the potential impacts of each action alternative and the no-action alternative. Only historic properties are listed in Table 12.2-4.

Table 12.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Archaeological Resources			
SI-M • Significant adverse direct impacts to 9 NRHP-eligible archaeological resources Less than significant indirect impacts to 55 NRHP-eligible archaeological sites in the SDZ and the NHL	SI-M • Significant adverse direct impacts to 7 NRHP-eligible archaeological resources Less than significant indirect impacts to 52 NRHP-eligible archaeological sites in the SDZ and the NHL	SI-M • Significant adverse direct impacts to 6 NRHP-eligible archaeological resources Less than significant indirect impacts to 55 NRHP-eligible archaeological sites in the SDZ and the NHL	NI • No impacts to archaeological resources
Architectural Resources			
NI • No impacts to NRHP-eligible architectural resources	NI • No impacts to NRHP-eligible architectural resources	NI • No impacts to NRHP-eligible architectural resources	NI • No impacts to NRHP-eligible architectural resources
Submerged Resources or Objects			
NI • No adverse impacts to NRHP-eligible submerged resources or objects	NI • No adverse impacts to NRHP-eligible submerged resources or objects	NI • No adverse impacts to NRHP-eligible submerged resources or objects	NI • No impacts to NRHP-eligible submerged resources or objects
Traditional Cultural Properties			
LSI • Indirect impacts to one traditional cultural property	LSI • Indirect impacts to three traditional cultural properties	LSI • Indirect impacts to two traditional cultural properties	NI • No impacts to NRHP-eligible traditional cultural properties

Legend: SI-M = Significant impact mitigable to less than significant, LSI = Less than significant impact, NI = No impact/

12.2.7 Summary of Proposed Mitigation Measures

Mitigation would be conducted in accordance with the PA and include avoidance, survey, monitoring during construction, data recovery, building documentation, public education, and historic property awareness training of Marines to prevent vandalism. The proposed mitigation measures are presented in Table 12.2-5.

Table 12.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Archaeological Resources			
• Production of Cultural Landscape Report, Thematic Synthesis Publications, Historic Properties Pamphlet Driving Tour Update • Production of a Curation Assessment • Data recovery of sites 5007, 5012, 5011, 5009, TN0619, 5022, TN0606, TN0034, TN0030 • Ground Penetrating Radar, Monitoring, of site TN0002 (former Camp Churo Cemetery) reburial of human remains, if appropriate • Historic Property awareness training of Marines to promote protection of sensitive sites	• Production of Cultural Landscape Report, Thematic Synthesis Publications, Historic Properties Pamphlet Driving Tour Update • Production of a Curation Assessment • Data recovery of sites TN0034, 5007, 5009, 5021, TN0606, TN0030 Ground Penetrating Radar, Monitoring, of site TN0002 (former Camp Churo Cemetery) reburial of human remains, if appropriate • Historic property awareness training of Marines to promote protection of sensitive sites	• Production of Cultural Landscape Report, Thematic Synthesis Publications, Historic Properties Pamphlet Driving Tour Update • Production of a Curation Assessment • Data recovery of sites TN0034, 5007, 5009, 5021, TN0030 • Ground Penetrating Radar, Monitoring, of site TN0002 (former Camp Churo Cemetery), reburial of human remains, if appropriate • Historic property awareness training of Marines to promote protection of sensitive sites	• None
Architectural Resources			
• None	• None	• None	• None
Submerged Resources and Objects			
• None	• None	• None	• None
Traditional Cultural Properties			
• Public educational materials and displays about the NHL and the history of Tinian	• Public educational materials and displays about the NHL and the history of Tinian	• Public educational materials and displays about the NHL and the history of Tinian	• None

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CHAPTER 13.
VISUAL RESOURCES

13.1 AFFECTED ENVIRONMENT

13.1.1 Definition of Resource

This section describes the applicable existing visual conditions and resources on Tinian. While the focus is on the visual resources on those lands being considered under the proposed action, it also includes areas within the general region of influence. Chapter 9, Figure 9.1-1 shows recreational resources on Tinian where all of the various areas and scenic points of interest are located. The visual aspects of these recreational resources are described in this section.

Visual resources include scenic areas, vistas or thoroughfares and locations that provide natural-appearing or aesthetically-pleasing places or views. This includes natural views such as shorelines, seascapes, cliffs and man-made views such as unique buildings, landscaping, parks, and other types of cultural features. Typically, visual resource descriptions focus on those that are recognized as highly valued. For instance, they may be specific places, vistas, and scenic overlooks identified by a visitor's association. However, visual resources are also recognized as views and vistas that people are accustomed to seeing and often take for granted as a general part of the landscape.

Visual resources are an important part of the quality and sensory experience of an area. Users often encounter an area first and foremost through a visual interaction or their 'view' of a place. Views are generally composed of, and often described in terms of foreground, middle-ground and background depending on the site. For analysis purposes, visual resources are composed of the following:

- 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., rows of crops adjacent to an urban area with the mountains as a backdrop)
- Elements of line, color, form, and texture
- Distinctive visual edges (e.g., a housing tract adjacent to a forested area)

13.1.2 Tinian

The island of Tinian is located south of Saipan and approximately north of Guam. The total land area of Tinian is 39.2 square miles (56 square kilometers). Approximately two-thirds of the island is leased to the United States (U.S.) Department of Defense (DoD), with the majority of commercial and residential land located in the southern part of the island, mostly in the village of San Jose. San Jose is a low-rise, sparsely populated rural housing community with a very small village center.

Much of the native limestone forest was removed in the 1920s for sugar cane cultivation in the Japanese Colonial Era. Many of the sugar cane fields were removed and/or destroyed during World War II (WWII) leaving the fields now covered with mostly non-native vegetation.

Like Guam and other islands in the Marianas chain, Tinian is full of history from the WWII era. Because of its relatively flat topography (particularly in the north), it was used by the Japanese and then the Americans as an airfield during WWII. Thus, visual resources are closely-related to the cultural landscape and man-made structures from this time period. Figure 13.1-1 and Figure 13.1-2 show aerial views of northern Tinian photographed during WWII.

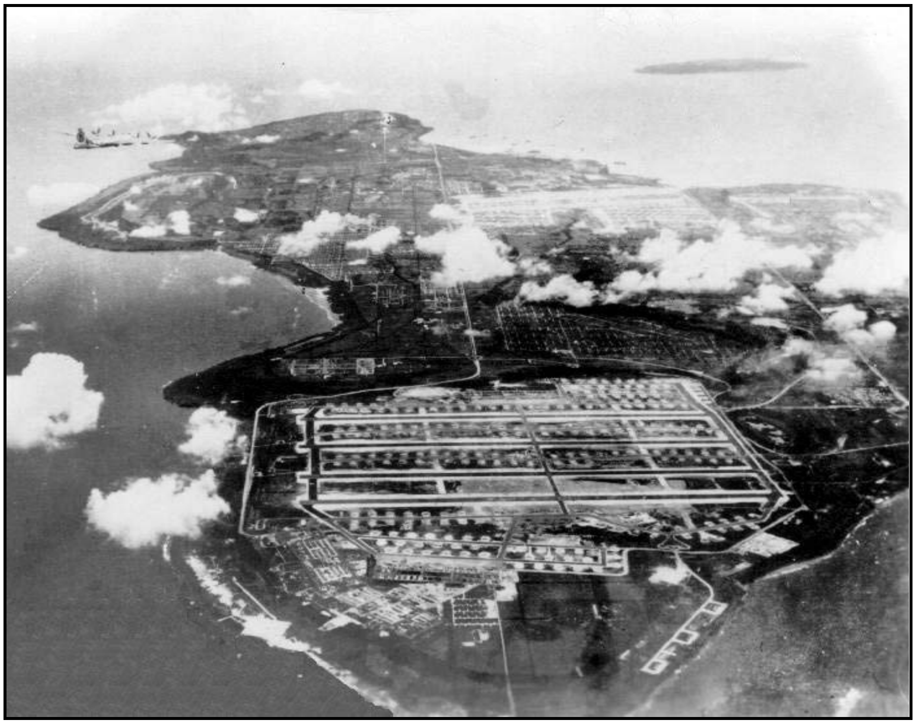

Figure 13.1-1. Aerial View of Northern Tinian Photographed During WWII
Photo Taken from the Northern end of Tinian looking South
Source: Tinian Island, Northern Mariana Islands 2008.

Figure 13.1-2. WWII Era Aerial View of North Field and Surrounding Facilities
Source: The 6th Bomb Group 2009.

13.1.2.1 North

North Tinian, the area defined by the Exclusive Military Use Area, is primarily composed of previously developed and disturbed lands, with old runways extended from east to west (Figure 13.1-3). Today, northern Tinian is mostly dominated by overgrown vegetation carpeting the once open airfield. As shown in Figure 13.1-4, current views from within the northern area are generally short range of the overgrown vegetation, degraded runways and taxiways, old bunkers and other structures. Both the north and northeast coastlines are covered with low, windblown vegetation and generally afford open and expansive views (Figure 13.1-5).

Figure 13.1-3. A Current Aerial View of Northern Tinian; Most of the Airfield has been Overgrown by Vegetation; Photo Taken from East of Tinian Looking West Across North Field

Source: National Park Service, U.S. Department of Interior. http://www.nps.gov

Figure 13.1-4. View of Degraded Airfield and Overgrown Vegetation
Source: EDAW 2009.

Figure 13.1-5. View from Northeastern Tinian Looking North Toward Saipan in the Distance
Source: EDAW 2009.

<u>North Field</u>

North Field is a National Historic Landmark and is listed on the National Register of Historic Places (Figure 13.1-6). The Atomic Bomb Pits in the North Field, where the bombs used on Nagasaki and Hiroshima, Japan, were loaded, became an important feature after WWII (Figure 13.1-7 and Figure 13.1-8). In addition, as shown in Figure 13.1-9, the Japanese Air Command Post at Ushi Airfield has been preserved and provides a cultural landscape feature with high visual quality. The North Field was a significant military platform designed and constructed with four runways, numerous taxiways and two service aprons. The area surrounding North Field was fully built out with supporting infrastructure and facilities. Though the field and surrounding facilities are now overgrown and abandoned, its historic significance remains and associated aesthetic value continues to draw visitors.

Figure 13.1-6. View of National Historic Landmark Marker and WWII Bunker at North Field
Source: EDAW 2009.

Figure 13.1-7. An Aerial View of the National Historic Landmark and Bomb Pit Enclosure (Lower Left Side of Photo)

Source: EDAW 2009.

Figure 13.1-8. National Historic Landmark Marker and Bomb Pit Enclosure

Source: EDAW 2009.

Figure 13.1-9. Ushi Airfield Japanese Air Command Post
Source: EDAW 2009.

Tinian Blowhole

The Tinian Blowhole is located on the northeastern side of Tinian and is a well visited scenic viewpoint. The primary aesthetic value of this area is of seawater pushed through a basalt cave along the shoreline that forces seawater high into the air. As shown in Figure 13.1-10, this coastal feature forms the foreground, the rugged coastline green/blue water composes the middle-ground, and Saipan in the distance makes up the background to a highly valued scenic vista.

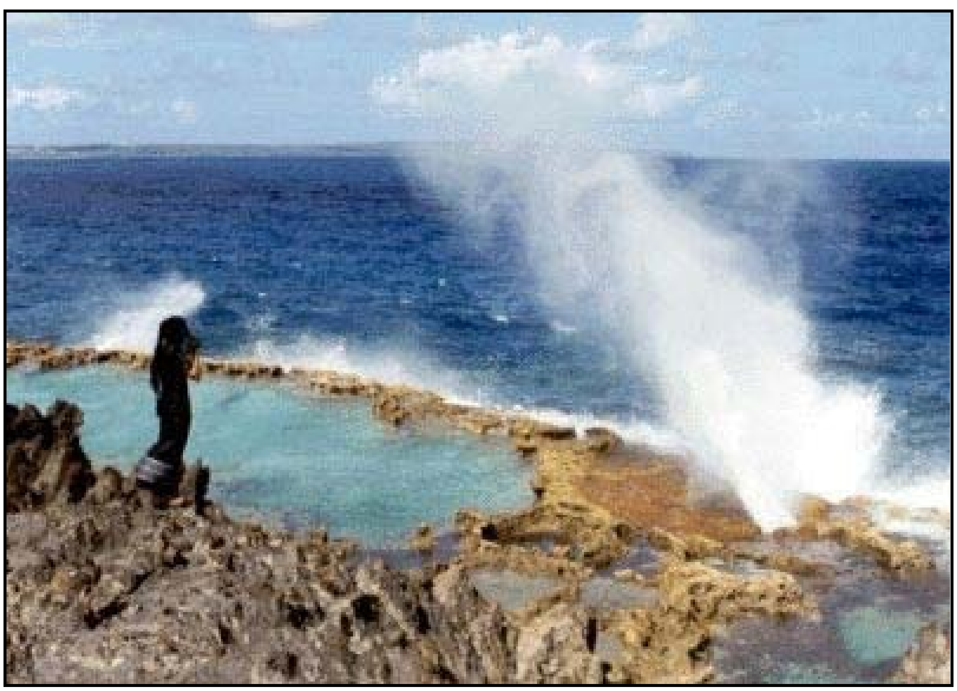

Figure 13.1-10. Tinian Blowhole with Saipan in the Distance

Source: Visitor Information Page 2008.

Chulu Beach (Unai Chulu-Invasion Beach White)

Chulu Beach is about 1.5 miles (mi) (2.4 kilometers [km]) away from the Atomic Bomb Pits on the northwestern shoreline. This is the leeward (western) side of the island and is therefore less windswept with thicker and taller vegetation. Chulu Beach consists of white sand and volcanic rocks offering an overlook to the Philippine Sea, also known as "Star Beach" named after the shape of the sand in this area. View of Chulu Beach is shown in Figure 13.1-11.

Figure 13.1-11. Chulu Beach
Source: Google Earth 2008a.

International Broadcasting Bureau

The International Broadcasting Bureau (IBB) (also known as the Voice of America) operates a large antennae array located on the northwest side of the island (Figure 13.1-12). The antenna field consists of 14 to 17 guyed antennas up to 400 feet (ft) (122 meters [m]) tall with strung curtains between 8 to12 antennas. The IBB is clearly visible from the air and island high points (particularly Mount Lasso).

Figure 13.1-12. An Aerial View of the Voice of America, North Field, and Saipan in the Distance
Source: World War II on Tinian 2009

<u>Shinto Shrine</u>

The Shinto Shrine is another one of Tinian's primary visitor destinations. It is located on one of the highest points of Tinian and is recognized as the only Shinto Shrine in the Commonwealth of the Northern Mariana Islands. It is also situated on the path to the top of Carolinas Plateau that provides a vantage point where visitors can look down to the village and ocean below.

13.1.2.2 Central

Central Tinian is leased land currently controlled by the DoD. The area is a layered limestone plateau mostly blanketed by thick vegetation. Central Tinian is currently largely unused, with several historic building structures that were abandoned after WWII. Areas of fenced agricultural lands primarily used for cattle grazing are located in the Central Area, primarily to the west of Broadway (Figure 13.1-13). Street trees along old roadways provide an impression of this area being previously developed before/during WWII.

Figure 13.1-13. A View of Broadway in Central Tinian with Agricultural Lands (Cattle) to the Right and the Carolinas Plateau in the Background
Source: EDAW 2009.

Japanese Radio Communications Center

The Radio Communications Center is located on Broadway in Central Tinian. It is a concrete fortification that was used as a communication station of the Japanese Army and was later used as a prisoner of war brig and slaughterhouse by the U.S. military during WWII. The building is now abandoned and another one of Tinian's highly visited historic structures.

13.1.2.3 South

South Tinian is a mixed area of suburban and rural development. Tinian Airport lies at the northern edge of this area with the village of San Jose and Tinian Harbor to the south. San Jose is the only village on Tinian and is composed of sparsely located, low-rise buildings. Because of this, the majority of the village and its surroundings have relatively unobstructed views in all directions. South Tinian also contains a low valley and the island's second highest mountain ridge.

San Jose Village

San Jose Village is located on the southwest side of Tinian facing the Philippine Sea (Figure 13.1-14). It is a mixed-use village located in the Median Valley (Marpo Valley). The main road, Broadway, connects inland areas to Taga Beach. Grassland, palms, and medium size canopy trees comprise the major vegetation along the street providing an informal streetscape. This informal streetscape provides a clear view toward the ocean. Furthermore, the low-rise building structures in San Jose Village provide visitors an opportunity to appreciate the surrounding areas from the cliff line to the skyline.

Figure 13.1-14. A View of San Jose Village from 8th Avenue
Tinian Dynasty Hotel can be Seen on the Left Side of the Photo with the Tinian Channel Beyond
Source: Google Earth 2008b.

House of Taga

The House of Taga is a *latte* stone site featuring remnants of the foundations of the traditional Chamorro style of shelter (Figure 13.1-15). The remains of the House of Taga are located within the trees and shrubs adjacent to the most populated area of San Jose Village. The House of Taga surroundings are undeveloped and are primarily low vegetation (mainly grasses). The site provides visitors a scenic view toward the ocean and Kammer Beach.

Figure 13.1-15. The Remnants of the House of Taga
Source: Google Earth 2008c.

Suicide Cliff

Suicide Cliff is located on the southeastern side of Tinian affording a view of the Pacific Ocean. The vertical cliff extrudes along the shoreline providing a fortification-like natural wall. This was the location where hundreds of Japanese soldiers and family members jumped to their deaths rather than be captured by U.S. soldiers. It is another one of Tinian's highly visited scenic viewpoints (Figure 13.1-16).

Figure 13.1-16. A View of the Southern Shoreline at Suicide Cliff
Source: Google Earth 2008d.

Taga Beach and Kammer Beach

Both Kammer Beach and Taga Beach are located on the southwestern side of Tinian facing the Philippine Sea (Figure 13.1-17 and Figure 13.1-18). Taga Beach is about 1 mile away from Kammer Beach to the south. Both white-sand beaches are surrounded by native vegetation. Aguijan Island, to the south, can be seen from both Taga Beach and Kammer Beach.

Figure 13.1-17. Kammer Beach
Source: Google Earth 2008e.

Figure 13.1-18. Taga Beach
Source: Google Earth 2008f.

13.2 ENVIRONMENTAL CONSEQUENCES

13.2.1 Approach to Analysis

13.2.1.1 Methodology

Information on visual resources was gathered through on-site visits, background research, and participation in stakeholder and public meetings. The analysis of potential impacts to visual resources is based on the long term (operational) effects – i.e., after construction has occurred and all ranges and associated roads are in place. Construction-related activities related to the development of the ranges would be short-term in duration and minimal in their impacts (i.e., earth-moving equipment clearing vegetation from the range areas).

13.2.1.2 Determination of Significance

For the purpose of the Environmental Impact Statement, the proposed action would cause a significant impact to visual resources if they:

- Would substantially alter the views or scenic quality associated with particularly significant and/or publicly recognized vistas, viewsheds, overlooks, or features
- Would substantially change the light, glare, or shadows within a given area
- Would substantially affect sensitive receptors – i.e., viewers with particular sensitivity (or intolerance) to a changed view (e.g., a hillside neighborhood with views of a relatively undisturbed, naturally-appearing landscape)

Significant impacts that cannot be mitigated to less than significant levels are considered unavoidable. A discussion is presented for each significance criterion listed that would be triggered by the alternatives.

13.2.1.3 Visual Characteristics of the Proposed Ranges

The proposed firing ranges would generally be seen as cleared, grassed areas with varying features.

The Rifle Known Distance (KD) Range would be seen as a large clear grassed area of approximately 1,050 yards (yd) (960 m) by 100 yd (91 m), or 22 acres (ac) (9 hectares [ha]), with a 15-ft (4.6-m) tall earthen berm at one end.

The Automated Combat Pistol/Military Police Firearms Qualification Course would be seen as a cleared, grassed area of approximately 55-yd (50-m) by 50-yd (46-m) wide, or 0.6 ac (0.2 ha). A 10-ft (5-m) tall earthen berm would be located approximately 20 ft (6 m) behind a single row of targets.

The Platoon Battle Course would be seen as a cleared, grassed area of approximately 1,312-yd (1,200-m) long and 656-yards (600-m) wide, encompassing approximately 178-ac (72-ha). The Platoon Battle Course would be dotted with shallow target pits and 5-ft (2-m) tall earthen berms located 3 ft (1 m) behind each target.

The Automatic Field Firing Range would be seen as a cleared-grassed area of approximately 219-yds (200-m) wide by 547-yards (500-m) long, or approximately 25 ac (10 ha). The Field Firing Range would be dotted with shallow target pits and 5-ft (2-m) tall earthen berms located 3 ft (0.9 m) behind each target.

13.2.1.4 Issues Identified during Public Scoping Process

Comments received during the scoping process from the public, including regulatory stakeholders, do not specifically mention concerns about increased visual resources due to the proposed action for Tinian. Consequently, no concerns about impacts to visual resources were identified.

13.2.2 Alternative 1 (Preferred Alternative)

13.2.2.1 Tinian

Under Alternative 1, no facilities or structures would be constructed in the north area of Tinian. However, views of the various ranges from Mount Lasso, Tinian's highest point and a publicly recognized overlook providing panoramic views of much of the island, would likely be negatively impacted by the altered landscape caused by the addition of the ranges. In particular, this would likely be most significantly affected by the Platoon Battle Course 5.56 (177-52) range due to its size and position relative to the Mount Lasso viewpoint. Since the majority of north Tinian had been historically clear space due to Tinian's military history, the tolerance for these cleared ranges may be higher than in other locations. With the implementation of mitigation measures listed in Section 13.2.2.3, the impacts of Alternative 1 on visual resources in north Tinian would be at a level less than significant.

Under Alternative 1, the ranges would be constructed in the central area of Tinian. Construction related disturbances would be evident from 8th Avenue, Broadway, and Mount Lasso. These activities would introduce some new elements into the landscape. But construction activities would be temporary and would have less than significant long-term impacts. Of most prominence to public viewing would be the Automatic Field Firing Range along the east side of Broadway, and the Platoon Battle Course range along the east side of 8th Avenue. The cleared ranges and perimeter roads/firebreaks would be a substantial change from the current, more naturally appearing landscape. Nevertheless, similar to the North area, because of Tinian's military history and other associated cleared areas on the island, the tolerance for these cleared ranges may be higher than in other locations. Additionally, none of the proposed ranges in Alternative 1 would be visible from viewpoints in the central area of Tinian. Training at the ranges would involve transport of personnel in vehicles to the ranges from bivouac areas or from West Field. Some fugitive dust would likely be visible at the Platoon Battle Course since that involves vehicle maneuvering. However, fugitive dust would not be substantial as the majority of activities involve military personnel on the range without vehicles. Also, fugitive dust would be temporary and would cease following completion of the exercise. With implementation of mitigation measures listed in Section 13.2.2.3, the impacts of Alternative 1 to visual resources in central Tinian would be at a level less than significant.

Under Alternative 1, no facilities or structures would be constructed in the south area of Tinian, and no public viewpoints would be expected to be impacted. Therefore, no impacts to visual resources would be anticipated.

13.2.2.2 Summary of Alternative 1 Impacts

Table 13.2-1 summarizes Alternative 1 impacts.

Table 13.2-1. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Impacts during construction would be mitigated to a level less than significant
	Operation	Impacts on visual resources in north Tinian would be mitigated to a level less than significant

13.2.2.3 Alternative 1 Proposed Mitigation Measures

To maintain the existing visual appearance, land clearing and grading should be minimized to the extent possible on lands proposed for ranges uses. Minimize impact by using native flora to create a natural-appearing "screen" around the cleared range areas, outside of the firebreaks/perimeter roads.

13.2.3 Alternative 2

13.2.3.1 Tinian

Similar to Alternative 1, under Alternative 2 no facilities or structures would be constructed in the north area of Tinian. However, views of the various ranges and associated facilities from Mount Lasso would likely be negatively impacted by the altered landscape caused by the addition of these facilities. Due to Tinian's military history and other associated cleared areas on the island, the tolerance for these cleared ranges may be higher than in other locations. With implementation of mitigation measures listed in Section 13.2.2.3, the impacts of Alternative 2 on visual resources in north Tinian would be at a level less than significant.

Similar to Alternative 1, under Alternative 2 the ranges would be constructed in the Central area of Tinian. Construction related disturbances would be evident from 8th Avenue, Broadway, and Mount Lasso. These activities would introduce some new elements into the landscape. But construction activities would be temporary and would have less than significant long-term impacts. Of most prominence to public viewing would be the Platoon Battle Course along the east side of 8th Avenue, and to a lesser degree, the Automatic Field Firing Range along the east side of Broadway. The large earthen berms, cleared ranges and perimeter roads/firebreaks would be a substantial change from the current, more naturally-appearing landscape. However, similar to the north area, because of Tinian's military history and other associated cleared areas on the island, the tolerance for these cleared ranges may be higher than in other locations. Therefore, the impacts of Alternative 2 to visual resources in north Tinian would be at a level less than significant with mitigation.

Under Alternative 2, no facilities or structures would be constructed in the south area of Tinian, and no public viewpoints would be expected to be impacted. Also, the proposed ranges are far enough north that they would not be seen from viewpoints in the south. Therefore, no impacts to southern visual resources would be anticipated.

13.2.3.2 Summary of Alternative 2 Impacts

Table 13.2-2 summarizes Alternative 2 impacts.

Table 13.2-2. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Impacts during construction would be mitigated to a level less than significant
	Operation	Impacts on visual resources in north Tinian would be mitigated to a level less than significant with mitigation

13.2.3.3 Alternative 2 Proposed Mitigation Measures

Mitigation measures for Alternative 2 would be the same as described for Alternative 1.

13.2.4 Alternative 3

13.2.4.1 Tinian

Similar to Alternative 1, under Alternative 3 no facilities or structures would be constructed in the north area of Tinian. Construction related disturbances in central Tinian would be evident from 8th Avenue, Broadway, and Mount Lasso. These activities would introduce some new elements into the landscape. But construction activities would be temporary and would have less than significant long-term impacts. Views of the various ranges from Mount Lasso would likely be negatively impacted by the altered landscape caused by the addition of these facilities. Due to Tinian's military history and other associated cleared areas on the island, the tolerance for these cleared ranges may be higher than in other locations. With implementation of mitigation measures listed in Section 13.2.2.3, the impacts of Alternative 3 on visual resources in north Tinian would be at a level less than significant.

Similar to Alternative 1, under Alternative 3 the ranges would be constructed in the central area of Tinian. Of most prominence to public viewing would be the Platoon Battle Course along the east side of 8th Avenue, and to a lesser degree, the other three ranges south of 86th Street and north of Tinian Airport (West Field). The large earthen berms, cleared ranges and perimeter roads/firebreaks would be a substantial change from the current, more naturally-appearing landscape. However, similar to the north area, because of Tinian's military history and other associated cleared areas on the island, the tolerance for these cleared ranges may be higher than in other locations. With implementation of mitigation measures listed in Section 13.2.2.3, the impacts of Alternative 3 to visual resources in north Tinian would be at a level less than significant.

Under Alternative 3, no facilities or structures would be constructed in the south area of Tinian and no public viewpoints would be expected to be impacted, therefore, no impacts to visual resources would be anticipated.

13.2.4.2 Summary of Alternative 3 Impacts

Table 13.2-3 summarizes Alternative 3 impacts.

Table 13.2-3. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Impacts during construction would be mitigated to a level less than significant
	Operation	Impacts on visual resources in north Tinian would be mitigated to a level less than significant

13.2.4.3 Alternative 3 Proposed Mitigation Measures

Mitigation measures for Alternative 3 would be the same as described for Alternative 1.

13.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. Existing operations on Tinian would continue. Therefore, the no-action alternative would have no impacts to visual resources.

13.2.6 Summary of Impacts

Development of the ranges on Tinian would result in large cleared areas and a change to the central area of Tinian. This would primarily affect views from Mount Lasso, the tallest point on the island, as well as views along Broadway and 8^{th} Avenue. These changes to the visual environment, while somewhat substantial in scale and potentially significant in nature, would be expected to be brought to a level of less than significant with mitigation measures in place. Table 13.2-4 summarizes the potential impacts of each action alternative and the no-action alternative.

Table 13.2-4. Summary of Impacts

Potentially Impacted Resource	*Alternative 1*	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Views from Mount Lasso	SI-M	SI-M	SI-M	NI
Views along Broadway	SI-M	SI-M	SI-M	NI
Views along 8^{th} Avenue	SI-M	SI-M	SI-M	NI

Legend: SI-M = Significant impact mitigable to less than significant, NI = No impact.

13.2.7 Summary of Proposed Mitigation Measures

Table 13.2-5 summarizes the proposed mitigation measures.

Table 13.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Construction		
• To maintain the existing visual appearance, land clearing and grading should be minimized to the extent possible on lands proposed for ranges uses.	• To maintain the existing visual appearance, land clearing and grading should be minimized to the extent possible on lands proposed for ranges uses.	• To maintain the existing visual appearance, land clearing and grading should be minimized to the extent possible on lands proposed for ranges uses.
Operation		
• Minimize impact by using native flora to create a natural-appearing “screen” around the cleared range areas, outside of the firebreaks/perimeter roads.	• Minimize impact by using native flora to create a natural-appearing “screen” around the cleared range areas, outside of the firebreaks/perimeter roads.	• Minimize impact by using native flora to create a natural-appearing “screen” around the cleared range areas, outside of the firebreaks/perimeter roads.

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CHAPTER 14. ROADWAYS AND MARINE TRANSPORTATION

14.1 AFFECTED ENVIRONMENT

14.1.1 Definition of Resource

This section describes the existing transportation facilities, specifically roads, the Tinian International Airport, and the Tinian Harbor, in Tinian and the activities that occur there. The possible effects to these transportation facilities as a result of the proposed action are presented and these effects are compared to the conditions under the no-action alternative.

14.1.2 Tinian

14.1.2.1 Roads

Tinian has approximately 68.4 miles (mi) (110 kilometers [km]) of roads, most of which were constructed prior to and during World War II. Most roads were developed, graded, and paved for heavy truck traffic when the island's United States (U.S.) military population was about 150,000. Roads throughout Tinian are now in good to poor condition and traffic is extremely light. Roadways in the Military Lease Area (MLA) include former runways, taxiways, and parking aprons constructed to support B-24 and B-29 bombers (Belt Collins 1999).

Two primary roadways (Broadway and 8th Avenue) connect the San Jose Village to the MLA. Broadway is a two-lane divided highway with approximately 20-foot (ft) (6.10-meters [m]) wide lanes and a 32-ft (9.75-m) wide median. 8th Avenue has three distinct roadway sections: a 24-ft (7-m) unpaved roadway adjacent to the Tinian Airport, an 18-ft (5-m) to 22-ft (7-m) two-lane undivided highway immediately north and south of the Tinian Airport, and an 18-ft (5-m) two-lane undivided highway just south of 86th Street. This third section was previously a divided roadway with approximately 18-ft (5-m) wide lanes and a 36-ft (11-m) wide median. Lack of maintenance on Broadway and 8th Avenue within the MLA has resulted in the southbound lanes of these roads being unusable.

Other roadways on Tinian are typically two lanes, undivided, with no striped median and have a capacity of approximately 5,000 vehicles per day. The majority of the roadways on Tinian carry between 25 to 400 vehicles per day. Broadway and 8th Avenue carry up to 1,470 and 180 vehicles per day in certain segments, respectively. Route 201 and 202, two major routes that provide access in and out of the San Jose Village area, carry the highest traffic with approximately 1,520 and 2,240 vehicles per day, respectively. Based on the operational analysis conducted in the Draft Commonwealth of the Northern Mariana Islands (CNMI) Comprehensive Highway Master Plan, all roadways on Tinian are operating at excellent levels of service in their existing condition, as evidenced by free flowing traffic and no traffic delays.

14.1.2.2 Airport

The Tinian International Airport is a Federal Aviation Administration (FAA) certified facility that currently accommodates single engine aircraft and Shorts 360 aircraft with capacity of up to 36 passengers. In 2002, the runway was extended to 8,600 ft (2,621.28 m) from 6,000 ft (1,828.80 m) in length capable of handling 767s. The apron is capable of handling two 767 in addition to one 767 at the gate. There is additional capacity for one C130 in the hard packed area at the west end of the taxiway.

14.1.2.3 Harbors

The affected environment discussed in this section is in the South region of Tinian. Tinian Harbor includes both the Inner Harbor near the town of Tinian and the Outer Harbor lying about 1.7 mi (2.8 km) off shore between Garguan Point and Carolinas Point. The Inner Harbor is entered via a channel that has a navigable width of 500 ft (152 m) and a minimum depth of 25 ft (7.6 m).

The Inner Harbor was constructed in 1944 to accommodate up to eight Liberty Ship cargo vessels (Belt Collins 1999). The main quay has a usable length of 2,200 ft (670 m) with depths varying between 25 and 29 ft (7.6 and 8.8 m) (Figure 14.2-1). There are two piers (pier 1 and pier 2) lying to the southwest of the main quay (Global Security 2008). Piers 1 and 2 are in a state of disrepair (Tinian Chamber of Commerce 2010). The Municipality of Tinian declared a state of emergency in October 2009 in order to repair these piers.

The Navy estimates that the main quay, or wharf, could handle up to 4,500 tons (4,082 metric tons) of cargo daily. The main quay is used to moor commercial barges operating between Tinian and Saipan and for hydrofoil ferry service for visitors from Saipan. Two stevedore companies service commercial shipping traffic. Gasoline and diesel fuel can be obtained at the Mobile Oil tank compound at the harbor. No tugboats operate in Tinian Harbor (Belt Collins 1999).

14.2 ENVIRONMENTAL CONSEQUENCES

14.2.1 Approach to Analysis

14.2.1.1 Methodology

The need for the actions proposed on Tinian is to provide facilities to allow Marine Corps forces relocating to Guam to sustain their combat readiness that could not be accommodated on Guam. Construction and operation activities under the proposed action have been compared to the no-action alternative. There is no construction or modification of existing facilities at Tinian Harbor, Tinian International Airport, North Field or the roadways for training under the proposed action. Existing facilities would be used by existing modes of transportation.

14.2.1.2 Determination of Significance

A determination of significant adverse effect is made where the projected increase in transportation would exceed the infrastructure for that mode of transportation, such that the infrastructure would not be able to service additional demands while maintaining the same level of service for existing users.

14.2.1.3 Issues Identified during Public Scoping Process

As part of the analysis, concerns related to marine transportation that were mentioned by the public, including regulatory stakeholders, during the public scoping meetings were addressed. This included concern for the impact of the proposed military relocation on harbor and navigable waters. Respondents expressed a desire for the military to invest in improving the present harbor infrastructure and for undertaking necessary repairs to the harbor facility. The public expressed a desire to be informed of how the military control would affect local small craft operators who presently use the harbor facility. Concerns were also expressed regarding restriction of public access and movement through the harbor and airport due to military control. Specific comments regarding road transportation were not raised.

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Figure 14.2-1
Tinian Inner Harbor

However, access to tourist and historical locations within military zone was identified as a concern by the public.

14.2.2 Alternative 1 (Preferred Alternative)

14.2.2.1 Tinian

Construction

No new transportation infrastructure would be required for implementation of Alternative 1 at Tinian. There is no construction or modification of existing facilities at Tinian Harbor, Tinian International Airport, North Field or on the roadways for the training related to the relocation. There would be no impact to marine transportation.

Operation

Roads

Under the proposed training, 200 to 400 personnel would be transported between Andersen Air Force Base (AFB) North Field on Guam to Tinian International Airport (West Field) on Tinian, depending on the type of aircraft. Frequency of the training would be approximately one week per month. The various routes proposed to transport the personnel from the airport would be on foot or by contracted bus service with the exception of up to four humvees for ammunition and equipment.

The range area would not be accessible by non-participating personnel during training, including sufficient lead-time before training to ensure range area clearance. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would maintain access to areas where training is not being conducted. Broadway would be closed during training. However, the public would be able to travel on 8th Avenue, check in with personnel manning the first traffic control point. Once cleared by range control, they would proceed on 8th Avenue, checking in with each successive traffic control point until clear of the training area. The additional traffic proposed by transporting personnel, equipment, and ammunition from the airport to the ranges would not exceed the existing capacity of the roadways; impacts to roadways would be less than significant.

Airport

There is no construction or modification proposed at the airport for training. As indicated above, air transport would be between Andersen AFB North Field on Guam to Tinian International Airport (West Field) on Tinian, depending on the type of aircraft. Only the C-17s need the use of the Tinian West Field Airport due to the runway requirements for these aircraft and there would be 2 airlifts to transport 200 Marines and 4 airlifts to transport 400 Marines per training event. No impacts to the Tinian International Airport are anticipated. In addition, public access to the Tinian International Airport would not be impacted.

Harbors

If equipment is moved by barge, one single barge would be able to carry the equipment necessary to support the estimated 200 to 400 Marine training evolution. The harbor currently accommodates this type of marine vessel activity on a regular basis. Therefore, the addition of one barge per month would result in no impact to marine transportation in Tinian Harbor.

14.2.2.2 Summary of Alternative 1 Impacts

Table 14.2-1 summarizes Alternative 1 impacts.

Table 14.2-1. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Less than significant impact to roads; no impact to the airport or to marine transportation in Tinian Harbor.
	Operation	Less than significant impact to roads; no impact to the airport or to marine transportation in Tinian Harbor.

14.2.2.3 Alternative 1 Proposed Mitigation Measures

No mitigation measures are suggested for Alternative 1.

14.2.3 Alternative 2

14.2.3.1 Tinian

Construction

The impacts for Alternative 2 are the same as Alternative 1.

Operation

Roads

Under the proposed training, 200 to 400 personnel would be transported between Andersen AFB North Field on Guam to either the bivouac area, Tinian North Field, or Tinian International Airport (West Field) on Tinian, depending on the type of aircraft. Frequency of the training would be approximately one week per month. The various routes proposed to transport the personnel from the airport would be on foot or by contracted bus service with the exception of up to four humvees for ammunition and equipment. The range area would not be accessible by non-participating personnel during training, including sufficient lead-time before training to ensure range area clearance. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would maintain access to areas where training is not being conducted. Broadway would be closed during training. However, the public would be able to travel on 8th Avenue, check in with personnel manning the first traffic control point. Once cleared by range control, they would proceed on 8th Avenue, checking in with each successive traffic control point until clear of the training area. The additional traffic proposed by transporting personnel, equipment, and ammunition from the airport to the ranges would not exceed the existing capacity of the roadways; impacts to roadways would be less than significant.

Airport

The impacts for Alternative 2 are the same as Alternative 1.

Harbors

The impacts for Alternative 2 are the same as Alternative 1.

14.2.3.2 Summary of Alternative 2 Impacts

Table 14.2-2 summarizes Alternative 2 impacts.

Table 14.2-2. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Less than significant impact to roads; no impact to the airport or to marine transportation in Tinian Harbor.
	Operation	Less than significant impact to roads; no impact to the airport or to marine transportation in Tinian Harbor.

14.2.3.3 Alternative 2 Proposed Mitigation Measures

No mitigation measures are suggested for Alternative 2.

14.2.4 Alternative 3

14.2.4.1 Tinian

Construction

The impacts for Alternative 3 are the same as Alternative 1.

Operation

Roads

Under the proposed training, 200 to 400 personnel would be transported between Andersen AFB North Field on Guam to either the bivouac area, Tinian North Field, or Tinian International Airport (West Field) on Tinian, depending on the type of aircraft. Frequency of the training would be approximately one week per month. The various routes proposed to transport the personnel from the airport would be on foot or by contracted bus service with the exception of up to four humvees for ammunition and equipment. The range area would not be accessible by non-participating personnel during training, including sufficient lead-time before training to ensure range area clearance. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would maintain access to areas where training is not being conducted. Broadway and 86th Street would be closed during training. However, the public would be able to travel on 8th Avenue through the unpaved section west of the Tinian Airport, check in with personnel manning the first traffic control point. Once cleared by range control, they would proceed on 8th Avenue, checking in with each successive traffic control point until clear of the training area. The additional traffic proposed by transporting personnel, equipment, and ammunition from the airport to the ranges would not exceed the existing capacity of the roadways; impacts to roadways would be less than significant.

Airport

The impacts for Alternative 3 are the same as Alternative 1.

Harbors

The impacts for Alternative 3 are would be the same as Alternative 1.

14.2.4.2 Summary of Alternative 3 Impacts

Table 14.2-3 summarizes Alternative 3 impacts.

Table 14.2-3. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Less than significant impact to roads; no impact to the airport or to marine transportation in Tinian Harbor.
	Operation	Less than significant impact to roads; no impact to the airport or to marine transportation in Tinian Harbor.

14.2.4.3 Alternative 3 Proposed Mitigation Measures

No mitigation measures are suggested for Alternative 3.

14.2.5 No-Action Alternative

Under the no-action, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. Existing operations on Tinian would continue. Therefore, the no-action alternative would result in no impacts to roadways. Since there is no proposed construction or transportation of Marines or supplies by ship or barge, there would be no impact to marine transportation in Tinian Harbor.

14.2.6 Summary of Impacts

Table 14.2-4 summarizes the potential impacts of each action alternative and the no-action alternative. A text summary is provided below.

Table 14.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Roads			
• LSI	• LSI	• LSI	• NI
Airport			
• NI	• NI	• NI	• NI
Tinian Harbor			
• NI	• NI	• NI	• NI

Legend: LSI = Less than significant impact, NI = No impact.

14.2.7 Summary of Proposed Mitigation Measures

Table 14.2-5 summarizes the proposed mitigation measures.

Table 14.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Roads		
• None	• None	• None
Airport		
• None	• None	• None
Tinian Harbor		
• None	• None	• None

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CHAPTER 15. UTILITIES

15.1 AFFECTED ENVIRONMENT

15.1.1 Definition of Resource

This section includes information related to existing electrical utilities, potable water supplies, wastewater systems, and solid waste facilities in the Commonwealth of the Northern Mariana Islands (CNMI) that could be directly or indirectly impacted by the proposed Marine Corps relocation. The region of influence (ROI) for this resource includes the Department of Defense (DoD) and public utilities on Tinian that could be directly or indirectly impacted by the proposed training activities.

15.1.2 Tinian

15.1.2.1 Power

The ROI for power includes the generation units and transmission lines supporting the existing island wide power system on Tinian.

The existing island-wide power system is owned by Commonwealth Utility Corporation (CUC) and operated by Telesource CNMI Inc. (Telesource). Operations include power generation, transmission, and distribution. The generation facility consists of the following components:

- Four – 2.5 megawatt (MW) diesel generators
- Two – 5 MW diesel generators
- Two exhaust stacks:
  - One 90 foot (ft) (27 meter [m]) tall stack to service the four – 2.5 MW generators
  - One 175 ft (53 m) tall stack to service the two – 5 MW generators
- An above-ground fuel delivery pipeline from Tinian Harbor to a storage tank adjacent to the power plant facility
- Expansion capability for two additional 5 MW diesel generators (including space inside the existing facility and tie-in points to the existing exhaust stack)

Current peak demand on Tinian is less than 5 MW, having been reduced from a prior peak demand of approximately 8.5 MW. The drop in demand is likely attributed to conservation measures from the two main users, the Dynasty Casino and the International Broadcasting Bureau (IBB). With the current configuration of the generation facility, the practical peak capacity is 15 MW, leaving at least one 5 MW generator or two 2.5 MW generators in reserve for maintenance backup during this peak generation.

The existing transmission and distribution system on Tinian includes primary feed lines with capacities of 13.8 kilovolts (kV), with the exception of a small area in the village of San Jose around the high school where a transformer upgrade is being pursued that would enable conversion of this area to a 13.8 kV feed line.

Currently, a primary 13.8 kV feed line runs from the generation facility to the IBB via 8th Avenue. This feed line is above ground except for a portion west of the airport that is buried underground to facilitate the recent runway expansion clear zone. Up to 1 MW of power is available for use from this feed line assuming the IBB draws their maximum anticipated power load.

A separate 13.8 kV feed line runs from the generation facility to the airport. This feed line runs above ground via Broadway north to the airport access road, then west along this airport access road to the airport. Up to 1.5 MW would be available for use from this feed line following expansion of the airport.

15.1.2.2 Potable Water

The ROI for potable water includes the existing municipal potable water system on Tinian. The primary source of potable water on Tinian is the freshwater Marpo Valley marsh. The marsh is the exposed surface of a basal groundwater lens. Water is collected from the lens by two horizontal wells, Maui Well No. 1 and Maui Well No. 2. It has been estimated that the Maui Well Nos. 1 and 2 together can produce at least 1 million gallons per day (MGd) (3.8 million liters per day [mld]) of clean, low salinity, potable water in the dry season, and 1.5 MGd (5.7 mld) in the wet season (Belt Collins 2003).

Tinian's public water system is operated and maintained by the CUC. Existing water infrastructure includes the two Maui-type horizontal wells, four deep vertical wells, chlorine injection points, two storage tanks, and water distribution lines servicing the San Jose, Makpo Heights, and Carolinas Heights areas. The two storage tanks include a 0.25 million gallon (MG) (0.95 million liter) tank south of the airport; and a 0.5 MG (1.9 million liter) tank in the vicinity of Carolinas Heights.

Currently, the quantity of water production from municipal wells easily meets the current average daily water demand of approximately 1.3 MGd (4.9 mld). The capacity for water production is 2.2 MGd (8.3 mld) based on a 24-hour period and 1.8 MGd (12.3 mld) for a 16-hour period.

15.1.2.3 Wastewater

There is currently no centralized wastewater treatment system on Tinian. Most residents utilize personal septic tanks with leach fields or cesspools. The Tinian Dynasty Hotel and Casino has its own tertiary treatment plant with an average flow of 0.17 MGd (0.64 mld) and discharges the treated effluent to a leach field on the hotel's property. The IBB has its own septic tank/leach field system. DoD installed a septic tank/leach field in 1998-1999 in support of the "Tandem Thrust" training exercise (CNMI Division of Water Quality [DEQ] 1999). The size of the septic tank is 25-feet (ft) (8-meters [m]) long, 25-ft (8-m) wide and 5-ft (1.5-m) deep below bottom of the outlet pipe. The size of the leach field is 70-ft (21-m) long, 40-ft (12-m) wide and 6-ft (2-m) deep from finish grade to bottom of gravel. The system was permitted to service population of 2,500 and handle an average daily sewage flow of 6,640 gallons/day (25,140 liters/day). That exercise involved approximately 2,000 people for one week. This DoD septic tank/leach field is not currently being used, so its total capacity would be available. Portable sanitary facilities are used on Tinian, being available from an on-island company.

A centralized wastewater treatment plant, treating wastewater mainly generated from residents on the southern portion of the island, was studied and proposed at a location south of the IBB, west of 8th Avenue, and co-located with a proposed solid waste landfill. Funding to construct and operate the proposed wastewater treatment plant is not currently available. The proposed new training ranges would not restrict civilian access to and west of 8th Avenue, thus there would be no impact to the operation of the proposed new wastewater treatment plant should it be built.

15.1.2.4 Solid Waste

The ROI for solid waste includes the existing unlined open dump operated by the CNMI Department of Public Works and the proposed new landfill adjacent to the proposed new wastewater treatment plant, south of the IBB, and west of 8th Avenue. All municipal solid waste (including septage) is currently received at an open dumpsite located approximately 0.5 mile (mi) (0.8 kilometer [km]) north of San Jose, and west of 8th Avenue. The disposal site is operated as an open burning dump. Current practice is for septage pumped from septic tanks, cesspools, or portable sanitation devices to be discharged at an area adjacent to the existing open dumpsite as there is no separate septage disposal facility. The existing municipal solid waste dumpsite does not comply with the Resource Conservation and Recovery Act Subtitle D regulations for municipal solid waste landfills (40 Code of Federal Regulations Part 258). Development of a new compliant landfill for Tinian is currently in the planning/design phase (Wil-Chee Planning 2005). The proposed new ranges would not restrict civilian access to and west of 8th Avenue. Thus, operations at the proposed new landfill and the existing landfill would not be impacted.

15.2 Environmental Consequences

This section contains a discussion of the potential environmental consequences associated with implementation of the proposed alternatives for power, potable water, wastewater, and solid waste.

15.2.1.1 Approach to Analysis

Methodology

The impact analysis for utilities is based on comparing the existing capacity and demand on a utility to the projected capacity and demand under each of the alternatives.

Determination of Significance

A determination of significant adverse effect is made where the projected increase in demand for a utility would exceed the planned capacity for that utility.

Issues Identified during Public Scoping Process

As part of the analysis, concerns related to utilities that were mentioned by the public, including regulatory stakeholders, during the public scoping meetings were addressed. This includes concern for the impact that the proposed United States (U.S.) Marine Corps relocation would have on public utilities on Tinian, and a desire on the part of respondents for the military to partner with the CUC to improve utilities and infrastructure for all residents.

Respondents questioned if the existing utility infrastructure and the reliability of the CUC could sustain adequate utility services with the increase in military training activities. In addition, respondents requested that a certified solid waste landfill be constructed and operated on Tinian.

15.2.2 Alternative 1 (Preferred Alternative)

15.2.2.1 Tinian

Construction

There would be minimal construction activities associated with the proposed action. There would be some clearing and grading to establish the ranges and for placement of targets. Construction equipment would be diesel-powered and there would be water trucks available for construction-related activities such as dust-control. Water trucks would utilize the municipal water supply; however, this would be short-term and would not have an adverse impact on the municipal water supply. Bottled potable water would be provided to construction workers for drinking. Impacts to utilities would be less than significant.

Operation

No supporting facilities are proposed for the Tinian firing ranges. All training would be considered "expeditionary," in that the Marines would bring all necessary equipment to the ranges, would bivouac onsite, and would remove all equipment following completion of the training activities. No construction of utility infrastructure or tie-ins to public utilities are proposed to support the firing ranges.

Water service would be provided via a water truck. Estimated potable water consumption would be 1 gallon per person per day for drinking and additional water would be consumed for cleaning, bathing, etc. Bottled potable water would be delivered to the range support areas associated with the four proposed ranges. Range fire fighting would be performed by local fire fighting services, as augmented for a range fire fighting role. Portable sanitary facilities would be provided at the ranges and bivouac areas by a contractor. Solid waste would be collected and returned with the using unit, pending a certified landfill being established on Tinian. Portable generators or solar-battery systems would be used to operate any equipment needed at the bivouac site.

The existing municipal water supply is adequate to support the proposed military demand. Proposed training activities would have no impact on public power or wastewater utilities on Tinian. Solid waste would be back-hauled to Guam, and the DoD would not dispose of solid waste at the open dump operated by the CNMI Department of Public Works.

For the training exercises, portable sanitary facilities would be provided and maintained by a contractor company. This contract would require the collected wastewater to be disposed in compliance with both local and federal regulations and that compliance would be monitored by DoD field inspectors. Leach field friendly odor control chemicals, such as IceClear® LavFluid or Spartan Consume® Eco-Lyzer® Neutral Disinfectant, would be used by the contracted services to prevent any impacts to groundwater from septic tank/leach field operations. The estimated wastewater generation for 400 people for one week using portable toilets is approximately 5 gallons per person per day (19 liters per person per day), or a total of 2,000 gallons per day (7,529 liters per day) (*Integrated Publishing-Construction,* Public Picnic Parks (toilet waste only), www.tpub.com). Potential disposal methods that the contractor could utilize include: 1) taking the wastewater to the existing DoD septic tank/leach field system (refer to Figure 2.1-3), after performing maintenance to ensure proper operation of this existing DoD facility, 2) taking the wastewater to the Dynasty Casino and injecting into their tertiary treatment system, 3) constructing a new leach field to handle the wastewater, and 4) finding other existing septic tank/leach field systems on Tinian with the capacity to accept this wastewater and with an owner willing to accept it. The preferred approach would be option 1, the use of an existing DoD septic tank/leach field. Septage from the portable sanitary facilities would be emptied by the providing contractor into and treated at the existing DoD septic tank/leach field. The existing septic tank with dimensions of 25 ft x 20 ft x 5 ft (8 m x 8 m x 2 m) would provide 224 hours retention time for the estimated flow of 2,000 gallons per day (7,529 liters per day), which exceeds UFC suggested 24 hours retention time in a normal septic tank design. The other options would not be implemented as part of the proposed action. The existing DoD system has adequate pretreatment capacity based on the original design basis population and can handle the flows without major failure or raw sewage backups (CNMI DEQ 1999). DoD would monitor the contractor's execution in proper disposal of the wastewater and would perform the following operation and maintenance of the septic tank and leach field system per permit requirements:

- Septic system would be inspected at intervals of not more than 3 years to determine the rate of scum and sludge accumulation.
- Inlet, outlet, and key joints to the septic tank would be inspected for damage after each pump out

- The septic tank would be cleaned or pumped out if the bottom of the scum layer is within 3 inches (in) (8 centimeters [cm]) of the bottom of the outlet device, and the sludge level is within 8 inches (20 cm) from the bottom of the outlet device.
- DoD would obtain approval from the DEQ prior to using a cleaning agent (degreaser) to maintain the system.

Impacts to utilities would be less than significant. Impacts to water resources are presented in Chapter 4, Water Resources; use of the existing septic tank/leach field would result in less than significant impacts to groundwater and nearshore water.

15.2.2.2 Summary of Alternative 1 Impacts

Table 15.2-1 summarizes Alternative 1 impacts.

Table 15.2-1. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	There would be water trucks available for construction-related activities such as dust-control. Water trucks would utilize the municipal water supply. The existing municipal water supply is adequate to support the proposed military demand; no adverse impacts would be anticipated.
	Operation	No construction of utility infrastructure or tie-ins to public utilities are proposed to support the firing ranges. Potable water from the municipal water supply would be provided via a water truck. The existing municipal water supply is adequate to support the proposed military demand. Proposed training activities would have no impact on public power and wastewater utilities on Tinian. Solid waste would be back-hauled to Guam, and the DoD would not dispose of solid waste at the open dump operated by the CNMI Department of Public Works. Septage from the portable sanitary facilities would be emptied by the providing company into and treated at the existing DoD septic tank/leach field.

15.2.2.3 Alternative 1 Proposed Mitigation Measures

No mitigation measures are suggested for Alternative 1.

15.2.3 Alternative 2

15.2.3.1 Tinian

<u>Construction</u>

The construction impacts for Alternative 2 are the same as Alternative 1. Therefore, impacts to utilities would be less than significant.

<u>Operation</u>

The operation impacts for Alternative 2 are the same as Alternative 1. Therefore, impacts to utilities would be less than significant.

15.2.3.2 Summary of Alternative 2 Impacts

Table 15.2-2 summarizes Alternative 2 impacts.

Table 15.2-2. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	There would be water trucks available for construction-related activities such as dust-control. Water trucks would utilize the municipal water supply. The existing municipal water supply is adequate to support the proposed military demand; no adverse impacts would be anticipated.
	Operation	No construction of utility infrastructure or tie-ins to public utilities are proposed to support the firing ranges. Potable water from the municipal water supply would be provided via a water truck. The existing municipal water supply is adequate to support the proposed military demand. Proposed training activities would have no impact on public power and wastewater utilities on Tinian. Solid waste would be back-hauled to Guam, and the DoD would not dispose of solid waste at the open dump operated by the CNMI Department of Public Works. Septage from the portable sanitary facilities would be emptied by the providing company into and treated at the existing DoD septic tank/leach field.

15.2.3.3 Alternative 2 Proposed Mitigation Measures

No mitigation measures are suggested for Alternative 2.

15.2.4 Alternative 3

15.2.4.1 Tinian

Construction

The construction impacts for Alternative 3 are the same as Alternative 1. Therefore, impacts to utilities would be less than significant.

Operation

The operation impacts for Alternative 2 are the same as Alternative 1. Therefore, impacts to utilities would be less than significant.

15.2.4.2 Summary of Alternative 3 Impacts

Table 15.2-3 summarizes Alternative 3 impacts.

Table 15.2-3. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	There would be water trucks available for construction-related activities such as dust-control. Water trucks would utilize the municipal water supply. The existing municipal water supply is adequate to support the proposed military demand; no adverse impacts would be anticipated.
	Operation	No construction of utility infrastructure or tie-ins to public utilities are proposed to support the firing ranges. Potable water from the municipal water supply would be provided via a water truck. The existing municipal water supply is adequate to support the proposed military demand. Proposed training activities would have no impact on public power and wastewater utilities on Tinian. Solid waste would be back-hauled to Guam, and the DoD would not dispose of solid waste at the open dump operated by the CNMI Department of Public Works. Septage from the portable sanitary facilities would be emptied by the providing company into and treated at the existing DoD septic tank/leach field.

15.2.4.3 Alternative 3 Proposed Mitigation Measures

No mitigation measures are suggested for Alternative 3.

15.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. There would be no change to power, potable water, wastewater, and solid waste infrastructure on Tinian. Therefore, the no-action alternative would have no impacts to utilities.

15.2.6 Summary of Impacts

Table 15.2-4 summarizes the potential impacts of each action alternative and the no-action alternative. A text summary is provided below.

Table 15.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Utilities			
LSI • Use of existing wastewater treatment systems and potable water NI • Power and solid waste utilities would not be used.	LSI • Use of existing wastewater treatment systems and potable water NI • Power and solid waste utilities would not be used.	LSI • Use of existing wastewater treatment systems and potable water NI • Power and solid waste utilities would not be used.	NI • No impacts

Legend: LSI = Less than significant impact, NI = No impact.

No construction of utility infrastructure or tie-ins to public utilities are proposed. However, treatment and disposal of wastewater generated during training exercises would be done at existing DoD on-island facilities. Potable water would also be obtained from the current on-island public water system and used for fire-fighting activities. These existing systems are adequate to handle the additional demand with less than significant impacts. Thus the overall summary of impacts would be deemed less than significant from implementation of any of the alternatives considered.

15.2.7 Summary of Proposed Mitigation Measures

Less than significant impacts would result from the implementation of the proposed action, and no mitigation measures are required. Table 15.2-5 summarizes the proposed mitigation measures.

Table 15.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Utilities		
• None	• None	• None

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CHAPTER 16. SOCIOECONOMICS AND GENERAL SERVICES

Because of the relatively small size of the Commonwealth of the Northern Mariana Islands (CNMI), most of the anticipated socioeconomic impacts of the proposed action are expected to affect the Commonwealth as a whole. This chapter summarizes a socioeconomic analysis performed in 2008-2009 and documented in the report, Socioeconomic Impact Analysis Study (SIAS), provided in its entirety in Volume 9 Appendix F. The magnitude of the proposed action on the CNMI is far less than for Guam so there is limited discussion on fewer topics in this Volume. The proposed action would occur on Tinian, one island in the CNMI. This analysis presents information on the CNMI as a whole, Tinian in particular, and Saipan and Rota in brief detail.

This chapter begins with an affected environment section that provides a current and historical perspective on the current socioeconomic status of the CNMI, including economic characteristics, public services, and sociocultural issues, each discussed further in the environmental consequences sections.

16.1 AFFECTED ENVIRONMENT

16.1.1 Historical and Economic Overview

16.1.1.1 CNMI

The CNMI became part of the United States (U.S.) Trust Territories of the Pacific following World War II (WWII).

The Northern Marianas negotiated a Commonwealth Agreement with the U.S., approved in 1975. In 1986, the CNMI assumed control of its domestic affairs while the U.S. government retained responsibility over foreign affairs and defense. One of the controversial economic aspects of the Commonwealth Agreement was the ability it gave the CNMI to control the minimum wages and immigration visas/work permits of foreign workers. Foreign workers included Chinese workers employed in the garment manufacturing industry (largely on Saipan) and Filipino or other Asian workers in the hotel and resort industry.

The CNMI's dependence on guest workers and tourism caused economic difficulties in the 1990s. Wage rates were maintained at substantially lower levels than in neighboring Guam or in Puerto Rico. The evolution of the General Agreement of Trade and Tariffs into the World Trade Organization and the accompanying liberalization of trade between the U.S. mainland and other Asian garment manufacturing countries caused the CNMI garment industry to go into decline. This decline coincided with a drop in Japanese tourist arrivals following the September 11, 2001 attack of the World Trade Center. In 2005, Japan Airlines, the main airline between the CNMI and Japan, discontinued its Saipan service.

Currently, the economy of the CNMI is depressed with limited prospects for near-term recovery. Private sector employment fell from 32,790 jobs in 2002 to 22,622 jobs in 2007, with the biggest drop in manufacturing (U.S. Census Bureau 2002 and 2007).

An evolving area of concern for the CNMI businesses involves Title VII, Section 702 of the 2008 Consolidated Natural Resources Act, now U.S. Public Law 110-229. The law re-federalizes the CNMI immigration policy and control. It became effective November 2009, followed by a transition period. Areas of uncertainty include guest worker labor availability and the continued ability of Chinese and Russians to invest in second homes or other real estate.

Resorts are particularly at risk because of their dependence on foreign workers who may be repatriated, and because tourists from the People's Republic of China and Russia, comprising about 20% of tourism revenues in Fiscal Year 2008 (Hotel Association of the Northern Mariana Islands 2009b) no longer qualify for visa waivers under the new rules. Additionally, the previous economic advantage of hiring workers from Asian sources who accept lower wages may become moot as the CNMI minimum wage rises incrementally to meet the U.S. federal minimum wage because of Public Law 110-28 (enacted in 2007).

A recent study commissioned by the governor of the CNMI and funded by the Department of the Interior estimates a 44% decrease in Gross Domestic Product in the CNMI due to the combined federalization of wages and immigration (CNMI Office of the Governor 2008).

The political reaction to re-federalization has resulted in strong suspicion of other federal actions in the CNMI. For example, in 2008, President George W. Bush designated the Marianas Trench and surrounding waters as the Marianas Trench Marine Monument. While the designation could represent an economic asset to the CNMI in tourist revenues and non-governmental organization activity (Pew Environmental 2008), it has also been characterized as a federal encroachment on the CNMI's local sovereignty (Sebastian 2008).

Other challenges to the CNMI economy include its outdated and inefficient power equipment. These have resulted in high utility rates that drain consumer expenditures from other normal activity (CNMI Department of Commerce 2008a).

Finally, some economic observers (e.g., Bartolucci and Shreni 2006) believe that the CNMI's current real estate system presents a deterrent to outside investors and tends to depress land values. Namely, there exists a Constitutional restriction of real property ownership to persons of at least 25% Northern Mariana Islands descent. The purpose of this restriction is to prevent the alienation of land from native peoples that has occurred in places such as the Hawaiian Islands. This is covered in more length in the section "Sociocultural Issues."

16.1.1.2 Tinian

From a historical perspective, the island of Tinian is best known as the forward base from where nuclear attacks on Japan were launched in 1945. Most residents moved from Tinian following the close of the war. In recent years the airstrip has become an attraction for Tinian's small tourism industry. In general however, Tinian has remained a quiet and lightly populated island.

The leasing of land from the CNMI by the federal government has been an economic factor since January 6, 1983, when the federal government finalized a lease agreement for the use of 17,799 acres (ac) (7,203 hectares [ha]) of land and waters for military training. Other items included in the lease agreement were 177 acres in Tanapag Harbor on Saipan, and the entire Farallon de Mendinilla (an approximate area of 206 acres). The Tinian portion of the agreement encompasses roughly the northern two-thirds of the island. In total, the government paid $19,520,600 for the lease agreement. Of that amount, $17,500,000 was for the Tinian acreage. The lease agreement is effective for 50 years (until year 2028), with a 50 year renewal option.

The CNMI and Department of Defense (DoD) have a leaseback agreement for a portion of the public lands leased to the military. The CNMI government issues permits for the leaseback lands making them available for small agricultural and grazing operations. The leaseback agreement was amended, and has now expired. The agreement is now available on a month-to-month basis, at the discretion of the military. The military has also ceded some lands in and around the West Field back to the local government of

Tinian to build and operate the civilian airport. The current remaining military lease area is 15,353 ac (6,213 ha).

The leased lands utilized by the military are called the Exclusive Military Use Area and they are open to the public only during times when military training is not occurring. The leaseback area on the other hand, is a joint use area at all times, and military and civilian activities on this land must be compatible.

When the original lease was made, residents anticipated the economic benefits of a permanent base. As the Covenant was being discussed in the early 1970s, military planners told Tinian residents that North field would be refurbished into a fully-functioning B-52 Air Force Base, generating approximately 300 jobs for the local population at mainland U.S. wage scales (Tinian Chamber of Commerce 2009). The construction of such a base would have allowed residents to access (now-defunct) clauses in the original lease agreement guaranteeing them access to on-base amenities. In reality however, the various military services have conducted only sporadic training exercises on Tinian. While there is no permanent residential population on the military's land, it is usually available for resident food-gathering and recreation, and for tour business access to beaches and historical sites.

Tinian's economy is dominated by one existing casino, a small tourism trade centered on the island's role in WWII, and marine activities such as diving. In the early 1990s the island hosted a tuna transshipment and freezer facility, but this facility closed late in the decade when its owner entered bankruptcy. Agriculture on the island is primarily of a subsistence nature, though there is some small cash cropping of vegetables. Cattle-ranching has been promoted as a growth industry on Tinian but remains in its early stages; currently, it is primarily a subsistence activity. Both cattle ranching and tourism are dependent on access to the military lease area.

Household income on Tinian is derived mainly from the CNMI government employment and a small retail trade sector. Casino gaming revenues enter the economy through revenues to the taxation by the local government. The existing casino has been staffed almost entirely with foreign guest workers, as longtime Tinian residents are more likely to seek work in the higher-paying government sector.

The development of the Tinian casino and resort economy shows its reliance on the Asian market. In the late 1970s, the people of Tinian decided to permit gambling on the island through construction of up to five casinos. Thus far only the Tinian Dynasty Hotel and Casino resort has actually been constructed. It enjoyed success after its 1998 opening but has suffered in the CNMI economic recession. In 2008, a second casino (Bridge Investment Group) began construction, with two more in the planning and permitting phases. However, reflecting both international and the CNMI economic conditions, Bridge Investment Group subsequently halted its current casino construction. Various industry representatives interviewed for this report believe the Tinian Dynasty may have to close if and when visa waiver federalization takes effect (Hotel Association of the Northern Mariana Islands 2009a, Marianas Visitors Authority 2009a, Tinian Dynasty Hotel and Casino 2009a).

The Tinian Dynasty Hotel and Casino, the only casino operating on Tinian, is at risk of closure for two reasons. The first is because a large percentage of its customer base is Chinese. The second is because the availability of a foreign labor workforce is now threatened by re-federalization. Table 16.1-1 shows the Tinian Dynasty's reliance on the Chinese market as well as its recent lower occupancy numbers. The low level of "Guam and Other U.S." percentages indicates that few of the current military personnel on Guam have spent rest and relaxation time on Tinian.

Table 16.1-1. Tinian Dynasty Hotel and Casino National Markets and Occupancy Levels

	2002	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*
Tinian Dynasty Markets							
China %	24%	39%	55%	58%	65%	63%	56%
Japan %	33%	30%	24%	22%	20%	18%	24%
Korea %	19%	13%	10%	7%	5%	8%	10%
Guam, Other U.S. %	8%	2%	1%	1%	1%	1%	2%
All Else:	17%	16%	10%	12%	9%	10%	9%
Tinian Dynasty Average Occupancy Levels	**51%**	**45%**	**58%**	**62%**	**63%**	**54%**	**43%**

Source: Data on visitors by nationality provided by Tinian Dynasty Hotel and Casino (Tinian Dynasty Hotel and Casino 2009b); occupancies calculated using data and/or assumptions vetted with the casino – total number of guests per year, 400 rooms, 1.75 average persons per room, average three-night stay.

In addition to the Tinian Dynasty, there are two other local hotels on Tinian. Table 16.1-2 shows a trend estimate for Tinian's total average daily visitor count, using tourist counts from these locations. Given a 2005 Tinian resident population of 2,829, this estimate suggests that tourists comprised about 15% of the total number of people on island at any one time for that year. The visitor population declined by about 30% from 2005 to 2008. There are no data on the rate of resident population decline during those years.

Table 16.1-2. Tinian Average Daily Visitor Count

	2002	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*
Tinian Dynasty	418	369	477	504	512	437	350
Day Trippers	12	11	14	14	15	12	10
Total	**430**	**379**	**491**	**519**	**526**	**450**	**360**

Source: Tinian Dynasty Hotel and Casino (2009b) data on annual visitors, plus additional assumptions provided by or vetted with the casino – additional visitors equal 10% of Dynasty numbers; average length of stay 3.5 days.

Insufficient transportation infrastructure is also noted as a barrier to further tourism development throughout Tinian, and as a factor in the Tinian Dynasty's poor occupancy rate and financial performance. The recent reduction in air travel and corresponding slump in tourist numbers on all the CNMI islands has led to less revenue going to any island. That, coupled with the fact of rising fuel and food prices, has made living on Tinian economically difficult for residents.

16.1.1.3 Saipan

In conjunction with and since the decline of the previously strong garment industry, tourism has comprised a major part of the Saipan economy for decades. Saipan's principal markets have been Japan and Korea, with strong recent growth from China and Russia. Tourism was again surging in early 2008 before the global economic crisis occurred and new federal controls over wage levels and visa entry permits were announced. As a result, as of June 2009, visitor arrivals (for all purposes, including business) were down 29% from the previous June, with declines from China (72%) and Russia (43%) leading the downturn. The Marianas Visitors Authority said the Russian decline was due to the misimpression that the new visa permit rules had already been implemented (Marianas Visitors Authority 2009a, Marianas Visitors Authority 2009b).

16.1.1.4 Rota

The 2007 Economic Census indicates Rota's private-sector economy that year was dominated by retail trade and the accommodations and food service industries. Rota has a number of small hotels and hostels, and a very small visitor count (680 in June 2009, down from 953 in June 2008) is dominated by U.S./Guam leisure and business visitors, followed by Japanese (Marianas Visitors Authority 2009a).

Although no casinos have yet been built on Rota, in 2007 a Casino Gaming Commission was created and island leaders have been looking into this activity for Rota's economic future (Marchesseault 2009).

Rota has also long been known as an agricultural island, though the 2007 U.S. Agricultural Census indicates the number of farm operators dipped slightly from 2002 to 2007 (99 to 97) and the acreage in farms during the same period dropped from 897 to 770, the smallest amount of any CNMI municipality (U.S. Department of Agriculture [USDA] 2009). However, the reported 2007 market value of Rota agricultural products reached nearly $1 million. Most of this value was from root crops (principally sweet potatoes and taro), followed by vegetables and melons (with cucumbers and watermelons the principal crop in terms of pound raised).

16.1.2 Population Characteristics

16.1.2.1 CNMI

Population trends for the CNMI and Tinian are shown in Table 16.1-3.

Table 16.1-3. Historical and Projected CNMI and Tinian Populations, 1970 - 2015

	1970	*1980*	*1990*	*2000*	*2005*	*2008*	*2010*	*2015*
CNMI	12,359	16,890	44,037	69,706	65,927	62,969	63,031	64,068
Tinian	710	866	2,118	3,540	2,829	NA	NA	NA

NA = Not Applicable
Sources: U.S. Census Bureau 2000, CNMI Department of Commerce Central Statistics Division 2008, Secretariat of the South Pacific 2008.

The CNMI population increased during the 1980s and 1990s due to high birthrates and guest-worker in-migration. However, that trend reversed itself in the 2000s, due to a shrinking economy.

In 2000, the CNMI had a population of 69,921:

- 5% on Tinian (3,540 people)
- 90% on the capital island of Saipan
- 5% on Rota
- Only a handful of residents on the northern islands

By 2005, due to a faltering economy, the CNMI-wide population had dropped to 65,927 and Tinian's population had declined even more rapidly to 2,829, just 4% of the total population (CNMI Department of Commerce, Central Statistics Division 2008). The 2000 CNMI-wide census indicated that the largest population group was Asian.

Currently, the Commonwealth is characterized by a relatively young population (median age 30.1 years); high annual rate of population growth (approximately 2.3% per year); and a relatively long life expectancy at birth (76.7 years). It is estimated that 27% of the population is under 18 and 3% is over age 65. These population characteristics heavily impact the health care and educational systems (Central Intelligence Agency 2009).

Official projections by the U.S. Census Bureau (2008) estimate continued expansion of the population, but the CNMI government statisticians give more weight to the projections of the Secretariat of the South Pacific (included in Table 16.1-3), though they believe even these may be overstated (CNMI Department of Commerce 2008b).

16.1.2.2 Tinian

The 2005 CNMI Department of Commerce Household Income and Expenditure Survey counted 2,829 residents on Tinian. All of Tinian's population is located in the south with 76% of the island's 2005 population located in and around the main village of San José.

The ethnic makeup of Tinian is heavily influenced by the resort/tourism industries that employ large numbers of guest workers from the Philippines and other Asian countries. The 2005 CNMI Household Income and Expenditures Survey found that 32% of the population of Tinian is of Filipino descent and 0.8% was of Micronesian descent. Overall, the Chinese population on Tinian is lower than for the CNMI as a whole as Filipino workers, and a smaller group of Bangladeshi, fill many hotel jobs on Tinian.

Birthplace information for Tinian residence is shown in Table 16.1-4. Despite the population decline from 2000 to 2005, birthplace profiles remained similar. A little less than half the Tinian citizenry was CNMI-born, and a little under half were foreign-born. Additional data from both years showed the great majority of the foreign-born had not become U.S. citizens. Furthermore, the foreign born population has a higher outward migration rate than their native born counterparts.

Table 16.1-4. Tinian Residents by Birthplace, 2000 and 2005

	2000	*2005*
Total Population	**3,540**	**2,829**
Native born	53.6%	54.3%
Born CNMI	44.7%	46.2%
Born Elsewhere in the U.S.	8.8%	8.1%
Foreign born	46.4%	45.7%
Philippines	26.6%	27.0%
China	6.9%	8.8%
Bangladesh	2.6%	2.9%
All Other Foreign	10.3%	7.1%

Source: U.S. Census Bureau 2000.

Tinian's future population growth independent of the proposed action is not certain, as it would likely depend on the construction and success of additional casinos.

16.1.2.3 Saipan

The island of Saipan is home to more than 90% of the population of the CNMI. The 2005 population was 60,608. Only 49% of the residents of Saipan were U.S. citizens at the time, though it should be noted that elements of the garment industry were still active then so that number may have gone up as foreign workers migrated home. Saipan consists of 31% Filipinos, 20% Chamorros, and the remaining consisting of various other Asian and Pacific Islander groups (CNMI Department of Commerce, Central Statistics Division 2008).

16.1.2.4 Rota

U.S. Census records assembled by the U.S. Department of Interior (U.S. Department of the Interior 2009) indicated Rota's population peaked at 3,509 in 1995 and then declined to 3,283 in 2000, less than Tinian's population at the time. CNMI Census data for 2005 indicated a further drop to 2,490 in 2005, still under Tinian's population (CNMI Department of Commerce, Central Statistics Division 2008). Rota's 2005 population had the highest proportion of Chamorros of the three major the CNMI municipalities (65%, vs. 44% for Tinian and 20% for Saipan). It also had the highest proportion of U.S.

citizens (77%, vs. 55% for Tinian and 49% for Saipan) and of children under 18 (35%, vs. 26% for Tinian and 29% for Saipan).

16.1.3 Economic Characteristics

16.1.3.1 Labor Force and Income

CNMI

Minimum wage rates in the CNMI ($4.55/hour) are substantially below comparable wage rates on Guam ($6.55). There have been few organized labor contracts in the guest-worker-dependent sectors of the economy. Thus there is little internal pressure for wage increases.

Average income varies considerably from one ethnic group to another. Chamorros earned a median 2005 annual income of $31,619; Filipinos earned $14,190; peoples of the Freely Associated States of Micronesia (FAS), earned $13,916 (CNMI Department of Commerce, Central Statistics Division 2008).

The raising of CNMI wages to meet the new minimum wage standards would have various consequences on labor force and income. One consequence of the CNMI's guest worker policies has been that most wages were at the legal CNMI minimum wage level. Under Public Law 110-28, the CNMI minimum wage would rise to meet the U.S. federal minimum wage by 2014. It would accomplish this by annual $0.50 increases. The CNMI minimum wage was $4.55 per hour as of September 2009, with another $0.50 increase planned for May 26, 2010 (this increase has since been delayed until September 30, 2010). The rising minimum wage would have an impact on the CNMI income, but is also likely to result in a reduction in overall CNMI employment and a loss of the Commonwealth's competitive wage advantage (Congressional Budget Office 2004, Vallejera 2007). It may also encourage more native born persons to replace foreign workers as wages increase to more desirable levels.

Table 16.1-5 shows employment by industry for the CNMI in 2005. Employment in the manufacturing industry made up about one-third of total employment; the accommodations industry (e.g. Tourism) was the second leading employer.

Table 16.1-5. Employment by Industry, CNMI, 2005

	Total CNMI	*Tinian*	*Saipan*	*Rota*
Total Employed	33,622	1,602	31,109	908
Agriculture/forestry/fisheries/mining	422	15	392	14
Construction	1,640	77	1,505	58
Manufacturing	10,988	31	10,950	7
Wholesale	305	8	297	0
Retail	2,431	23	2,386	22
Transportation/communication/utilities	913	23	875	14
Information	366	0	366	0
Finance	821	62	752	7
Professional Services	1,803	46	1,727	29
Educational	2,070	131	1,794	145
Arts	1,430	69	1,255	105
Accommodation	4,866	677	4,066	123
Other	2,414	170	2,201	43
Public	3,153	270	2,543	341

Source: CNMI Department of Commerce Central Statistics Division 2008

Tinian

The leading employer on Tinian is the accommodations industry, providing more than 40% of jobs. The second leading employer is the public sector (17% of total employment). Tinian's unemployment rate is estimated to be around 17%.

Hourly wages on Tinian have historically been somewhat higher than in the CNMI as a whole. Overall CNMI hourly wages were brought down due to the large amount of low-wage Chinese workers employed on Saipan. Another possible factor contributing to higher wages on Tinian is the relatively high level of educational attainment on the island (Table 16.1-6).

Table 16.1-6. Educational Attainment on Tinian (Population 25 and Older)

	2000	*2005*
Less than 9th grade	9%	10%
9th to 12 grade, no diploma	15%	11%
High school graduate	31%	41%
Some college, no degree	18%	12%
Associate degree	6%	16%
Bachelor's degree	18%	7%
Graduate or professional degree	3%	2%
% High School Grad or Higher	76%	79%
% Bachelor Degree or Higher	21%	9%

Sources: U.S. Census Bureau 2000, CNMI Department of Commerce Central Statistics Division 2008.

Saipan

The Saipan-wide 2005 number of employed persons was 31,109, with the unemployment rate estimated at 7.7%. As previously suggested the population and labor force are both believed to be declining as the depressed economy produces both out-migration and discouraged workers dropping out of the official labor force. Chamorros made up only 12% of the active labor force in 2005, but 30% of the unemployed population. The household median income was $16,835, and per capita income was $6,017.

Rota

Unemployment was 10.1%, the intermediate between Tinian and Saipan. Rota's median household income slightly exceeded that of Tinian in 2005 ($22,270 on Rota, $21,538 on Tinian, and $16,835 on Saipan). However, this likely reflects the effects of strong reliance on government jobs rather than the health of the private sector – of Rota's 908 employed persons in 2005, 51% held government jobs. Using data from the 2007 U.S. Economic Census (that includes private-sector employment only) to calculate average salary by dividing total payroll by number of employees, Rota emerges as having the lowest private-sector average ($8,100, vs. $10,400 on Tinian and about $11,000 on Saipan) (U.S. Census Bureau 2009).

16.1.3.2 Agriculture

CNMI

The CNMI agriculture industry accounts for only a small percentage of employment; however, it is an important component of the local economy because it is a subsistence activity. Table 16.1-7 shows the number of farms and the monetary value of agricultural production, by island, for 2002 and 2007.

Table 16.1-7. Number of Farms and $ Values of Agricultural Production, CNMI, 2002 and 2007

Item	*CNMI Total*		*Tinian*		*Saipan*		*Rota*	
	2002	*2007*	*2002*	*2007*	*2002*	*2007*	*2002*	*2007*
Total # of Farms	214	256	23	31	92	128	99	97
Total $ Value	$2,287,407	$2,409,513	$147,387	$263,622	$1,469,548	$1,241,411	$670,472	$904,480
Root Farms	85	106	2	5	37	54	46	47
Root $ Value	$404,734	$638,498	(D)	$3,010	(D)	$184,228	$297,284	$451,260
Vegetable and Melon Farms	102	110	6	7	64	69	32	34
Vegetable and Melon $ Value	$821,293	$631,470	$54,500	$77,188	$684,178	$340,182	$82,615	$214,100
Fruits and Nuts Farms	103	115	9	8	37	74	57	33
Fruits and Nuts $ value	$343,021	$401,664	$16,000	$72,339	$122,083	$217,480	$204,938	$111,845
Nursery Crop Farms	10	17	1	2	6	10	3	5
Nursery Crop $ Value	$93,247	$178,311	(D)	(D)	$72,600	(D)	(D)	$26,500
Livestock Farms	71	98	11	26	16	36	44	36
Livestock $ Value	$475,167	$279,485	$52,800	$77,945	$365,027	$107,415	$57,340	$94,125
Poultry and Eggs Farms	32	18	1	3	3	9	28	6
Poultry and Eggs $ Value	$143,795	$214,360	(D)	(D)	(D)	$187,745	$24,345	(D)
Fish and Aquaculture Farms	5	5	1	1	1	2	3	2
Fish and Aquaculture $ Value	$6,150	$65,725	(D)	(D)	(D)	(D)	(D)	(D)

Notes: Some farms produce more than one type of crop and are included under multiple categories.
(D) represents that data was withheld so that the sales of individual farms would not be disclosed.
Source: USDA 2009.

Tinian

Tinian has the lowest monetary level of agricultural production of the three islands. Livestock farms are more numerous than other types of farms and account for 30% of the value of agricultural production. Vegetable/melon farms and fruits/nuts farms also each account for about 30% of the value of production on Tinian.

Saipan

Saipan has the highest level of agricultural production of the three islands. Vegetable and melon produce accounts for the highest percentage of sales, however; vegetable and melon sales declined dramatically from 2002 to 2007, and the total value of Saipan agricultural production declined by 15.5% from 2002 to 2007.

Rota

Agricultural production on Rota grew by 35% from 2002 to 2007. This indicates improved efficiency, as the growth occurred despite the loss of two farms. Root produce generally creates the most value of all of the different types of produce (50% of the total in 2007). Vegetable and melon production value increased substantially from 2002 to 2007 while fruit and nut production value declined.

16.1.3.3 Housing Supply and Projections

CNMI

In 2000, the CNMI had the highest median house value of any of the U.S. Insular Areas, exceeding median house values on the U.S. Mainland. More than three-quarters (76%) of the CNMI houses were valued at $100,000 or above in 1999. Approximately 32% of these homes were appraised at $500,000 or above.

Table 16.1-8 presents year 2000 data on the value of housing for the CNMI as a whole, as well as Tinian, Saipan, and Rota. About two-thirds of the houses were constructed since 1980.

Table 16.1-8. Value of Owner-Occupied Housing in CNMI, 2000

	Total CNMI	*Tinian*	*Saipan*	*Rota*
Total Units	**4,408**	**248**	**3,560**	**352**
Less than $50,000	10.1%	6.8%	10.7%	11.1%
$50,000 to $99,999	17.2%	17.2%	16.3%	22.7%
$100,000 to $149,999	16.8%	16.5%	16.5%	19.6%
$150,000 to $199,999	13.9%	21.0%	13.0%	13.1%
$200,000 to $299,999	15.2%	19.0%	14.6%	15.9%
$300,000 to $499,999	10.2%	3.6%	11.6%	5.2%
$500,000 or more	16.6%	15.7%	17.1%	12.5%
Median	$159,829	$162,234	$161,205	$125,000

Source: U.S. Census Bureau 2000.

Tinian

Table 16.1-9 summarizes the most recent available information on housing occupancy on Tinian.

A substantial number of houses were vacant at the time of the 2000 census. While the Tinian homeownership rate was low, there also remained a high rental vacancy rate. This was caused by limited employment and the existence of group housing for hotel workers. By 2005, the number of occupied units had begun to dwindle along with the population, but the homeownership rate remained roughly constant.

Table 16.1-9. Housing Occupancy and Ownership on Tinian, 2000 and 2005

	2000	*2005*
Occupied Housing Units	790	656
Occupied by the Owner	248	216
Vacant all Year	266	NA
Vacant part of the Year	14	NA
Total Units	**1,055**	**NA**

NA = Not Applicable

Sources: U.S. Census Bureau 2000, CNMI Department of Commerce Central Statistics Division 2008.

As of 2000, the average household size for owner-occupied dwellings on Tinian (5.04 individuals) was substantially higher than that for rented units (2.85 individuals). The higher household size reflects the existence of multi-generational households common in the CNMI society (CNMI Department of Commerce, Central Statistics Division 2002).

Table 16.1-8 shows the 2000 median value of housing on Tinian to be the highest in the CNMI. These prices were partially due to optimism on the part of homeowners during 2000, a time of economic success. Subsequent economic downturns have most likely reduced housing values, at least relative to other islands in the CNMI. Additionally, there has been modest increase in housing supply for permanent residents, as well as the construction of temporary barracks by the Bridge Investment Group for the possible development of a new casino (CNMI Department of Commerce 2008b).

Saipan

Saipan had the most housing units in the CNMI as of 2000, and the median value of those units was above the CNMI average. Nearly 30% of the housing units on Saipan had a value of at least $300,000. Based on the 2000 U.S. Census data, the total value of housing units on Saipan was $574 million.

Rota

Rota had the fewest number of housing units in the CNMI as of 2000 and the value per unit was below the CNMI average. About 67% of Rota housing units were valued below $200,000. Based on 2000 U.S. Census data, the total value of housing units on Rota was $44 million.

16.1.3.4 CNMI Government Finances

Table 16.1-10 shows the recent financial conditions of the CNMI government. In 2001 the government was running a budget surplus. However in later years, mostly due to increasing expenditures, the government has spent more than it earns. In 2004 the CNMI government budget deficit equaled 18% of its total revenues.

Table 16.1-10. CNMI Government Finances, 2001-2004

	2001	*2002*	*2003*	*2004*
Own source revenue	$227,709,651	$215,650,986	$225,412,808	$235,754,891
Federal contributions	$49,348,134	$71,964,627	$57,560,034	$63,006,595
Total revenues	$277,057,785	$287,615,613	$282,972,842	$298,761,486
Total expenditures	$258,177,431	$314,985,333	$303,986,379	$352,488,419
Revenues less expenditures [surplus/(deficit)]	$18,880,354	($27,369,720)	($21,013,537)	($53,726,933)

Source: General Accounting Office 2006.

Tinian Government Structure and Revenue

The Municipality of Tinian and Aguiguan is made up of the islands of Tinian and Aguiguan (sometimes referred to as Goat Island), an uninhabited island about 10 miles southeast of Tinian. The municipal government is made up of the Mayor's Office and Municipal Council. The Municipal Council is an elected three-person Council. The Municipality of Tinian and Aguiguan is represented in the CNMI Legislature by an elected four-member Legislative Delegation (three senators and one House representative).

The relationship between the Municipality and the CNMI central government is not as independent as are relationships between most American cities or counties and state governments. All CNMI Resident Department Heads on Tinian are appointed by Tinian's Mayor. Thus the CNMI agencies on Tinian are effectively responsible to both the Mayor and the CNMI department heads on Saipan.

Casino revenues on Tinian, derived from private casino operators, represent the only revenue generated on the island. Gambling is prohibited in the Northern Mariana Islands except as allowed through Commonwealth law or as established through initiative in the Commonwealth or in any senatorial district, per Article XXI of the CNMI Constitution. In the November 1978 general elections, 78% of the people of Tinian voted in a senatorial initiative to allow casino gaming in the Municipality of Tinian and Aguiguan. Through this casino gaming initiative, revenues generated are considered local revenues and remain in the municipality instead of being transferred to the central government.

Casino revenues thus contribute to a local budget that funds the operations of the Tinian Casino Gaming Control Commission, the Tinian Municipal Treasury, and the Tinian Mayor’s Office. The Commission was created through the Casino Gaming Act to be the regulatory and enforcement agency for the casino gaming industry. The Treasury was created by the Act to handle all related gaming revenues. Casino revenues flowing to the Tinian Mayor's Office are used to fund personnel, operations, and public programs that are not provided for under the CNMI primary funding.

A collapse of the Tinian casino gaming industry would displace casino employees and workers in those regulatory agencies currently funded through the casino revenues. Table 16.1-11 and Table 16.1-12 show current Tinian government employment funded by casino revenues and CNMI Legislative Appropriations.

Table 16.1-11. Tinian Governmental Agencies by Primary Funding Source

Agencies Funded by Tinian Gaming Revenues	*Agencies Funded by CNMI Legislative Appropriations*
Mayor's Office (25 employees as of early 2009)	Mayor's Office (125 employees as of early 2009)
Municipal Treasury (Treasurer and 4 staff as of early 2009)	Tinian Municipal Council (3 Council members and 4 staff as of early 2009)
Tinian Youth Center (Director and 11 staff as of early 2009)	CNMI agencies located on Tinian (6 Resident Department Heads and 297 employees as of early 2009)
Tinian Casino Gaming Control Commission (5 Commissioners and 39 staff as of early 2009)	

Source: Tinian Municipal Treasury 2009.

Table 16.1-12. Trends in Tinian Municipal Budgets and Employment Funded by Gaming Revenues

FYs	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*
Revenues									
From Gaming	$4,509,875	$2,983,242	$4,082,930	$4,144,802	$4,641,222	$3,709,667	$4,933,137	$3,643,869	$3,304,018
Other Sources	$0	$0	$0	$0	$0	$0	$0	$0	$649,217
Expenditures (all purposes)	$2,340,874	$4,308,361	$3,853,264	$4,475,527	$4,547,366	$3,695,949	$4,505,376	$4,351,260	$4,297,424
Year-End Surplus/Deficit	$2,169,001	-1,325,119	$229,666	-$330,275	$93,856	$13,718	$427,761	-$707,391	-$344,189
Combined Jobcount[1] (filled positions)	40	80	84	93	92	94	80	80	80
Mayor’s Office/ Youth Center/ Treasurer	2	46	50	57	56	48	42	42	42
Gaming Commission	38	34	34	36	36	36	38	38	38

Notes:
[1] FTE
Source: Tinian Municipal Treasury 2009.

16.1.3.5 Tinian Public Services

Education Services

There are two public schools on Tinian; Tinian Elementary (grades 1-6) and Tinian Junior/Senior High Schools (grades 7-12). Both are located in the village of San José and are accredited by the Accrediting Commission of Western Association of Schools and Colleges.

According to 2007-2008 school year data, Tinian Elementary enrollment was 295 students, and Tinian Junior/Senior High School enrollment was 320 students.

Class sizes are relatively small with a student-teacher ratio of 20 at Tinian Elementary and 13.4 at Tinian Junior/Senior High School. About 64% of the teachers at the high school are certified by the CNMI Public School System (CNMI Public School System 2008a).

The student body of the CNMI as a whole is mostly drawn from the indigenous population. Guest worker populations (with the exception of the Filipino population) have been less likely to have children.

On Tinian, the primary school student population is concentrated in the Chamorro and Filipino ethnicities, with relatively few from neighboring Micronesian areas (Table 16.1-13).

Table 16.1-13. Ethnic Pupil Accounting, Tinian versus Rest of CNMI Schools, 2007-2008

	Tinian (Combined Schools)	*All Other CNMI Schools*
Chamorro or Chamorro Mix	62%	41%
Carolinian or Carolinian Mix	1%	11%
Other Micronesian*	2%	13%
Filipino	32%	28%
Other Asian**	2%	4%
Caucasian	0%	1%
All Others	1%	2%
Total (Base)	**615**	**10,127**

Notes:
* Chuukese, Palauan, Pohnpeian, Marshallese, Yapese
** Korean, Chinese, Japanese
Source: CNMI Public School System 2008a.

For the period 2000-2005, student tracking studies suggest that approximately 37% of the graduates from Tinian High school have some college education. The Northern Marianas College operates an extension campus in San José but is currently limited to continuing education and high school equivalency courses.

In 2006, the CNMI school system received 46% of its revenues from the CNMI sources. Another 40% came from grants, mostly from the U.S. Department of Education (CNMI Public School System 2008b).

Health and Human Services

Infectious diseases in the CNMI are a major health concern, in particular, HIV, TB, Hepatitis A and B, food-borne illnesses, vaccine-preventable diseases, and sexually-transmitted diseases. The rapid influx of contract workers has contributed to these problems. The incidence of tuberculosis is over 10 times higher than the Mainland U.S., with over half of all cases among non-resident alien workers (U.S. Department of the Interior 1999).

The Tinian Health Center is the island's primary health care facility. It was built in 1987. The building is entirely air-conditioned. The Center provides emergency services, treatment, two holding beds, delivery, laboratory, X-Ray, pharmacy, dental and public health services. The morgue and sanitation office are located in a separate building. The morgue can currently accommodate two bodies and there are no funded plans for a larger morgue facility.

The Tinian Health Center employs one full-time doctor, one nurse-practitioner, one physician's assistant, five registered nurses, five licensed practical nurses, and one nursing aide. It also employs one dentist and two dental technicians. While this staffing level meets Tinian's current needs, this staffing capacity is tenuous, as health professionals often leave the island after only short periods of employment (Tinian Municipal Directors 2009).

Public Safety Services

The CNMI Department of Public Safety is responsible for police, fire, and emergency management activities on Tinian. Facilities are located in San José and as of late 2008 were staffed by 20 police officers, 12 firefighters, and six administrative support personnel. Staffing was anticipated to expand if and when a new casino opened.

The Commonwealth Ports Authority maintains firefighting capability at the Tinian International Airport. This capability could be made available to Department of Public Safety in the event of a major emergency. The airport has two fire-fighting vehicles and a staff of nine officers (out of 12 authorized positions) who man the facility on a three-shift, 24-hour basis.

In general, the CNMI Department of Public Safety's capacity is adequate to meet the current needs of the Tinian community.

While recent Tinian crime rates are not available, Tinian police officials identified recent spikes in petty theft due to "the discovered value of copper, brass, aluminum, etc.," and status offenses. Although organized crime (mainly prostitution) linked to the tourist industry exists on Saipan, no prostitution has yet been reported on Tinian. Much of the Department of Public Safety's law enforcement effort is directed at traffic control, drunk driving, and domestic disputes. While Tinian police report significant reductions in the number of highway accidents, they remain concerned that Tinian's legal exemption from written driver examinations leads to a lack of driver education on the island (this exemption applies on Rota as well) (Tinian Department of Public Safety 2008).

Public safety services on Tinian as they currently exist would not be adequate to meet the needs of a large population influx or a serious public emergency. In particular, fire-fighting equipment may not be capable of suppressing major structural or brush fires. Acquisition in 2006 of a refurbished fire engine provided by the Department of Homeland Security under its Weapons of Mass Destruction program was the first key piece of firefighting equipment to arrive on the island for several years (de la Torre 2006).

16.1.3.6 Sociocultural Issues

Land tenure is an important social issue in the CNMI, as it is elsewhere in the Pacific islands.

Although long-term land leases are possible on Tinian and elsewhere in the CNMI, Article XII of the CNMI Constitution restricts ownership of real property to people of at least 25% Northern Mariana Islands descent or to corporations entirely controlled and owned by Northern Mariana Islands descent. Privately-owned lands may be leased to individuals of non-Northern Mariana Islands descent for no more than 55 years, and (under Article XI) public lands may be leased for no more than 40 years.

Economic stratification and language differences between guest and indigenous populations have been accentuated by ethnic enclaves in group housing. For example the garment industry on Saipan often provided housing to Chinese workers in large compounds. In these compounds, traditional Chinese food and medicine was supplied and Chinese civil law was sometimes applied. Hotels and tourism companies in the CNMI often provide housing for their workers.

Recent changes to the CNMI immigration system would impact social values and issues in the CNMI. The recent federalization of the CNMI's immigration system is likely to change the source, if not the pattern, of immigrant labor in the Commonwealth. This federal legislation, combined with the collapse of the garment industry, would decrease the CNMI's Chinese guest worker population. Over the longer term the Filipino labor force supporting the tourism industry may also contract. These jobs are likely to be taken primarily by migrants from neighboring areas (such as the FSM and Palau) that are not subject to immigration restrictions (*Compact of Free Association, Sec. 141*).

Additional social impacts of the proposed federalization of the CNMI immigration (cited in mid-2007 by the Deputy Assistant Secretary of the Interior for Insular Affairs) included: (1) security concerns including the need for an effective pre-screening process for aliens wishing to enter the Commonwealth and the implementation of a refugee protection system and (2) the possibility of human trafficking, primarily for prostitution purposes, into the CNMI (Cohen 2007).

Upcoming possible changes to the CNMI land tenure system would also be influential to social values and issues in the region. Beginning in 2011, a 1976 Covenant between the U.S. and the CNMI would permit the amendment of land tenure laws through ballot initiatives. Although substantial support for continuation of the current system exists throughout the CNMI, it has been argued that the current system leads to the concentration of land ownership within a pool of a few families, and that continued demographic change in the CNMI could exacerbate this concentration. One possible result of such a landowner monopoly would be that business and residential rental prices could be set independent of market forces (Bartolucci and Shreni 2006).

16.2 ENVIRONMENTAL CONSEQUENCES

The section provides the socioeconomic impact analysis clustered into four major sections of Environmental Consequences: Economic Impacts, Public Service Impacts and Sociocultural Impacts. The section concludes with a Summary of Impacts and Summary of Proposed Mitigation Measures. Socioeconomic impacts would be islandwide in nature with little difference in effects among the various alternatives. Therefore, the summary of impacts presented below covers all of the alternatives except the no-action alternative, which is treated separately in Section 16.2.4.

16.2.1 Approach to Analysis

The impact analysis for this Volume 3 follows the approach laid out in Volume 2, Chapter 16. However, because the magnitude of the proposed action on the CNMI is far less than on Guam, the analysis and discussion of impacts is more limited than in Volume 2 Chapter 16. Impact analysis discusses both the construction and operation components of the proposed action.

16.2.1.1 Methodology

Refer to the Volume 2 and the Methodology Chapter (Chapter 2) of the SIAS (located in Appendix F) for a detailing of methodology.

Public service impacts for this action are limited due to the small number of jobs involved. Information on public service impacts was based in part on input from military planners and discussions with Tinian resident department heads. Sociocultural topics are assessed in a qualitative fashion and are primarily based on interviews conducted during three site visits over the course of a year (from February 2008 to February 2009).

16.2.1.2 Determination of Significance

Significance Criteria for Economic Sections

The economic sections focus on impacts the proposed action would have on the economy of the affected CNMI islands and the prosperity of their people. Tinian is a small place where actions that would be insignificant elsewhere would have a critical impact on the population. Because only some economic impacts were quantifiable, determination of significance was carried out through consideration of quantitative and available qualitative (i.e., interview) information.

In the following analysis, quantifiable impacts and baseline trend projections were considered significant if they added 2% or more at any point in time to current levels, as determined by most recent available information. (The 2% value was selected to be consistent with the criteria used for the socioeconomic analyses of impacts on Guam in other volumes.) Quantifiable impacts related to jobs and dollars – the usual measures of prosperity – would be considered beneficial if they increase the expected level of jobs or dollars by 2% or more. Significance of unquantifiable impacts are based on the context and magnitude of the impact.

Significance Criteria for Public Service Sections

Public service impacts stem from demands of additional population on current staff. Significance of additional demand was assessed through qualitative and quantitative calculation of whether this increase would necessitate substantial increases in 1) staffing (including consideration of whether staffing needs could easily be met), 2) new or physically altered facilities, and/or 3) equipment/vehicles. In general the 2% criterion was applied in relation to the reported actual staffing levels in the baseline year (generally 2005) for the agencies that supplied information.

Significance Criteria for Sociocultural Sections

Sociocultural impacts are qualitative in nature, and thus the emphasis of these sections is on identifying potential threats and opportunities rather than on quantifying impacts. Sociocultural impacts however remain an important element of the proposed action's impact and have attracted much public attention and comment. The significance of sociocultural impacts are assessed based on the relative magnitude and nature of the proposed action under consideration.

16.2.1.3 Issues Identified During Public Scoping Process

As part of the analysis, concerns related to socioeconomics that were mentioned by the public, including regulatory stakeholders, during the public scoping meetings were addressed. These comments included the following:

- *Access to Historical Sites:* cultural traditions and tourism.
- *Employment Opportunities:* would proposed action bring jobs?
- *Public Infrastructure:* collaboration between local agencies and the military.
- *Harbor and Airport Control:* transportation infrastructure needs repair/improvement.
- *Permanent Military Presence:* potential benefits of the action and effects on land lease issues.

16.2.2 Alternative 1 (Preferred Alternative)

16.2.2.1 Economic Impacts

Construction

Tinian

The construction associated with the proposed action would be minimal, especially relative to construction required for the Tinian Dynasty Hotel.

Most construction contracts are expected to be fulfilled by contractors based on Saipan or Guam (Tinian Business Panel 2008). A maximum of 180 construction jobs per year, for a two-year period, are expected to be created by the proposed action. This would also lead to the creation of about 35 indirect jobs in the Tinian economy. These 35 indirect jobs would constitute a significant beneficial impact, as they represent a greater than 2% increase in employment on Tinian (2006 Tinian employment figure of 1,626).

While the source of construction workers is uncertain, historically they have consisted mostly of foreign workers. Based on previous private-sector experience, expenditures of foreign construction workers in the Tinian economy would be negligible. However prime contractors would typically subcontract local Tinian companies for activities such as trash collection, security detail, and house rentals for construction executives (Bridge Investment Group 2008).

No economic costs to the community are anticipated from construction.

Saipan

There is no construction related to the proposed action expected to occur on Saipan. Neither is it expected that any lay down areas (off-site construction) would be located on the island. There may be some increased, indirect demand for Saipan's manufactured or agricultural products, however that impact is likely to be small. No economic costs are anticipated.

Rota

There is no construction related to the proposed action expected to occur on Rota. Neither is it expected that any lay down areas (off-site construction) would be located on the island. There may be some positive economic impact to Rota's agricultural industry as increased population in the region would drive up demand for more food. No economic costs are anticipated.

CNMI Government

The CNMI government revenues would likely increase because increased economic activity would generate higher tax revenues. This impact would likely not be substantial and would not, in and of itself, alleviate the government deficit.

Operation

Tinian

There is a possibility that 12 to 15 Tinian residents could be employed as security guards, ground-keeping crew members, and sanitation workers to support the proposed action on Tinian. Those direct jobs would have a less than significant economic impact, falling short of the calculated 32.5-job mark (i.e., 2% of 1,626).

Local stores and restaurants in San Jose would benefit from the proposed action if the Marines in training are granted liberty, as has been the case in the past. However, such liberty is not currently guaranteed for regular training exercises under the description of proposed action. Liberty may be available to advanced teams before and after training exercises, though these advanced teams would be much smaller and thus have a lesser economic impact.

Tinian's tourism may benefit from an increase in visitors from Guam due to the population growth in the region (Marianas Visitors Authority Tinian Office 2008); this effect is described in Volume 7, Chapter 3. Much of the Tinian visitor industry provides tours of scenic and/or historic sites on the island (e.g., the Atomic Bomb Pits where nuclear weapons were loaded into planes bound for Hiroshima and Nagasaki, Japan). About 70% of the visited sites are located in the military lease area (Tinian Chamber of Commerce 2009). The Tinian Dynasty runs one historical tour daily, and other independent tour companies such as Fleming Tour, Star Photo Tour, Island Garden Tour, and Hafa Adai Scooter Tour, also run various tours. Based on currently planned access procedures described in Chapter 2, Section 2.3.4.4 of this Volume, access via 8th Avenue would continue to remain available and tour operators would be allowed to access critical historical sites such as the Atomic Bomb Pits just north of Runway Able during training activities.

Tinian ranchers would be significantly impacted by the termination of grazing leases located within the range footprints and associated Surface Danger Zone (SDZs). Depending on the alternative, the acreage of land with agricultural/grazing permits that would be affected by the proposed action would be between 5 and 15% of the total amount of agricultural/grazing land available in the lease back area (LBA) (refer to Chapter 8 of this Volume, Land and Submerged Land Use for more information on the LBA). Ranchers have historically exercised grazing rights in the military lease area through a leaseback agreement. This agreement required the municipal government to pay a dollar per acre per year to lease back particular areas. Currently, grazing rights are allowed on a month-to-month basis. The military would not renew the grazing rights for only those leases located within the proposed Alternative 1 range footprints and associated SDZs. This non-renewal would have significant adverse economic impact. Tinian ranchers would have to utilize either other portions of the LBA outside of the range footprints and associated SDZs or a diminished amount of available grazing land in the southern third of the island.

Finally, restricted access to training areas during training activities would mean loss of local gathering access to the wild chili peppers (*Capsicum annum*) locally known as *donnisali*, a Tinian export. Residents earn money by collecting these peppers, nearly all grown in the military lease area. It is possible that residents would retain some access to the chili plants by way of 8th Avenue during training exercises. However, any chili plants in the southeast quadrant of the military lease area would be either up-rooted during grading or be located in the SDZs, where access would be restricted during training activities. Training activities are proposed one week per month on average throughout the year.

Saipan

There are no plans for any operational component of the proposed action to be located on Saipan. Some economic benefits from increased tourism, increased local agricultural consumption, and operational contracts for Saipan companies may be expected but these impacts would be very small. No economic costs are anticipated.

Rota

There are no plans for any operational component of the proposed action to be located on Rota. Rota's agriculture industry may see some positive impact as the increased population would demand more food than at present. No economic costs are anticipated.

CNMI Government

The CNMI government revenues would likely increase due to more economic activity generating higher tax revenues. This impact would not likely be substantial and would not, in and of itself, alleviate the government deficit. However, it should be noted that the CNMI government recently released a Draft of a report entitled "Strategic Approach: Utilizing CNMI's Natural Resources to Provide Complementary Support to DoD Guam." This report recommends that the CNMI adopt a strategy of providing DoD with support services in three areas: Operational Support; Supply and Maintenance; and Quality of Life. If this strategy was to be adopted and successfully implemented the CNMI's revenues from providing these support services could be substantially increased.

16.2.2.2 Public Service Impacts

Construction

Tinian

Although foreign construction workers historically keep to themselves and require little police attention (Tinian Department of Public Safety 2008), an increase in the number of construction workers would require the addition of one additional police officer. The addition of one additional officer would by an increase in more than 2% of the existing force, and therefore the construction phase would result in a significant impact to public safety services on Tinian.

Operation

Tinian

Tinian police anticipate few operation phase public safety impacts, if training units are accompanied by military police, as they historically have been (Tinian Department of Public Safety 2008). The Tinian fire department expects no impact from training, although brush fires are common on the island and range fires are possible (Tinian Municipal Directors 2009). As discussed in Chapter 3, Section 3.2.2.1 of this volume, Geological and Soil Resources, a fire management plan would be developed as part of a Range Training Area Management Plan. The plan would include assigned logistic support unit for fire control during training events, fuel management, and a fire danger rating system. However, a small number of contracted/civilian fire fighters may be required by the military.

Also, a small number of medical personnel would accompany military training units, and would be expected to assist civilian medical personnel in the event of emergencies. As these military medical personnel would rotate in and out with training units, the 2% significance threshold does not apply, and impacts would be less than significant.

16.2.2.3 Sociocultural Impacts

Construction

Tinian

The expected number of military-related construction workers on Tinian due to the proposed action alone would be 10% of the number that built the casino in the late 1990s, and sociocultural impacts due to this increase in population would be less than significant.

If the proposed action coincides with resumed casino construction, the combined increase in population could impact social relations on Tinian. The Tinian Department of Public Safety anticipates increased crime and community tensions if the economy permits eventual construction of new casinos (Tinian

Department of Public Safety 2008). Historical accounts of the sociocultural impacts of the construction of the Tinian Dynasty Hotel and Casino differ. Some accounts describe a situation where 18 months of construction and 1,800 largely foreign workers created conflict with local residents that culminated in several hundred construction workers storming the police department complaining of local assaults on workers (Tinian Dynasty Hotel and Casino 2008). Tinian police, however, recall only one fight between the local population and foreign construction workers in the 1970s (Tinian Municipal Directors 2009).

Operation

Tinian

Sociocultural impacts during the operations phase would be affected by decreased access and increased travel times to land for the purposes of recreation and cultural activities. However, there would be no adverse effects to recreational resources as decreased access would only be temporary.

Military-civilian relations under the preferred alternative could be significantly impacted. Overall, none of the alternatives being considered would meet Tinian resident expectations for a fully-operational military base in terms of economic benefits, facilities, and infrastructure. Overall sociocultural impact would be significant, as long-held community expectations for military expansion on the island would not be fully met. In addition, because of the minimal opportunities for liberty, there would be few opportunities for direct military-civilian interaction. While this could prevent friction between locals and Marines, it would also prevent the common everyday interpersonal interactions that could result in mutual understanding between the local and military populations on Tinian.

16.2.3 Summary of Impacts

Table 16.2-1 summarizes the potential impacts of the action alternatives and the no-action alternative.

Economic impacts would be significant during the construction phase due to the provision of 35 indirect jobs on Tinian. Economic impacts on Tinian would be significant during the operations phase due to the non-renewal of agricultural and grazing leases in the range footprints and associated SDZs on the LBA.

Public service impacts would be significant during the construction phase due to a need to increase the police force, and be reduced to less than significant during the operations phase.

Finally, sociocultural impacts would be significant. None of the alternatives being considered in the proposed action would meet Tinian resident expectations for a fully-operational military base in terms of economic benefits, facilities, and infrastructure.

Table 16.2-1. Summary of Impacts

Alternatives 1, 2, and 3	*No-Action Alternative*
Economic Impacts • Beneficial impacts to the CNMI economy during the construction phase due to the addition of approximately 35 indirect jobs on Tinian during construction. • Significant impacts during the construction and operations phases due to termination of currently used agricultural/grazing permits on LBA located within the range footprints and associated SDZs (loss of between 5 and 15% of available agricultural/grazing land in the lease back area).	Economic Impacts • No Impact Public Service Impacts • No Impact Sociocultural Impacts • Significant impact due to strained military-civilian relations. This strain would occur because long held community expectations for military expansion on the island are not met by the no action alternative.

<table>
<tr><th>Alternatives 1, 2, and 3</th><th>No-Action Alternative</th></tr>
<tr><td>

Less than significant beneficial impact due to 12 to 15 direct jobs on Tinian during operations.
Less than significant impact to tourism. Access to historical and cultural sites to the north of Tinian would be maintained. Tourism is likely to increase but not to a significant level.

Public Service Impacts

Significant impact to public safety services during the construction phase, reduced to less than significant during operations.

Sociocultural Impacts

Significant impact due to strained military-civilian relations. This strain would occur because long held community expectations for military expansion on the island are not fully met by the proposed action.

</td><td></td></tr>
</table>

Legend: SI = Significant impact, LSI = Less than significant impact, BI = Beneficial impact.

16.2.4 No-Action Alternative

Under the no-action alternative, the Marine Corps would continue to train in the military lease area of Tinian on a smaller scale, consistent with the existing Marianas Integrated Range Complex guidelines. No additional ranges or infrastructure would be built. Access to the military lease area, for any social or economic reasons, would remain the same as at present.

Wages would still rise to federal minimums. Federalization of the CNMI's immigration would restrict access to willing foreign laborers by the end of the transition period in 2014. Also, the global finance collapse appears likely to threaten future casino investment. Therefore, even without the development of additional ranges in the military lease area, Tinian's economy would experience a contraction like the rest of the CNMI.

Finally, the disappointment of expectations Tinian residents have long held about the benefits from a full-fledged military base may be especially acute under the no-action alternative, resulting in significant impacts to military-civilian relations.

16.2.5 Summary of Proposed Mitigation Measures

The proposed mitigation measures identified in Table 16.2-2 provide avenues to address the potential significant impacts identified above, taking into account the unique position of the CNMI as an isolated island economy.

Table 16.2-2. Summary of Proposed Mitigation Measures

Alternatives 1, 2, and 3
1. DoD would, to the extent possible, grant liberty to service personnel at the end of training missions. 2. DoD would assist with small business outreach and training on Tinian 3. DoD would work in collaboration with CNMI officials to ensure that access to tourism, cultural and economic activities be clearly communicated and made as easy as possible. 4. DoD would participate in Military Integration Management Committee and Civilian Military Task Force for the purposes of addressing individuals that are displaced if leases on the LBA do require termination. 5. DoD would assist by leading a federal inter-agency effort to identify other federal programs and funding sources for the CNMI to: a. Develop a small museum dedicated to Tinian's history; to support Tinian's tourism industry would further minimize economic impacts on the Tinian tourism industry b. Train public safety, emergency response and health personnel in the CNMI c. Enhance the agricultural productivity of land, and/or d. Develop a Tinian agricultural and conservation park.

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CHAPTER 17.
HAZARDOUS MATERIALS AND WASTE

17.1 AFFECTED ENVIRONMENT

This Section provides a summary of federal, Department of Defense (DoD), and local Commonwealth of the Northern Mariana Islands (CNMI) laws and regulations related to hazardous materials and waste that must be complied with by the DoD regardless of whether any increase in military activity occurs. In addition, this Section discusses the relevant affected environment or present conditions on Tinian, prior to any possible increased military activity.

The potential impacts hazardous materials and waste have on human health and environment is largely dependent upon their types, quantities, toxicities, and management practices. There is cause for concern if the use of these substances in some fashion violates applicable federal or local laws and/or regulations or DoD requirements. There is also cause for concern if the use of these substances increases risks to human health or the environment. This chapter describes current conditions on the United States (U.S.) territory of Tinian resulting from past and present use of these substances. In addition, this chapter discusses how these existing conditions could be altered by the proposed increase in military activities. The current DoD region of influence on Tinian addressed in this chapter for hazardous materials and wastes consists of the areas of Tinian Military Leased Area (MLA).

Hazardous substances are controlled in the U.S. primarily by laws and regulations administered by the U.S. Environmental Protection Agency (USEPA), the U.S. Occupational Safety and Health Administration (OSHA), and the U.S. Department of Transportation (DOT). Each agency incorporates hazardous substance controls and safeguards according to its unique Congressional mandate. USEPA regulations focus on the protection of human health and the environment. OSHA regulations primarily protect employee and workplace health and safety. DOT regulations promote the safe transportation of hazardous substances used in commerce.

All DoD operations are required to comply with the laws and regulations administered by the USEPA, DOT, and OSHA, as well as all other applicable federal, territorial, DoD laws and regulations, and Executive Orders (EO) (e.g., EO 12088, EO 13101, and EO 13148). Major federal environmental requirements associated with the management of hazardous material and waste are discussed in detail in Volume 2, Chapter 17, and therefore is not repeated here.

The CNMI oversees and administers these regulations through the CNMI Division of Environmental Quality (DEQ). The CNMI DEQ Hazardous and Solid Waste Management Branch regulates hazardous waste generated within the CNMI. In 1984, the CNMI DEQ adopted the federal hazardous waste regulations under Resource Conservation and Recovery Act (RCRA) and the hazardous and solid waste amendments. The CNMI does not have hazardous waste regulations that are more stringent than USEPA regulations.

The *Harmful Substance Clean up Regulations* were adopted under the authority of the CNMI Environmental Protection Act, (*Public Law 3-23; 2 CMC §3101 et seq. [as amended by Public Law 11-103]; 1 CMC §2646-2649; P.L. 11-108*). These regulations establish administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances are located.

The CNMI DEQ's Toxic Waste Management branch protects human health and the environment through the enforcement and ongoing inspections of hazardous waste and emergency response. The CNMI DEQ regulates hazardous and toxic materials through Title 65 DEQ §65-50, *Hazardous Waste Management Regulations*.

The Oil Pollution Act preserves local authority to establish regulations governing oil spill prevention and responses. Statutory petroleum, oil, and lubricants (POL) management authority for the CNMI is the CNMI DEQ Above & Underground Storage Tank and Pesticide Management (AUPM) Branch. The AUPM is responsible for regulating storage tank spill prevention, control, and countermeasures (SPCCs) as well as used oil and pesticides.

The AUPM branch regulates these activities based upon the CNMI DEQ's memorandum of understanding (MOU) with USEPA Region 9. The MOU establishes that the CNMI DEQ will take the lead when conducting and Enforcing Facility Response Plan/Spill Prevention, Control and Countermeasure (SPCC) requirements and specifies that the CNMI DEQ report their findings and recommendations quarterly to the USEPA.

All DoD operations on Tinian are required to comply with the CNMI DEQ as well as applicable federal and DoD laws and regulations.

17.1.1 Definition of Resource

The Defense Reutilization and Marketing Office (DRMO) arranges for the cataloging, storing, shipping, and disposal of hazardous substances generated from military activities in the CNMI. The DRMO maintains hazardous substance documentation and contracts with licensed contractors for the disposal of these substances at permitted facilities in accordance with all applicable federal, local, and DoD laws and regulations.

17.1.1.1 Hazardous Materials Management

<u>DoD Hazardous Materials Management</u>

The DoD has various guidance documents and policy that establish specific requirements for the minimization, recycling, storage, use, handling, and disposal of hazardous materials. This guidance and policy is described in Volume 2, Chapter 17, and therefore is not repeated here.

All applicable guidance and policy must be complied with for all DoD operations within the CNMI.

<u>CNMI Hazardous Materials Management</u>

The CNMI DEQ's AUPM branch protects human health and the environment by preventing the release of hazardous substances through enforcement of local and federal environmental laws and regulations.

This branch is responsible for permitting, inspecting, and monitoring storage tank installation and operation. AUPM is also responsible for the authorization of onsite commercial oil operations, including storage, and disposal of used oil through the use of an approved used oil burner unit and disposal at permitted facilities. In addition, the AUPM regulates the importation, sale, distribution, and application of pesticides in the CNMI.

17.1.1.2 Toxic Substances Management

<u>DoD Toxic Substances Management</u>

Toxic substances that may be present relative to DoD operations on Tinian include: asbestos containing materials (ACM), lead-based paint (LBP), polychlorinated biphenyls (PCB), and radon. LBP and PCBs originating in the CNMI are first transported to Guam, then off Guam by licensed disposal contractors for subsequent disposal at permitted facilities in accordance with federal, state, and local laws and regulations. ACM is disposed of at federal facilities located on Guam. Volume 2, Chapter 17 discusses DoD management practices relative to ACM, LBP, PCBs, and radon and is therefore not repeated here.

CNMI Toxic Substances Management

The CNMI DEQ Toxic Waste Management branch is responsible for implementing regulations for ACM, LBP, PCBs, and radon control and abatement for Tinian. DoD operations must comply with applicable local, federal and DoD laws and regulations (CNMI DEQ 2008).

17.1.1.3 Hazardous Waste Generation and Disposal

DoD Hazardous Waste Management

Volume 2, Chapter 17 describes various hazardous waste minimization, recycling, and use-reduction practices implemented by all DoD operations. In general, most hazardous waste generation on Tinian would take place as a result of DoD training exercises. Once hazardous waste is generated, it is transported to Guam in accordance with DOT regulations to DRMO facilities. Once on Guam, the DRMO arranges for the subsequent transfer and disposal of the hazardous waste off-island at licensed hazardous waste facilities.

For example, occasionally, small amounts of used oil are collected from these Tinian military training exercises as a result of vehicle repair or other circumstances. Once received on Guam, this oil is tested for hazardous characteristics to determine whether it should be classified and handled as hazardous waste. In addition, lithium batteries are used to power most field equipment. These batteries are generally returned to the U.S. mainland for recycling. If these batteries are not recycled, then they are classified and handled as hazardous waste and are disposed of as appropriate at permitted facilities off-island.

CNMI Hazardous Waste Management

Tinian-based activities generate hazardous waste from a multitude of waste streams. The CNMI DEQ imposes regulations to control the generation and disposal of hazardous waste. The CNMI DEQ's Toxic Waste Management branch protects human health and the environment through the enforcement and ongoing inspections of hazardous waste. The CNMI DEQ Toxic Waste Management branch is responsible for regulating businesses that engage or manage hazardous wastes (e.g., auto/heavy equipment shops, dry cleaning shops, print or photo shops) and responds to oil/chemical spills on land or water. DoD operations on Tinian must comply with applicable local, federal and DoD laws and regulations.

17.1.1.4 Contaminated Sites

Applicable DoD Hazardous Waste Sites

Past DoD activities have resulted in the presence of hazardous substance contamination and/or munitions and explosives of concern (MEC). In response, the USEPA, DoD, and the CNMI have established mitigation and cleanup activities under a variety of cleanup programs. These programs are described in Volume 2, Chapter 17. Table 17.1-1 lists DoD hazardous waste sites (GMP, Inc. 1997) on Tinian that are near or within the proposed expanded training operation footprints (Figure 17.2-1).

Table 17.1-1. Applicable DoD Hazardous Waste Sites on Tinian

Site	*Description/Materials Disposed*	*Status*
Tinian		
Site L-4	This site contains possible post -WWII era POL products.	According to the Tinian Environmental Baseline Survey (GMP, Inc. 1997) this was assigned a Category 3 status (areas where storage or release of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response).
Site L-7	This site consists of WWII – era service aprons and engineering areas containing possible POL products.	According to the Tinian Environmental Baseline Survey (GMP, Inc. 1997) this was assigned a Category 3 status (areas where storage or release of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response).
Site L-12	This site consists of WWII – era scrap metal dump site containing possible POL products and MEC.	According to the Tinian Environmental Baseline Survey (GMP, Inc. 1997) this was assigned a Category 5 status (areas where storage or release has occurred where removal or remedial actions has occurred).

CNMI DEQ Brownfields Program

Under the Brownfields Program, several projects have been set up to meet the program's requirements. These projects include: the development of environmental screening levels project, Brownfields site survey and inventory project, and Brownfields inventory database. If a Brownfields site is known or suspected to contain MEC, development of that site may be prohibited or may proceed only with extreme caution and with the proper safety measures in place.

The CNMI DEQ uses environmental screening levels to assist in identifying and prioritizing heavily contaminated sites. The environmental screening levels have been established for chemicals commonly found in soil and groundwater where releases of hazardous substances have occurred.

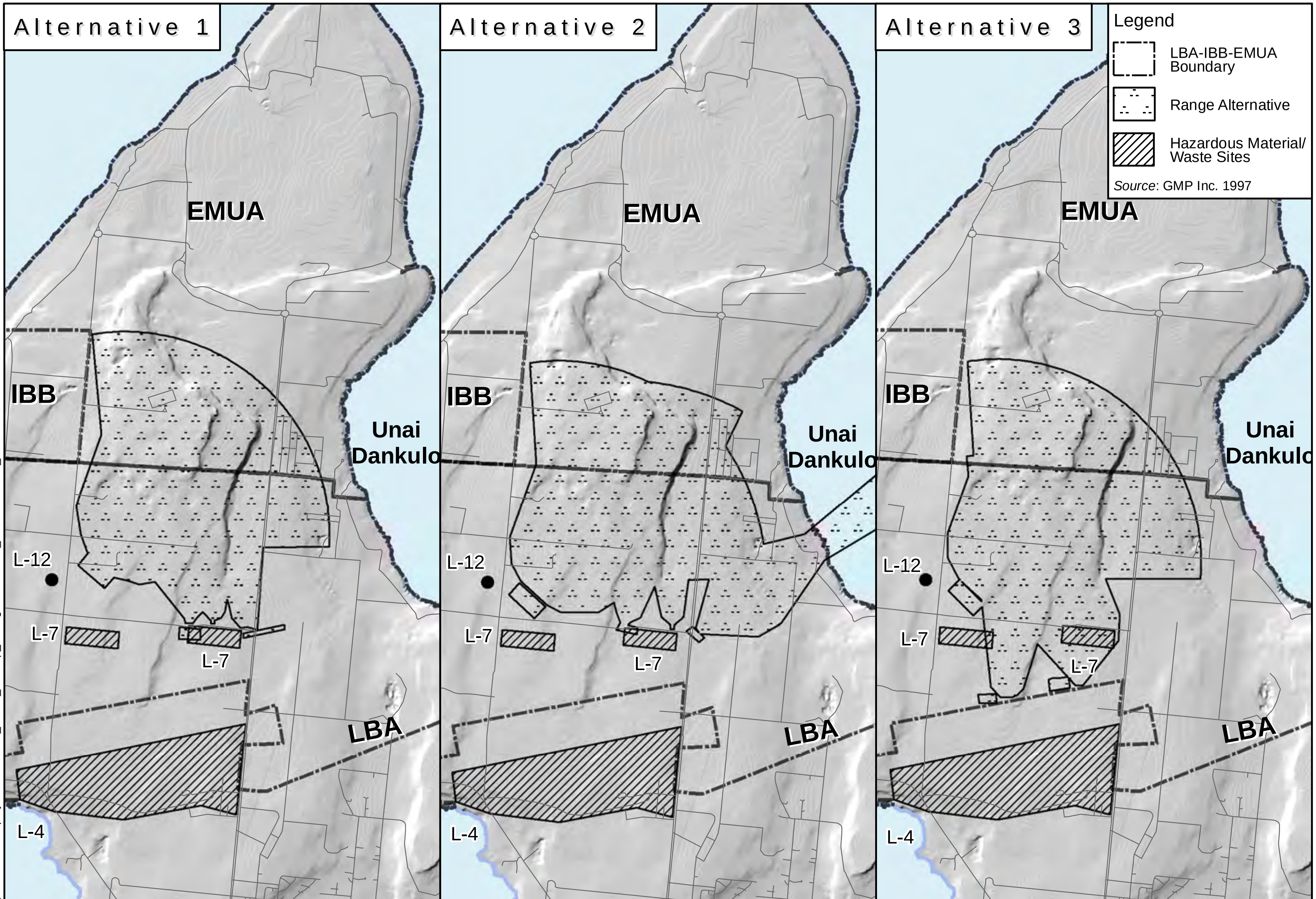

Figure 17.2-1
Tinian Hazardous Material/Waste Sites Near or Within Proposed Action Footprint

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17.2 ENVIRONMENTAL CONSEQUENCES

17.2.1 Approach to Analysis

17.2.1.1 Methodology

This section describes potential hazardous materials and waste impacts and proposed mitigation measures as they relate to the proposed increased DoD training operations at the Tinian MLA. Specifically, these impacts were assessed for the human health as well as various media (i.e., soils, surface water, groundwater, air, and biota) based upon various potential actions that include:

- Transportation to and on Tinian
- Minor Construction
- DoD operations

17.2.1.2 Determination of Significance

The determination of significance is based upon existing hazardous substance management practices, expected or potential impacts and environmental consequences of the proposed action, and alternatives and proposed mitigation measures to reduce the severity of impacts. This determination evaluated the overall ability to mitigate or control environmental impacts and consequences to soils, surface water, groundwater, air, and biota. This determination considers current conditions and potential consequences relative to the anticipated ability of the hazardous substance management infrastructure to accommodate added hazardous substance demand on the overall system. Specifically, for hazardous substances to be considered a significant impact, the following would have to occur:

- Leaks, spills, or releases of hazardous substances to environmental media (i.e., soils, surface water, groundwater, air, and/or biota) resulting in unacceptable risks to the human health or the environment.
- Violation of applicable federal, state, or local laws or regulations regarding the transportation, storage, handling, use, or disposal of hazardous substances.

17.2.1.3 Issues Identified during Public Scoping Process

As part of the analysis, concerns related to hazardous substances that were mentioned by the public, including regulatory stakeholders, during the public scoping meetings were addressed. A general account of these comments includes the following:

- Address management practices for hazardous substances including hazardous wastes, toxic substances, hazardous materials, and MEC.
- Describe the potential overall impacts of hazardous substances from construction and operation of proposed projects.
- Identify the projected hazardous waste types and volumes.
- Identify expected hazardous substance storage, disposal, and management plans.
- Evaluate measures to mitigate generation of hazardous waste including pollution prevention.
- Discuss how hazardous substances on land and from ships would be managed.
- Discuss the potential for impacts to environmental media from spills, accidents, and/or releases of hazardous substances.
- Identify existing installation restoration sites.

17.2.2 Alternative 1 (Preferred Alternative)

17.2.2.1 Transportation to and on Tinian

This subsection describes potential environmental consequences and proposed mitigation related to the establishment of expanded military training areas on Tinian. This includes the transport of all necessary supplies, materials, equipment, expendable, and non-expendable resources needed to perform the expanded training mission. In addition, this analysis considers the transport of these hazardous substances to Tinian and the routine transfer and use of hazardous substances within various DoD on-island training areas.

Hazardous Materials

The proposed action on Tinian would result in the transport/transfer of more hazardous materials on Tinian. It is expected that the largest increases of hazardous materials would occur from the use of POL. This includes gasoline, diesel, oil, grease, kerosene, and other related products. On Okinawa, approximately 32,000 pounds (lbs) (14,515 kilograms [kg]) of hazardous materials are annually arranged for disposal by DRMO from Marine activities. Training missions on Tinian are estimated to result in 20% of that total or about 6,400 lbs (14,606 kg) per year (DRMO Okinawa 2009).

However, proven and effective Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) would be used to:

- Prevent, contain, and/or clean up spills and leaks to protect the human health and environment.
- Provide personnel training and operational protocol and procedures to protect human health and environment.
- Ensure DRMO's ability to properly arrange for and coordinate the disposal of anticipated hazardous materials.
- Protect overall human health, welfare, and the environment.
- Properly identify, manage, and dispose of MEC associated with construction and operation of the expanded mission facilities.

Due to the projected increase in the volume of hazardous materials, Alternative 1 would have the potential to result in significant impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the increase in hazardous materials would be handled and disposed per applicable BMPs and SOPs. Therefore, the increase in volume would result in less than significant impacts. Table 17.2-1 summarizes BMPs and SOPs (also refer to Volume 7) that would be used. These include, but are not limited to:

Table 17.2-1. Summary of BMPs and SOPs

Alternatives 1, 2, and 3
For Soils, Water, Air, and Biota Relative to Transportation, Construction, and Operations Functions
• Update/implement HMMPs and HWMPs. • Update/implement Facility Response Plans. • Update/implement SPCC plans (training, spill containment and control procedures, clean up, notifications, etc.). • Update/implement stormwater pollution prevention plans (SWPPPs) • Ensure all DoD personnel and contractors are trained in accordance with applicable federal and CNMI DEQ regulations and DoD requirements regarding the importation, handling, use, and application of pesticides (e.g., during maintenance, pre and post construction, and general operations activities). • Ensure all DoD personnel and contractor personnel are trained as to proper labeling, container, storage, staging, and transportation requirements for hazardous substances. Also, ensure they are trained in accordance with spill prevention, control, and cleanup methods. • Perform all maintenance activities off-range at existing DoD maintenance shops. • Implement aggressive hazardous waste and hazardous material minimization plans that substitute hazardous waste for non-hazardous or less toxic waste as applicable, maximize recycling, and use LEEDS criteria. • Verify through surveillances and inspections full compliance with federal and CNMI DEQ regulations and adherence to DoD requirements. Implement corrective actions as necessary. • Minimize the risk of uncontrolled leaks, spills, and releases through industry accepted methods for spill prevention, containment, control, and abatement. • Implement routine firing range clearance operations (e.g., annually or as needed), perform sampling and analysis as deemed necessary, and implement all applicable DoD MEC operations guidance to minimize or eliminate potential MEC explosion hazards and other adverse impacts (including depositions with potential to leach into the subsurface). • Implement land use controls, fencing, signage, observation points, periodic inspections, and other means to ensure no unauthorized access to firing ranges, MEC, and/or hazardous substances. • Implement public awareness education seminars and workshops regarding the dangers of MEC, the importance of staying off firing ranges, and what to do if possible MEC is found. • Minimize the use of contaminated sites for new construction. When new construction occurs on sites where contamination and/or MEC has been identified, ensure that the risk of human/ecological risk and exposure is minimized via the use of a site-specific health and safety plans, engineering and administrative controls, and PPE. These site-specific health and safety plans must specifically address how these controls will be implemented to ensure the protection of human health and the environment and designs must consider and address contaminated sites as appropriate. In addition, these projects would be subject to regulatory oversight from GEPA and/or USEPA. • Ensure that soils to be excavated are well characterized, properly handled, and disposed of in accordance with all applicable accordance with applicable federal and CNMI DEQ regulations and DoD requirements to minimize dispersal of any contaminants that may be present. • Ensure that site planning and activities are conducted in accordance with NOSSA Instruction 8020.15B Explosives Safety Review, Oversight, and Verification of Munitions Responses.

Table 17.2-2 summarizes potential effects and impacts associated with hazardous materials transport to and on Tinian. Note that BMPs and SOPs would be implemented as a part Alternative 1 and are not considered "mitigation measures" thus consequences and mitigation tables within this section state that no mitigation measures are identified.

Table 17.2-2. Hazardous Materials Transport/Transfer Consequences and Proposed Mitigation

Potential Activity (Cause)	*Potential Effect*	*Potential Impacts*	*Proposed Mitigation Measures*
• Hazardous materials transport to Tinian and transfer on Tinian.	• Increased transport of hazardous materials to Tinian • Increased hazardous materials transfer and use on Tinian	• Spill, leak, or release impacts during transport/ transfer between DoD locations • Adverse impacts and increased risks to human health and/or the environment including terrestrial and marine ecosystems • Increased risk of environmental media contamination	• No mitigation measures are identified

Toxic Substances

Toxic substances regardless of any DoD expansion include: ACM, LBP, PCBs, and radon. ACM, LBP, and PCBs in the CNMI are transported by licensed transporters and disposed of in accordance with applicable federal, state, and local laws and regulations as well as applicable DoD requirements.

The collection, transportation, and disposal of toxic substances from all DoD operations is arranged for by the DRMO. The management of ACM, LBP, PCBs, and radon are discussed as part of the Affected Environment section in Volume 2, Chapter 17.

When assessing the transport, transfer, and future use of these toxic substances associated with the proposed DoD expansion, there are not expected to be any significant environmental consequences from ACM, LBP, and PCBs. This is because LBP was banned by the USEPA in 1978 and most uses of PCBs were USEPA-banned in 1979. In addition, ACM and radon gas not already present would not be transported/transferred as a result of these activities. Therefore, no mitigation measures are required. Instead, BMPs and SOPs would be implemented as appropriate (refer to Table 17.2-1 and Volume 7) and would result in less than significant impacts.

Hazardous Waste

Expanded DoD missions on Tinian would result in an increase in the off-island transport and inter-island transfer of hazardous waste. Increases in the transport/transfer and use of pesticides, herbicides, solvents, adhesives, lubricants, corrosive liquids, aerosols, and other hazardous wastes are expected. On Okinawa, approximately 644,000 lbs (292,727 kg) of hazardous waste is annually arranged for, and disposed by DRMO from Marine activities. Training missions on Tinian are estimated to result in 20% of that total or about 128,800 lbs (58,423 kg) of hazardous waste per year (DRMO Okinawa 2009).

Due to the projected increase in the volume of hazardous materials, Alternative 1 would have the potential to result in significant impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the increase in hazardous materials would be handled and disposed per applicable BMPs and SOPs (refer to Table 17.2-1 and Volume 7), and therefore the increase in volume would result in less than significant impacts.

Table 17.2-3 summarizes potential hazardous waste transport/transfer effects, impacts, and mitigation.

Table 17.2-3. Hazardous Waste Transport/Transfer Consequences and Proposed Mitigation

Potential Activity (Cause)	*Potential Effect*	*Potential Impacts*	*Proposed Mitigation Measures*
• Hazardous waste transport to Tinian and transfer on Tinian	• Possible increased transport of hazardous waste to Tinian • Increased hazardous waste transfer and use on Tinian	• Spill, leak, or release impacts during transport/ transfer between DoD locations • Adverse impacts and increased risks to human health and/or the environment including terrestrial and marine ecosystems • Increased risk of environmental media contamination	• No mitigation measures are identified

17.2.2.2 Minor Construction Activities

Minor construction activities would be required to develop training ranges on Tinian. This subsection analyzes possible impacts of the potential expansion.

Anticipated construction activities under this alternative include site preparation, site grading, trenching and excavation, road improvements, landscaping, and other related infrastructure actions. There is a possibility that some of these planned construction project footprints could encounter sites contaminated with hazardous substances and/or MEC. If relocation of various construction projects that may encounter hazardous substances and/or MEC is not possible, several BMPs and SOPs (refer to Table 17.2-1 and Volume 7) would be used including, but are not limited to: development of site-specific health and safety plans, the use of engineering controls (e.g., dust suppression, etc.) and administrative controls, and the use of PPE. NOSSA Instruction 8020.15B establishes the ESS to provide effective review, oversight, and verification of the explosives safety aspects of munitions responses.

<u>Waste Sites</u>

As described in Section 17.1.1, there are waste sites located within or in close proximity to the overall areas of the proposed expansion. Consideration and careful attention during project design phases must be given prior to construction to avoid overlap with these sites. If relocation of proposed construction projects that may overlap these waste sites is not possible, then various BMPs and construction operational protocol must be followed to protect human health and the environment. In addition, special design techniques and methodology will be required to ensure the long-term structural integrity of proposed construction projects.

<u>MEC</u>

The proposed expansion areas are likely to contain MEC. NOSSA Instruction 8020.15B establishes the ESS process to provide effective review, oversight, and verification of the explosives safety aspects of munitions responses. When the ESS has been endorsed by NOSSA and approved by the DoD Explosive Safety Board, SOPs and operational protocol would be developed for addressing explosive safety hazards of MEC in the proposed construction areas.

Hazardous Materials

Proposed construction activities would result in the use and disposal of more hazardous materials. It is expected that the most notable increases of hazardous materials would occur for the use of POL for heavy construction equipment, construction vehicles, generators, and other construction activities. Construction activities on Tinian are estimated to result in approximately 1,280 lbs (581 kg) of hazardous materials per year, or approximately 4% of the known Okinawa annual total (DRMO Okinawa 2009).

Due to the projected increase in the volume of hazardous materials, Alternative 1 would have the potential to result in significant impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the increase in hazardous materials would be handled and disposed per applicable BMPs and SOPs, and therefore the increase in volume would result in less than significant impacts (refer to Table 17.2-1 and Volume 7).

Table 17.2-4 summarizes potential hazardous materials effects, impacts, and mitigation of expected construction activities.

Table 17.2-4. Hazardous Materials Construction Consequences and Proposed Mitigation

Potential Activity (Cause)	*Potential Effect*	*Potential Impacts*	*Proposed Mitigation Measures*
• Possible use of contaminated site footprint(s) for new construction projects • Hazardous materials use during construction activities	• Increased hazardous materials storage, use, handling, generation, and disposal • Increased fueling and POL operations	• Spill, leak, or release impacts during construction activities • Adverse impacts and increased risks to human health and/or the environment including terrestrial and marine ecosystems • Violations of applicable federal, state or local regulations, or DoD requirements during construction and demolition operations • Increased risk of environmental media contamination. • Increased construction site erosion runoff	• No mitigation measures are identified

Toxic Substances

There are not expected to result in significant environmental consequences from ACM, LBP, and PCBs. This is because LBP was banned by the USEPA in 1978 and most uses of PCBs were USEPA-banned in 1979. In addition, ACM would not be used to construct proposed new facilities on Tinian. However, minor building and/or utilities demolition may result in encountering PCBs, ACM and LBP that were used in building materials at the time of construction. If PCBs, ACM, and/or LBP are encountered during demolition, licensed contractors would be used for these projects to ensure that all DoD, federal, and local PCBs, ACM, and LBP testing, handling, and disposal protocol, procedures, and requirements are followed. If radon zones are present on Tinian, it is possible that new facilities and/or structures would be constructed in these areas. However, radon resistant construction techniques would be used and DoD would periodically test facilities constructed in known radon zones to verify that no unacceptable radon gas buildup occurs. As appropriate, radon mitigation measures would be installed. Therefore, less than significant impacts would result from toxic substances.

Hazardous Waste

Proposed construction activities would result in an increase in the use of hazardous waste. Construction activities are anticipated to increase the use of pesticides, herbicides, solvents, adhesives, lubricants, corrosive liquids, and aerosols. Construction activities on Tinian are estimated to result in approximately 25,760 lbs (11,685 kg) of hazardous waste, or 4% of the known annual Okinawa total (DRMO Okinawa 2009).

Due to the projected increase in the volume of hazardous waste, Alternative 1 would have the potential to result in significant impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the increase in hazardous waste would be handled and disposed per applicable BMPs and SOPs (refer to Table 17.2-1 and Volume 7); therefore, the increase in volume would result in less than significant impacts.

Table 17.2-5 summarizes hazardous waste potential impacts associated with construction activities.

Table 17.2-5. Hazardous Waste Construction Consequences and Proposed Mitigation

Potential Activity (Cause)	*Potential Effect*	*Potential Impacts*	*Proposed Mitigation Measures*
• Possible use of contaminated site footprint(s) for new construction projects • Hazardous waste generated during construction activities	• Increased hazardous waste generation, storage, handling, and disposal	• Spill, leak, or release impacts during construction activities • Increased requirement for off-island hazardous waste disposal • Adverse impacts and increased risks to human health and/or the environment including terrestrial and marine ecosystems • Violations of applicable federal, state or local regulations, or DoD requirements during construction and demolition operations • Changes in hazardous waste generator status • Increased risk of environmental media contamination	• No mitigation measures are identified

17.2.2.3 DoD Operations

There are various DoD-related operations as a result of the proposed military expansion. For the purpose of this analysis, these operations have been divided into the following categories:

- General Activities – administrative and support functions associated with the DoD expansion
- Range Operations – Firing range activities and range maneuver exercises

General Activities

This subsection discusses the potential impacts related to general support functions associated with the proposed training expansion mission.

Hazardous Materials

Increases in the use of hazardous materials are estimated be minimal as a result of these general support activities. General activities on Tinian are estimated to result in approximately 640 lbs (290 kg) of hazardous materials per year, or approximately 2% of the annual Okinawa total (DRMO Okinawa 2009).

Due to the projected increase in the volume of hazardous materials, Alternative 1 would have the potential to result in impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the increase in hazardous materials would be handled and disposed per applicable BMPs and SOPs, and therefore the increase in volume would result in less than significant impacts (refer to Table 17.2-1 and Volume 7).

Table 17.2-6 presents a summary of hazardous materials anticipated consequences and mitigation measures expected from these potential general support functions.

Table 17.2-6. Hazardous Materials/Waste Consequences and Proposed Mitigation

Potential Activity (Cause)	*Potential Effect*	*Potential Impacts*	*Proposed Mitigation Measures*
• Hazardous materials/ waste associated with general activities	• Negligible increases of hazardous materials/waste generation	• Minor spill, leak, or release impacts • Slight adverse impacts and increased risks to human health and/or the environment	• No mitigation measures are identified

Toxic Substances

ACM, LBP, and PCBs are not expected to result in additional impacts. This is because LBP was banned by the USEPA in 1978 and most uses of PCBs were USEPA-banned in 1979. In addition, ACM would not be used in new facilities on Tinian.

It is possible that new facilities may encounter radon intrusion. However, radon resistant construction techniques would be used and DoD would periodically test facilities constructed in known radon zones to verify that no unacceptable radon gas buildup occurs. As appropriate, radon mitigation measures would be installed. Therefore toxic substances impacts would be less than significant.

Hazardous Waste

Expected increases in the use of hazardous wastes are judged to be negligible as a result of these general activities. General activities on Tinian are estimated to result in approximately 1% of the known Okinawa annual total or about 6,440 lbs (2,921 kg) of hazardous waste per year.

Consequently, less than significant impacts (refer to Table 17.2-6) are expected due to the proposed actions and no proposed mitigation measures would be required. Instead, BMPs and SOPs would be implemented as appropriate (refer to Table 17.2-1 and Volume 7).

Range Operations

DoD has historically conducted live-firing, ordnance testing, and training exercises to ensure military readiness. These munitions-related activities have resulted in the presence of unexploded ordnance

(UXO), Discarded Military Munitions (DMM), and Munitions Constituents (MC). UXO, DMM, and MC are all collectively referred to as MEC. Volume 3, Chapter 2 describes these potential range operations, including types and quantities of MEC expected to be used.

Hazardous Materials

Activities associated with firing range operations would result in increased hazardous materials in the form of MEC. This is because UXO, DMM, and MC present an explosive hazard all have the potential to contain high explosives and explosives constituents and potentially leachable compounds. Furthermore, firing range activities would require the use of military transport vehicles and aircraft, hence resulting in an increase in the usage of fuels and POL. Firing range operations on Tinian are estimated to result in approximately 14% of the known Okinawa total or about 4,480 lbs (2,032 kg) of hazardous materials per year (DRMO Okinawa 2009).

Due to the projected increase in the volume of hazardous materials, Alternative 1 would have the potential to result in impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the increase in hazardous materials would be handled and disposed per applicable BMPs and SOPs (refer to Table 17.2-1 and Volume 7). Therefore, the increase in volume would result in less than significant impacts.

Table 17.2-7 presents potential impacts and mitigation measures for hazardous materials.

Table 17.2-7. Hazardous Materials Firing Range Operations Consequences and Proposed Mitigation

Potential Activity (Cause)	*Potential Effect*	*Potential Impacts*	*Proposed Mitigation Measures*
• Hazardous materials associated with firing range operations	• Increases of hazardous materials usage • Increased MEC disposition within firing ranges	• Minor spill, leak, or release impacts • Adverse impacts and increased risks to human health and/or the environment from MEC, fuels, and POLs	• No mitigation measures are identified

Toxic Substances

Activities associated with firing range operations would not result in environmental impacts from toxic substances (i.e., ACM, LBP, PCBs, or radon); therefore, no mitigation measures would be required. Instead, BMPs and SOPs would be implemented (refer to Table 17.2-1 and Volume 7).

Hazardous Waste

Military munitions that are used for their intended purposes are not considered waste per the Military Munitions Rule [MMR (40 Code of Federal Regulations 266.202)]. In general, military munitions become subject to RCRA 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

MEC at "closed" ranges are classified as solid waste and would likely be subject to RCRA Subtitle C hazardous waste disposal requirements as well. As long as the proposed firing ranges on Tinian remain on "active" or "inactive" status, then the MEC on those ranges should be considered as used for their "intended purposes" and subject to the MMR exception to Subtitle C of RCRA (i.e., likely not classified as a hazardous waste). Volume 2, Chapter 17 contains an in depth discussion of the MMR.

In addition to increased MEC, there may be slightly increased usage of other hazardous wastes as a result of expanded firing range operations. Specific increased hazardous waste generated could include: pesticides, herbicides, solvents, corrosive or toxic liquids, aerosols, pesticides, and herbicides. These hazardous wastes would be used for vehicle and aircraft maintenance, as well as range maintenance and operations activities. These operations on Tinian are estimated to result in approximately 14% of the known Okinawa total or about 90,160 lbs (40,896 kg) of hazardous waste per year (DRMO Okinawa 2009).

Due to the projected increase in the volume of hazardous waste, Alternative 1 would have the potential to result in significant impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the increase in hazardous waste would be handled and disposed per applicable BMPs and SOPs (refer to Table 17.2-1 and Volume 7). Therefore, the increase in volume would result in less than significant impacts.

Table 17.2-8 presents possible impacts and mitigation measures for firing range operations.

Table 17.2-8. Hazardous Waste Firing Range Consequences and Proposed Mitigation

Potential Activity (Cause)	*Potential Effect*	*Potential Impacts*	*Proposed Mitigation Measures*
• Hazardous waste generated from firing range operations	• Increased hazardous waste generation, storage, handling, and disposal	• Minor spill, leak, or release impacts from firing range vehicular traffic • Increased requirement for off-island hazardous waste disposal • Adverse impacts and increased risks to human health and/or the environment including terrestrial and marine ecosystems • Violations of applicable federal, state or local regulations or DoD requirements • Adverse impacts to DRMO's hazardous waste storage, handling, and disposal capacity. • Changes in hazardous waste generator status • Increased risks of environmental media contamination • MEC being classified as hazardous waste as a result of closing firing ranges	• No mitigation measures are identified

17.2.2.4 Summary of Alternative 1 Impacts

Due to the projected increase in the volume of hazardous substances, Alternative 1 would have the potential to result in significant impacts to human health and the environment (i.e., soils, surface water, groundwater, air, and biota). However, the increase in hazardous substances would be handled and disposed per applicable regulations and BMPs/SOPs (refer to Table 17.2-1 and Volume 7) therefore, the increase in volume would result in less than significant impacts (Table 17.2-9).

Table 17.2-9. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Less than significant adverse impacts to soils, surface water, groundwater, air, and/or biota related to construction activities
	Operation	Less than significant adverse impacts to soils, surface water, groundwater, air, and/or biota related to operation activities

17.2.2.5 Alternative 1 BMPs and SOPs

BMPs and SOPs that would be used as part of the proposed action are described in Table 17.2-1 and Volume 7.

17.2.3 Alternative 2

17.2.3.1 Tinian

Alternative 2 environmental consequences would be nearly identical to those of Alternative 1. The various proposed alternatives involve conducting DoD training operations at varying geographic areas. The use/presence of hazardous materials, toxic substances, and hazardous waste is primarily a function of the magnitude of DoD activities, not the geographic areas where potential operations would be based. Therefore, this chapter's potential environmental consequences, BMPs/SOPs, and related mitigation measures do not vary from alternative to alternative.

17.2.3.2 Summary of Alternative 2 Impacts

Table 17.2-10 summarizes Alternative 2 impacts.

Table 17.2-10. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Less than significant adverse impacts to soils, surface water, groundwater, air, and/or biota related to construction activities
	Operation	Less than significant adverse impacts to soils, surface water, groundwater, air, and/or biota related to operation activities

17.2.3.3 Alternative 2 BMPs and SOPs

BMPs and SOPs (refer to Table 17.2-1 and Volume 7) for Alternative 2 would be the same as for Alternative 1.

17.2.4 Alternative 3

17.2.4.1 Tinian

Alternative 3 environmental consequences would be nearly identical to those of Alternative 1.

17.2.4.2 Summary of Alternative 3 Impacts

Table 17.2-11 summarizes Alternative 3 impacts.

Table 17.2-11. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	Less than significant adverse impacts to soils, surface water, groundwater, air, and/or biota related to construction activities
	Operation	Less than significant adverse impacts to soils, surface water, groundwater, air, and/or biota related to operation activities

17.2.4.3 Alternative 3 BMPs and SOPs

The BMPs and SOPs (refer to 17.2-1 and Volume 7) that would be used for Alternative 3 would be the same as for Alternative 1.

17.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation would occur, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met. Therefore, implementation of the no-action alternative would retain existing conditions, and there would be no impacts associated with the proposed action and alternatives.

17.2.6 Summary of Potential Impacts

Table 17.2-12 summarizes the potential impacts of each action alternative and the no-action alternative. The resources potentially impacted by hazardous substances are soils, surface water, groundwater, air, and biota.

Table 17.2-12. Summary of Potential Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Soils, Surface Water, Groundwater, Air, and/or Biota Impacts			
LSI • Less than significant adverse impacts are anticipated • As with all operations using hazardous substances, there is a possibility for an inadvertent leak, spill, or release	LSI • The impacts would be the same as for Alternative 1	LSI • The impacts would be the same as for Alternative 1	NI • No impacts

Legend: LSI = Less than significant impact; NI = No impact

The potential environmental impacts related to the proposed military training activities on Tinian include increased transportation, handling, use, and disposal of hazardous materials and hazardous wastes. It is expected that the largest increases of hazardous materials would occur from the use of POL/fuels. Expected increases in hazardous waste include pesticides, herbicides, solvents, corrosive or toxic liquids, and aerosols. Toxic substances are not expected to contribute significantly to the expected waste increases. However, the increase in hazardous material and hazardous waste would be handled and disposed per applicable regulations, BMPs, and SOPs as discussed in this Chapter (refer to Table 17.2-1 and Volume 7).

Despite expected increases in hazardous materials and hazardous wastes, less than significant impacts are anticipated as long as the controls (e.g., BMPs and SOPs) discussed within this Chapter and in Volume 7 are implemented and related plans and procedures updated and modified as appropriate to meet possible increased demands upon DRMO regarding hazardous substance transportation, handling, storage, use, and disposal.

17.2.7 Summary of BMPs and SOPs

As shown above, Table 17.2-1 summarizes BMPs and SOPs (also refer to Volume 7) that would be implemented relative to hazardous substance transportation, construction, and/or operations activities for all the proposed alternatives. Note that BMPs and SOPs are not considered "mitigation measures."

CHAPTER 18.
PUBLIC HEALTH AND SAFETY

18.1 AFFECTED ENVIRONMENT

This section discusses the potential public health and safety issues related to implementation of the proposed action and alternatives on the Mariana Islands. The region of influence (ROI) for public health and safety concerns includes the island of Tinian. Public health and safety issues include potential hazards inherent in military training activities and the potential presence of unexploded ordnance (UXO). Safety of construction workers would be the same as outlined in Volume 2. Proposed construction activities on Tinian would be minimal and conducted in accordance with federal and local safety guidelines to ensure a safe work environment.

With respect to the proposed training and land use requirements on Tinian, there are no intended permanent personnel additions; therefore, the temporary increases in personnel during training exercises would not be expected to have an impact on the public health and safety of the residents of Tinian from notifiable diseases, mental illness, or traffic incidents.

18.1.1 Definition of Resource

18.1.1.1 Environmental/Social Safety

Environmental/Social safety impacts are potential impacts to public health and safety as a result of environmental (e.g., noise, water quality, air quality, and hazardous substances) or social (e.g., health care services, public services) impacts. For example, an increase in air pollution could have adverse health effects on sensitive populations including children, older adults, people who are active outdoors, and people with heart or lung diseases, or an increase in population without a corresponding increase in public safety officials could result in reduced response times resulting in more serious harm or possibly death of a victim.

18.1.1.2 Training

Sustainment training is training that enables Marine Corps forces to maintain combat readiness. The training operations proposed on Tinian would provide sustainment training for individuals, crews, and small units of Marine Corps forces. The training that would take place on Tinian is the next developmental step in the training progression and is essential to the end-state of sustaining combat readiness of Guam-based Marines. The proposed Tinian ranges are for training Marines with use of weapons, but in tactical scenarios. Training in tactical scenarios requires greater geographic distances and breadth of scope than available on Guam.

18.1.1.3 UXO

The Island of Tinian was an active battlefield during World War II (WWII). As a result of the occupation by Japanese forces and the assault by Allied/American forces to retake the island, unexploded military munitions may still remain. Unexploded military munitions have been discovered periodically since the end of the war and may still be present on Tinian. Unexploded military munitions can be classified into two main categories: UXO, these are ordnance items that were fired from a weapon and failed to function properly (i.e., explode). These items are fused and are considered more sensitive than the second category of unexploded military munitions, Discarded Military Munitions (DMM). DMM consists of munitions that were not fired but abandoned and were not properly disposed. DMM items could include munitions that were left behind by military personnel; intentionally buried (i.e., weapons cache) or unintentionally buried as a result of combat on the island; or munitions that were discarded/left behind by military personnel. Additionally, the retaking of Tinian by Allied/American forces required amphibious landings; therefore, UXO and DMM may also be present in waters off the assault beaches.

UXO and DMM items include, but are not limited to: aerial bombs, Naval and field artillery projectiles, aerial and barrage rockets, mortar rounds, bazooka rounds, hand grenades, landmines, flares, and other pyrotechnic devises. The aforementioned munitions would vary in size (e.g., 105-millimeter or 5-inch projectiles) and explosive hazard (e.g., high explosive, incendiary filler).

Clearances for unexploded military munitions have been conducted in the past to remove this hazard and unexploded military munitions have been found and reported periodically since the end of the war. Although over 60-years have passed since the battle for Tinian and portions of the island have been developed, unexploded military munitions may still be present.

In accordance with Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8020.15B, Explosives Safety Submission (ESS) documentation must be prepared that details how explosive safety standards are applied to munitions responses. The ESS also addresses how a project will comply with applicable environmental requirements related to the management of munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH). At munitions response.sites, no site operations may begin unless NOSSA and the Department of Defense (DoD) Explosive Safety Board have reviewed and approved the ESS. An ESS is prepared for on-site construction support where the likelihood of encountering UXO is determined to be moderate or high and where ground-distiurbing or other intrusive activities, including dredging may occur in areas known or suspected to contain UXO. The ESS outlines specific measuers to be taken to ensure the safety of workers and the public.

18.2 ENVIRONMENTAL CONSEQUENCES

This chapter discusses the potential effects to public health and safety from environmental (e.g., noise, water quality, air quality, and hazardous substances) or social (e.g., health care services, public services) impacts, the hazards inherent in military training activities, and UXO associated with implementation of the alternatives within the ROI.

18.2.1 Approach to Analysis

18.2.1.1 Methodology

Potential effects to public safety from implementation of the alternatives were derived based upon information detailed in the descriptions of each alternative. Several factors were considered in evaluating the effects of the activities on public health and safety. These factors include proximity to the public, access control, scheduling, public notification of events, frequency of events, duration of events, range safety procedures, operational control of training events, and safety history. The analysis did not differentiate between construction and operation activities, as the public health context contains both simultaneously.

With construction activities, there is a potential for standing water and water based vectors such as mosquitoes and related diseases. Most mosquitoes require quiet, standing water or moist soil where flooding occurs to lay their eggs. Removal of standing water sources and/or promotion of drainage would eliminate potential breeding sites. To limit the amount of standing water at construction sites, stagnant water pools, puddles, and ditches would be drained or filled; containers that catch/trap water (e.g., buckets, old tires, cans) would be removed; and if necessary, pesticide application (e.g., *Bacillus* *thuringensis*) could be used to help control mosquitoes. Implementing these Best Management Practices (BMPs) would reduce the opportunities for an outbreak of water-related diseases.

Potential health and safety concerns on Tinian result primarily from proposed training activities.

Information regarding the possible presence of UXO was obtained from various military and public sources. Information specific to the proposed training activities on Tinian was obtained from military sources.

18.2.1.2 Determination of Significance

Public health and safety impacts are considered significant if the general public is substantially endangered as a result of training activities. Several factors were considered in evaluating the effects of the activities on public health and safety. These factors include proximity to the public, access control, scheduling, public notification of events, frequency of events, duration of events, range safety procedures, and operational control of training events.

For proposed military training events conducted on or around Tinian, there would be specific and documented procedures in place to ensure that construction contractors and the public are not endangered by proposed military training activities.

18.2.1.3 Issues Identified during Public Scoping Process

As part of the analysis, concerns related to public health and safety that were mentioned by the public, including regulatory stakeholders, during the public scoping meetings were addressed. A general account of comments submitted regarding the overall military relocation includes the following:

- Potential increases in diseases including:
    - Acquired Immune Deficiency Syndrome (AIDS)
    - Cholera
    - Dengue
    - Hepatitis C
    - Malaria
    - Measles
    - Rubella
    - Sexually Transmitted Diseases other than AIDS
    - Tuberculosis (TB)
    - Typhoid Fever

- Potential increases in mental illness
- Potential increases in traffic incidents
- Potential contact with UXO.

18.2.2 Alternative 1 (Preferred Alternative)

18.2.2.1 Environmental/Social Safety

<u>Noise</u>

Noise associated with construction and training activities on Tinian is discussed in Chapter 6. Construction noise would attenuate to about 60 dB L_{max} at the nearest receptor. This is well below the threshold for sensitive receptors or continuous exposure and is less than significant. Aviation and live-fire training would be located well within the military area and noise associated with these activities would not likely be heard from off-base receptors. Therefore it is anticipated that overall impacts associated with noise to human health and safety would be less than significant.

Water Quality

Construction and operational activities associated with training activities on Tinian would be implemented in accordance with Standard Operating Procedures (SOPs) and BMPs, and in accordance with applicable regulations. Therefore, no impacts to water quality from construction and training activities are anticipated.

Air Quality

As discussed in Volume 3, Chapter 5, increased pollutants associated with training activities on Tinian would be less than significant. Although increased emissions would be less than significant, construction and operational activities would result in pollutant emissions, which could result in health impacts to individuals on Tinian that could increase the use of health care services. Air pollution can harm individuals when it accumulates in the air in high enough concentrations. People exposed to high enough levels of certain air pollutants may experience:

- Irritation of the eyes, nose, and throat
- Wheezing, coughing, chest tightness, and breathing difficulties
- Worsening of existing lung and heart problems
- Increased risk of heart attack

In addition, long-term exposure to air pollution has been linked to certain types of cancer and damage to the immune, neurological, reproductive, and respiratory systems.

Some groups of people are especially sensitive to common air pollutants such as particulates and ground-level ozone. Sensitive populations include children, older adults, people who are active outdoors, and people with heart or lung diseases, such as asthma. Because air emission increases would be less than significant, it is anticipated that the Tinian clinic would have adequate staffing to handle air quality-related illnesses; therefore, less than significant impacts would be anticipated as a result of emissions from construction and training activities.

Hazardous Substances

Activities associated with training activities on Tinian would result in an increase in the use, handling, storage, transportation, and disposition of hazardous substances. These activities would be conducted in accordance with applicable hazardous material and waste regulations, and established BMPs and SOPs to ensure the health and safety of workers and the general public is maintained. Because hazardous substance management activities would be conducted in accordance with applicable regulations and established BMPs and SOPs, no impacts to public health and safety are anticipated.

Health Care Services

Volume 3, Chapter 16 discusses staffing requirements for health care services necessary to cope with population increases associated with training activities on Tinian. A small number of medical personnel would accompany military training units, and would be expected to assist civilian medical personnel in the event of emergencies; therefore, no impact to health care services on Tinian is anticipated.

Public Services

Volume 3, Chapter 16 discusses staffing requirements for public services necessary to cope with population increases associated with training activities on Tinian. An increase in the number of construction workers would likely require the addition of one police officer. Tinian police anticipate few operation phase public safety impacts, if training units are accompanied by military police, as they historically have been. The Tinian fire department also expects no impact from training. No impact to public services is anticipated.

18.2.2.2 Training

The safety of the public as well as personnel participating in training events is a primary consideration for all training activities. The fundamental guidance adhered to during training is that the range must be able to safely contain the hazard footprints of the weapons and equipment employed. The Range Safety Officer ensures 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 clear of live rounds.

Training activity would be scheduled and public notices would be provided in newspapers/otherwise posted at least 1 week prior to training events. Prior to conducting training activities, the public and non-participating personnel would be cleared from the area so that the only public health and safety issue would be if a training event exceeded the safety area boundaries. The range area would not be accessible by non-participating personnel during training, including sufficient lead-time before training to ensure range area clearance. Training periods would be scheduled in advance with signs posted and published on a regular basis. To facilitate range safety, ground access would be controlled by traffic control points on existing roads. This would safeguard the public by keeping them out of any areas where there are potential dangers while simultaneously maintaining access to areas where training is not being conducted. Prior to training, range flags would be raised and traffic control points would be established and manned continuously throughout the duration of training. Interior portions of the range area (those affected by SDZs) would be inspected and watches would be posted at a range observation site for boats and aircraft, with positive observation of the sea and air space and having positive communications with range control. Risks to public health and safety are reduced by confirming that the training area is clear. The Marine Corps would also notify the public of training activities through public notices.

The Marine Corps would notify the Saipan International Airport air traffic control tower when firing is about to commence, monitor Saipan International Airport and Tinian International Airport (West Field) departure/arrivals information, and coordinate check firing procedures as required.

Public notification of training activities, use of established training areas, compliance with appropriate range safety procedures, and avoidance of non military vessels and personnel would reduce the potential for interaction between the public and personnel that are training. Specific and documented procedures would be in place to ensure the public is not endangered by training activities; therefore, training activities associated with Alternative 1 would result in less than significant impacts to public health and safety.

18.2.2.3 UXO

The Island of Tinian was an active battlefield during WWII. As a result of the invasion, occupation, and defense of the island by Japanese forces and the assault by Allied/American forces to retake the island, unexploded military munitions may still remain. Excavation for building foundations, roads, underground utilities, and other infrastructure could encounter unexploded military munitions in the form of UXO, DMM and/or MPPEH. Exposure to these MEC could result in the death or injury to workers, Marines or to the public. To reduce the potential hazards related to the exposure to MEC, in accordance with DoD Directive 6055.9 (DoD Ammunition and Explosive Safety Standard) and NOSSA Instruction 8020.15B, ESS documentation would be prepared that outlines specific measuers that would be implemented to ensure the safety of workers and the public. BMPs that would be implemented include having qualified UXO personnel perform surveys to identify and remove potential MEC items prior to the initiation of training activities and ground disturbing activities. Additional safety precautions could include; UXO personnel supervision during earth moving and training activities, providing MEC awareness training to Marines prior to initiating activities on Tinian, and providing MEC awareness training to construction personnel involved in grading and excavations prior to and during ground-disturbing activities. The identification and removal of MEC prior to initiating construction activities and training construction personnel as to the hazards associated with unexploded military munitions would ensure that potential impacts would be minimized. Therefore, Alternative 1 would result in less than significant impacts to public health and safety (from UXO).

18.2.2.4 Summary of Alternative 1 Impacts

Table 18.2-1 summarizes Alternative 1 impacts.

Table 18.2-1. Summary of Alternative 1 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	No impacts to water quality, hazardous substances, health care services, and protective services Less than significant impacts from increased noise, air pollution, training, and potential encounter with UXO
	Operation	No impacts to water quality, hazardous substances, health care services, and protective services Less than significant impacts from increased noise, air pollution, training, and potential encounters with UXO

18.2.2.5 Alternative 1 Mitigation Measures

No mitigation measures would be needed for Alternative 1.

18.2.3 Alternative 2

18.2.3.1 Environmental/Social Safety

Potential impacts to environmental/social safety (i.e., public health and safety concerns associated with noise, water quality, air quality, hazardous substances, health care services and public services) would be the same as discussed under Alternative 1. Less than significant impacts to public health and safety are anticipated from increases in noise and air quality emissions. No impact to public health and safety are anticipated from water quality concerns, management of hazardous substances, and requirements for health care services and public services.

18.2.3.2 Training

Potential impacts to public health and safety from training activities would be the same as discussed under Alternative 1. Possible interactions between the public and training activities in near shore areas within the SDZ of Alternative 2 would be minimized by ensuring the area is cleared. Public notification of training activities, use of established training areas, compliance with appropriate range safety procedures, and avoidance of non military vessels and personnel would reduce the potential for interaction between the public and personnel that are training. Specific and documented procedures would be in place to ensure the public is not endangered by training activities; therefore, training activities associated with Alternative 2 would result in less than significant impacts to public health and safety.

18.2.3.3 UXO

Potential impacts to public health and safety from UXO and measures to be implemented to ensure public safety would be the same as discussed under Alternative 1. The identification and removal of MEC prior to initiating construction activities and training construction personnel as to the hazards associated with unexploded military munitions would ensure that potential impacts would be minimized. Therefore, Alternative 2 would result in less than significant impacts to public health and safety (from UXO).

18.2.3.4 Summary of Alternative 2 Impacts

Table 18.2-2 summarizes Alternative 2 impacts.

Table 18.2-2. Summary of Alternative 2 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	No impacts to water quality, hazardous substances, health care services, and protective services Less than significant impacts from increased noise, air pollution, training, and potential encounter with UXO
	Operation	No impacts to water quality, hazardous substances, health care services, and protective services Less than significant impacts from increased noise, air pollution, training, and potential encounters with UXO

18.2.3.5 Alternative 2 Proposed Mitigation Measures

No mitigation measures would be needed for Alternative 2.

18.2.4 Alternative 3

18.2.4.1 Environmental/Social Safety

Potential impacts to environmental/social safety (i.e., public health and safety concerns associated with noise, air quality, water quality, hazardous substances, health care services and public services) would be the same as discussed under Alternative 1. Less than significant impacts to public health and safety are anticipated from increases in noise and air quality emissions. No impact to public health and safety are anticipated from water quality concerns, management of hazardous substances, and requirements for health care services and public services.

18.2.4.2 Training

Potential impacts to public health and safety from training activities would be the same as discussed under Alternative 1. Public notification of training activities, use of established training areas, compliance with appropriate range safety procedures, and avoidance of non military vessels and personnel would reduce the potential for interaction between the public and personnel that are training. Specific and documented procedures would be in place to ensure the public is not endangered by training activities; therefore, training activities associated with Alternative 3 would result in less than significant impacts to public health and safety.

18.2.4.3 UXO

Potential impacts to public health and safety from UXO and measures to be implemented to ensure public safety would be the same as discussed under Alternative 1. The identification and removal of MEC prior to initiating construction activities and training construction personnel as to the hazards associated with unexploded military munitions would ensure that potential impacts would be minimized. Therefore, Alternative 3 would result in less than significant impacts to public health and safety (from UXO).

18.2.4.4 Summary of Alternative 3 Impacts

Table 18.2-3 summarizes Alternative 3 impacts.

Table 18.2-3. Summary of Alternative 3 Impacts

Area	*Project Activities*	*Project Specific Impacts*
Tinian	Construction	No impacts to water quality, hazardous substances, health care services, and protective services Less than significant impacts from increased noise, air pollution, training, and potential encounter with UXO
	Operation	No impacts to water quality, hazardous substances, health care services, and protective services Less than significant impacts from increased noise, air pollution, training, and potential encounters with UXO

18.2.4.5 Alternative 3 Proposed Mitigation Measures

No mitigation measures would be needed for Alternative 3.

18.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur on Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training on Tinian as described in Chapter 1 would not be met.

18.2.5.1 Environmental/Social Safety

Noise

No new impacts to public health and safety associated with noise would result from construction or training activities on Tinian. Therefore, no impacts to public safety from noise would be expected from the no-action alternative.

Water Quality

No new impacts to public health and safety associated with water quality would result from construction or training activities on Tinian. Therefore, no impacts to public safety from water quality would be expected from the no-action alternative.

Air Quality

No new impacts to public health and safety associated with air quality would result from construction or training activities on Tinian. Therefore, no impacts to public safety from air emissions would be expected from the no-action alternative.

Hazardous Substances

No increase in the types or quantities of hazardous substances would be anticipated under the no-action alternative. Management of hazardous substances would continue to be conducted in accordance with applicable hazardous material and waste regulations, and established BMPs and SOPs to ensure the health and safety of workers and the general public is maintained. Therefore, no impacts to management of hazardous substances would be expected from the no-action alternative.

Health Care Services

No increases in demand for health care services would occur as a result of training activities on Tinian. Therefore, no impacts to health care services would be expected from the no-action alternative.

Public Services

No increases in demand for public services would occur as a result of training activities on Tinian. Therefore, no impacts to public services would be expected from the no-action alternative.

18.2.5.2 Operation

Under the no-action alternative, no new training activities associated with the Marine Corps relocation to Guam would occur on Tinian. As a result, there would be no potential risk to the public from training activities. Therefore, the no-action alternative would result in no impacts to public health and safety.

18.2.5.3 UXO

The Island of Tinian was an active battlefield during WWII. As a result of the invasion, occupation, and defense of the island by Japanese forces and the assault by Allied/American forces to retake the island, unexploded military munitions may still remain. Under the no-action alternative, no excavation for building foundations, roads, underground utilities, and other infrastructure would occur in support of proposed Marine training requirements. As a result, there would not be an increase in the likelihood of encountering unexploded military munitions. Therefore, the no-action alternative would result in no impacts to public health and safety (from UXO).

18.2.6 Summary of Impacts

Table 18.2-4 summarizes the potential impacts of each action alternative and the no-action alternative. A text summary is provided below.

Table 18.2-4. Summary of Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Construction and Operation			
Environmental/Social Safety			
• LSI	• LSI	• LSI	• NI
Training			
• LSI	• LSI	• LSI	• NI
UXO			
• LSI	• LSI	• LSI	• NI

Legend: LSI = Less than significant impact, NI = No impact.

The potential increase in noise and air quality emissions would be less than significant; therefore, overall potential impacts to human health and safety would be less than significant. Health care professionals and public service personnel are anticipated to maintain existing service conditions; therefore, no impact to health care, police, or fire service is anticipated. No impact to public health and safety are anticipated from water quality concerns and management of hazardous substances.

Prior to conducting training activities, range areas would be cleared of non-participating personnel and the public so that the only public health and safety issue would be if a training event exceeded the safety area boundaries. Public notification of training activities, use of established training areas, compliance with appropriate range safety procedures, and avoidance of non military vessels and personnel would reduce the potential for interaction between the public and personnel that are training. Therefore, less than significant impacts to public health and safety from training activities are anticipated.

Excavation for building foundations, roads, underground utilities, and other infrastructure could encounter unexploded military munitions in the form of UXO, DMM, and MPPEH. To reduce the potential hazards related to the exposure to MEC, in accordance with DoD Directive 6055.9 and NOSSA Instruction 8020.15B, ESS documentation would be prepared that outlines specific measuers that would be implemented to ensure the safety of workers and the public. BMPs that would be implemented include having qualified UXO personnel perform surveys to identify and remove potential MEC items prior to the initiation of ground disturbing activities. UXO supervision during earth moving activities and providing MEC awareness training to construction personnel prior to and during ground-disturbing activities could also occur. The identification and removal of MEC prior to initiating construction activities and training construction personnel regarding hazards associated with MEC would ensure that potential impacts would be minimized. Therefore, less than significant impacts to public health and safety from UXO are anticipated.

18.2.7 Summary of Proposed Mitigation Measures

Table 18.2-5 summarizes the proposed mitigation measures.

Table 18.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Environmental/Social Safety		
• None	• None	• None
Training		
• None	• None	• None
UXO		
• None	• None	• None

CHAPTER 19. ENVIRONMENTAL JUSTICE AND THE PROTECTION OF CHILDREN

This chapter focuses on the potential for racial and ethnic minorities, low-income populations, or children to be disproportionately affected by project-related impacts. Normally an analysis of environmental justice is initiated by determining the presence and proximity of these segments of the population relative to the specific locations that would experience adverse impacts to the human environment. The situation on Tinian is unique in this regard because racial or ethnic minority groups (as defined by the United States [U.S.]) comprise almost all of the Tinian population, and the proportions of people living in poverty or who are under 18 years of age are also substantially higher than in the general U.S. population. The analysis is further complicated by the fact that Tinian is a relatively small and isolated island, and certain types of impacts would be experienced islandwide. Accordingly, the analysis of environmental justice described in this chapter acknowledges the unique demographic characteristics of the island population and assumes that the project effects could disproportionately affect disadvantaged groups and children because they comprise relatively high proportions of the population. By the same logic, proposed mitigation measures would be expected to effectively mitigate potential environmental justice impacts. Consequently, a distinction is made between potential impacts that would be mitigated and those for which no mitigations have been identified. The focus of this analysis is on the latter type of impacts. If a resource area did not have significant impacts, or were mitigable to less than significant, as analyzed in each individual chapter in Volume 2, then it was not further analyzed in this chapter. These resources are: geology and soils, water resources, air quality, noise, airspace, recreation, terrestrial and marine biological resources, visual, marine transportation, cultural resources, and hazardous materials and waste.

19.1 AFFECTED ENVIRONMENT

19.1.1 Definition of Resource

In 1994, President Clinton issued Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, in response to growing concern that minority and low-income populations bear adverse health and environmental effects disproportionately. EO 12898 requires federal agencies to assess the potential for their actions to have disproportionately high and adverse environmental and health impacts on minority and low-income populations. In 1997, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks* required a similar analysis for children. Federal agencies must identify and assess environmental health risks and safety risks that may disproportionately affect children.

EO 12898 authorized the creation of an Interagency Working Group on Environmental Justice, overseen by the United States Environmental Protection Agency (USEPA), to implement the EO's requirements. The Interagency Working Group and the USEPA developed guidance for terms contained in the EO. The USEPA (2009) 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."

The USEPA (1995) defines "fair treatment" as follows: "No group of people, including a racial, ethnic, or a socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies." A "disproportionate share of the negative environmental consequences" is an adverse effect or impact that is predominately borne by any segment of the population, including a minority population or a low income population. It can also mean that the suffering experienced by a minority population or low income population is appreciably more severe or greater in magnitude than the adverse effect that would be suffered by a non-minority or non-low-income population (USEPA 2009).

The USEPA defines "meaningful involvement" as follows:

- Potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that would affect their environment and/or health
- The public's contribution can influence the regulatory agency's decision
- The concerns of all participants involved would be considered in the decision making process
- The decision makers seek out and facilitate the involvement of those potentially affected

The Presidential Memorandum that accompanies EO 12898 cites the importance of National Environmental Policy Act (NEPA) in identifying and addressing environmental justice concerns. The memorandum states that, "each federal agency shall analyze the environmental effects, including human health, economic and social effects, of federal actions, including effects on minority communities and low-income communities, when such analysis is required by NEPA" (Presidential Documents 1994). The memorandum emphasizes the importance of NEPA's public participation process, directing that, "each federal agency shall provide opportunities for community input in the NEPA process." Agencies are directed to identify potential impacts and mitigations in consultation with affected communities and ensure the accessibility of meetings, crucial documents, and notices." The Presidential Memorandum includes four provisions that identify ways agencies should consider environmental justice under NEPA:

- Each federal agency should analyze the environmental effects, including human health, economic, and social effects of federal actions, including effects on minority populations and low-income populations, and Indian tribes, when such analysis is required by NEPA.
- Mitigation measures identified as part of an Environmental Assessment, a Finding of No Significant Impact, an Environmental Impact Statement (EIS), or a Record of Decision (ROD) should, whenever feasible, address significant and adverse environmental effects of proposed federal actions on minority populations, low-income populations, and Indian tribes.
- Each federal agency must provide opportunities for effective community participation in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of public meetings, crucial documents, and notices.
- Review of NEPA compliance must ensure that the lead agency preparing NEPA analyses and documentation has appropriately analyzed environmental effects on minority populations, low-income populations, or Indian tribes, including human health, social, and economic effects.

Neither the EO nor Council on Environmental Quality (CEQ) prescribes a specific format for environmental justice assessments in the context of NEPA documents. However, CEQ (1997) identifies the following seven general principles intended to guide the integration of environmental justice assessment into NEPA compliance, and that are applicable to the proposed project:

- Agencies should consider the composition of the affected area to determine whether minority populations, low-income populations, or Indian tribes are present in the area affected by the proposed action and, if so, whether there may be disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or Indian tribes.

- Agencies should consider relevant public health data and industry data concerning the potential for multiple or cumulative exposure to human health or environmental hazards in the affected population and historical patterns of exposure to environmental hazards, to the extent such information is reasonably available. For example, data may suggest there are disproportionately high and adverse human health or environmental effects on a minority population, low-income population, or Indian tribe from the agency action. Agencies should consider these multiple, or cumulative effects, even if certain effects are not within the control or subject to the discretion of the agency proposing the action.
- Agencies should recognize the interrelated cultural, social, occupational, historical, or economic factors that may amplify the natural and physical environmental effects of the agency's proposed action. These factors should include the physical sensitivity of the community or population to particular impacts; the effect of any disruption on the community structure associated with the proposed action; and the nature and degree of impact on the physical and social structure of the community.
- Agencies should develop effective public participation strategies. Agencies should, as appropriate, acknowledge and seek to overcome linguistic, cultural, institutional, geographic, and other barriers to meaningful participation, and should incorporate active outreach to affected groups.
- Agencies should assure meaningful community representation in the process. Agencies should be aware of the diverse constituencies within any particular community when they seek community representation and should endeavor to have complete representation of the community as a whole. Agencies also should be aware that community participation must occur as early as possible if it is to be meaningful.
- Agencies should seek tribal representation in a manner that is consistent with current procedures and protocols between the U.S. and tribal governments, the federal government's trust responsibility to federally-recognized tribes, and any treaty rights.
- CEQ (1997) states that the identification of a disproportionately high and adverse human health or environmental effect on a low-income or minority population does not preclude a proposed agency action from going forward with an action, or compel a finding that a proposed project is environmentally unacceptable. Instead, the identification of such effects is expected to encourage agency consideration of alternatives, mitigation measures, and preferences expressed by the affected community or population.

The following assumptions apply to this chapter:

- This chapter defines a racial minority according to the 2005 Commonwealth of the Northern Mariana Islands (CNMI) Department of Commerce Household Income and Expenditure Survey's definition of ethnicity (the survey does not refer at all to race). This includes Chamorro, Filipino, Chinese, Asian, Pacific Islander, and Caucasian. The 2005 CNMI survey used U.S. Census racial and ethnic categories.
- Children are defined as people under the age of 18. However, because the CNMI Department of Commerce (2005) collected data from age 20 and younger, the discussion of children would involve this age group.

- According to the 2005 CNMI Department of Commerce Household Income and Expenditure Survey, the largest single ethnic group in the CNMI is Filipino (30%), followed by Chamorro (23%), and Chinese (16%). The Carolinians are about 5% of the population. Asians comprise more than 53% of the CNMI's total population, Pacific Islanders approximately 37%, and Caucasian less than 2%. About 8% of the CNMI's total population is comprised of people with multiple ethnicities.
- According to the U.S. Census 2000, "Native Hawaiian and Other Pacific Islander" refers to any of the original peoples of Guam, Hawaii, Samoa, or other Pacific Islands. This category includes people who indicated their race or races as Native Hawaiian, Chamorro, Samoan, Carolinian, Chuukese, Tahitian, Mariana Islander, Kosraean, Marshallese, Palauan, Pohnpeian, Yapese, or Other Pacific Islander (Grieco and Cassidy 2001, U.S. Department of Commerce 2003).

The location of the proposed actions and alternatives is Tinian, an island in the CNMI. With an estimated total population of 2,829, Tinian contains about 4% of the CNMI's total population (CNMI Department of Commerce 2005). Tinian's population is concentrated in three villages in the southern portion of the island: San Jose, Marpo, and Carolinas (Figure 19.1-1). According to the CNMI Department of Commerce (2005), the majority of Tinian residents live in San Jose (76%), while about 20% live in Marpo and less than 3% in Carolinas. This section provides an overview of the racial composition, percentage of households in poverty, and relative percentage of children in each village.

Racial or Ethnic Minorities

The largest racial/ethnic group on Tinian is Chamorro (44%), followed by Filipino (32%) and Chinese (9%) (CNMI Department of Commerce 2005). Asians comprise about half (49%) of Tinian's total population, Pacific Islanders nearly the other half (42%), and Caucasians only 1%. People with multiple ethnicities comprise about 5% of Tinian's population (CNMI Department of Commerce 2005).

Low-Income Population

Of over 650 Tinian households that responded to the 2005 CNMI Department of Commerce Household Income and Expenditure Survey, 48% have an income less than $20,000 per year, and 22% of those households have a household income below $10,000. In the year that the CNMI survey was conducted (2004), the federal poverty line for a family of four was $18,850 (U.S. Department of Health and Social Services 2004). Therefore, nearly half of the households of Tinian were living near or below the federal poverty line in 2004, and almost one quarter of those households had an income of only $10,000 (CNMI Department of Commerce 2005). Table 19.1-1 outlines the poverty rate on Tinian is nearly double that of Dededo, and more than four times the rate of the U.S.

Table 19.1-1. Comparison of Poverty on Tinian

Tinian	*Dededo*	*U.S.*
48%	25.8%	11.3%

Notes: Data for Dededo and the U.S. are for 2000. This is the most recent demographic data available for Dededo.
Sources: U.S. Census Bureau 2000, CNMI Department of Commerce 2005.

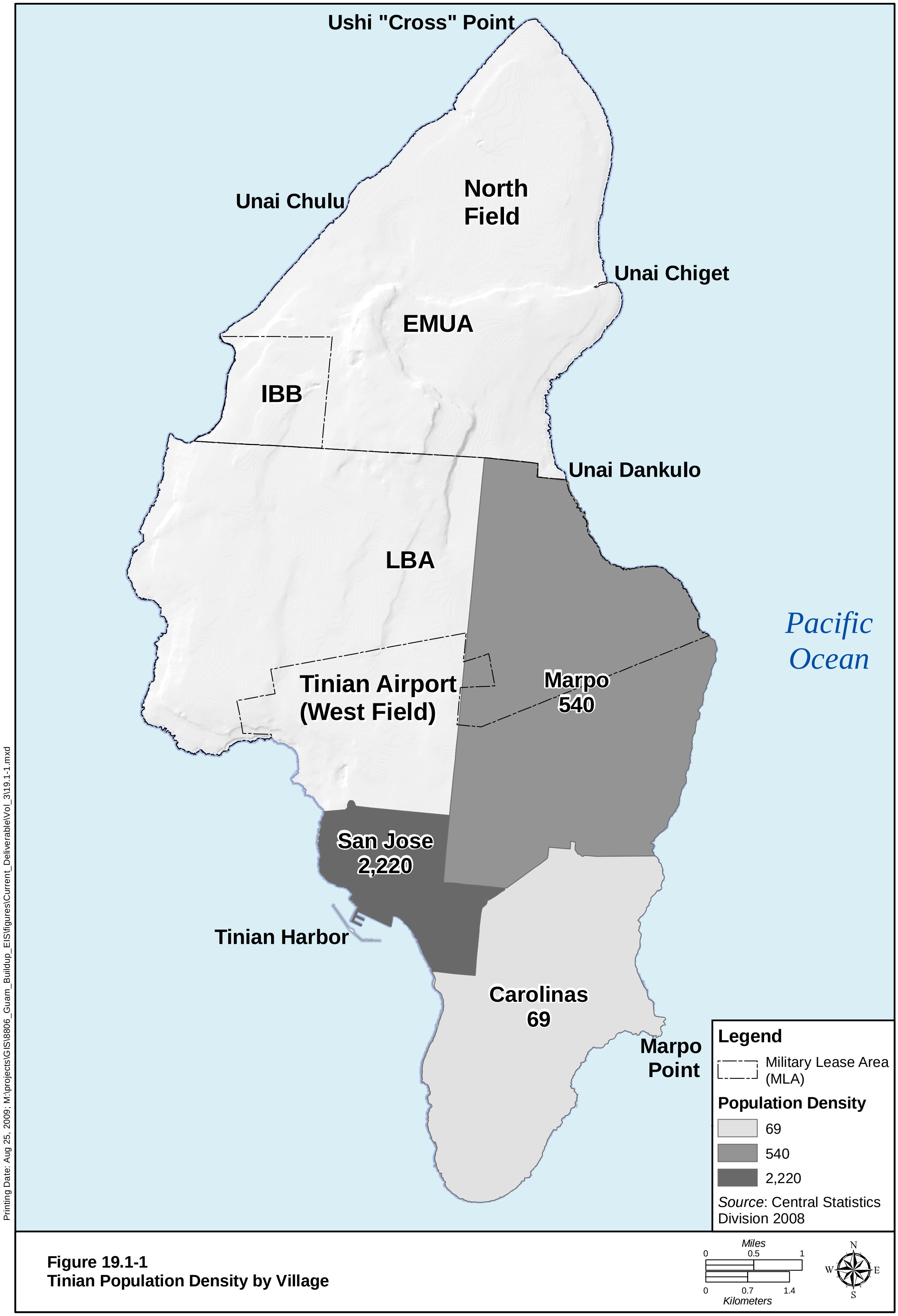

Figure 19.1-1
Tinian Population Density by Village

Children

Approximately 28% of Tinian's population is age 20 or younger, and nearly 53% of Tinian's population is between the ages of 20–44 (CNMI Department of Commerce 2005). This is because there were a large number of migrant workers on Tinian who fell into the 20-44 age category when the CNMI Department of Commerce 2005 study was conducted. Compared to many villages on Guam, including Dededo, Tinian does not have a high percentage of children; however, it has a higher percentage of children than the U.S. (Table 19.1-2).

Table 19.1-2. Comparison of Percent of Children on Tinian

Tinian	*Dededo*	*U.S.*
28%	36%	21.4%

Notes: Data for Dededo and the U.S. are for 2000. This is the most recent demographic data available for Dededo.
Sources: U.S. Census Bureau 2000, CNMI Department of Commerce 2005.

In summary, when compared to a village on Guam with a similar demographic profile (Dededo), and the U.S. population as a whole, Tinian has a high percentage of racial minorities and households living in poverty.

19.2 Environmental Consequences

19.2.1 Approach to Analysis

19.2.1.1 Methodology

Volume 3 of this EIS examines the potential impacts that each alternative would potentially have on various environmental and human resources. Based on the conclusions reached in each resource chapter, the analysis of environmental justice sought to identify the adverse impacts that would disproportionately affect racial minorities, children, and/or low-income populations, based on the following assumptions.

- Environmental Justice and Protection of Children policies require a federal agency to analyze whether its proposed action would adversely affect a minority, low-income, and child population disproportionately to the rest of the community. The island of Tinian is unique in that a majority of the population of Tinian meets the criteria for being an Asian Pacific minority group in the context of the overall U.S. population. As a result, where the EIS identifies significant impacts for a particular resource, there would be a corresponding, island-wide adverse effect to minority populations on Tinian, compared to the U.S. population. However, because of international agreements that require the proposed action to focus on Guam and CNMI, and not other locations within the U.S., the evaluation of environmental justice would be on whether there are disproportionate adverse effects within the context of alternatives for facility location on Tinian. Because of this, it would be impossible for there to be a disproportionate effect from an identified adverse impact based solely on the impact affecting a minority population. Therefore, the analysis for environmental justice on Tinian must consider whether there is a disproportionate adverse effect on a low-income population or children. For example, if there is a low-income population that is being impacted by a potential reduction in Public Health and Social Services, that impact would be considered a significant impact because the population, as a given, is a minority population and it is being disproportionately affected because it is a low-income population. As a result, some resource areas may have effects on a minority population, but because they do not impact a low-income or child population in a disproportionate manner they will not be considered as causing an environmental justice adverse effect.

- The region of influence (ROI) is defined as the area that the principal effects arising from the implementation of the proposed action or alternatives are likely to occur. Those who potentially may be affected by the consequences of the alternatives are those who reside or otherwise occupy areas immediately adjacent to the alternative locations.
- Because the proposed actions are related either to construction or operations, impacts to the ROI would likely be either "spill over" effects that extend beyond an installation's boundary line into the surrounding community, or impacts that directly affect minority populations in the ROI.

The analysis involved the application of three tiers of criteria to assess the environmental justice implications for each significant impact identified in the relevant resource chapters. In some cases if the analysis shows that the requirements for the specific criteria have not been met, then a discussion on the next tier may not be required. For instance, if an applicable disadvantaged group is not disproportionately affected in Tier 2, then a discussion on significant effects under environmental justice would not be warranted.

- *Tier 1:* Are there any racial minorities, low-income, or children populations adjacent to the proposed action site?
- *Tier 2*: Are the applicable disadvantaged groups disproportionately affected by the negative environmental consequences of the proposed action(s)?
- *Tier 3*: Would the disproportionate adverse effects be significant?

19.2.1.2 Determination of Significance

According to Section 1508.27 of the Regulations for Implementing NEPA (CEQ 1979), determining the level of significance of an environmental impact requires that both context and intensity be considered. These are defined in Section 1508.27 as follows:

- "Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant."
- "Intensity. This refers to the severity of the impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:
    - Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect would be beneficial.
    - The degree that the proposed action affects public health or safety.
    - Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
    - The degree that the effects on the quality of the human environment are highly uncertain or involve unique or unknown risks.
    - The degree that the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

- o Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
- o The degree that the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
- o The degree that the action may adversely affect an endangered or threatened species or its habitat that has been determined critical under the Endangered Species Act of 1973.
- o Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment."

19.2.1.3 Issues Identified During Public Scoping Process

No issues specific to environmental justice or protection of children were mentioned by the public, including regulatory stakeholders, during the public scoping meetings.

19.2.1.4 Public Involvement

Public involvement measures were implemented to address issues that often complicate the public participation of disadvantaged groups. These issues include lack of transportation, language barriers, and internet/computer access. To ensure that non-English speakers and low-income people were involved in the EIS process and were able to voice their concerns about the military relocation, the following outreach measures were taken during the scoping and Draft EIS comment periods:

- Public meeting notices, announcements, and documents were posted in paper form as well as online and were located in public libraries.
- Scoping meeting notices and comment forms were mailed to elected officials, agencies and organizations encouraging comments on the proposed action .
- Scoping meeting materials (handouts, posters, etc) were in English and Chamorro.
- The Draft EIS Executive Summary was made available online and at public hearings in English, Chamorro, and Carolinian.
- Chamorro and Carolinian interpreters were present at public hearings.
- Verbal public comments in Chamorro and Carolinian taken at public hearings were translated into English and included in transcripts.

19.2.2 Alternative 1 (Preferred Alternative)

19.2.2.1 Tinian

Construction

The construction associated with this project should be minimal because proposed actions are focused on intermittent training operations that would be set up impromptu and would not have permanent support structures associated with them. Further, any construction that does occur would be done north of San Jose, and thus would not be in proximity to the local population. Therefore, there would be no impacts associated with construction.

Operation

Proposed operations as described in Volume 3, Chapter 2 include introducing live-fire weapons training into the Tinian Military Lease Area. There would be no permanent support facilities, equipment, or ammunition storage because the type of training conducted would require Marines to bring their own equipment and remove it when they are finished. During range operations, Marines would set up manned traffic control points, range flags, and Safety Distance Zone (SDZ) observation points. Controlled access would be allowed to historic sites and northern beaches during training activities in accordance with procedures described in Section 2.3.4.4.

Marines who participate in the training would be transported to Tinian from Guam for the proposed one week per month company-level training exercises. Approximately 200-400 Marines would be expected to train at any one time.

As Chapter 2 describes, it is estimated that civilian access to and through the Range Training Area (RTA) would be affected approximately 12 to 16 weeks per year. The limit of the restrictions would depend on the training uses scheduled:

- For use of the weapons ranges, portion of the RTA would be closed for safety reasons. Locations of traffic control points are presented in Section 2.5 for each action alternative.
- For larger exercises, the entire RTA would be closed to use; however, access to northern beaches and the International Broadcasting Bureau (IBB) property would not be restricted.
- Periods of closure would last from a day before the scheduled event to ensure clearance, through post-event clean up and transport back to Guam.
- According to Chapter 2, during periods of non-military use, it is anticipated that the RTA would be available for civilian purposes consistent with RTA policies, subject to management restrictions to protect public safety, property, and the environment. These uses include the proposed landfill, the proposed wastewater treatment plant, and agency personnel access for natural and cultural resource surveys on Tinian. Periods of potential civilian use would need to be defined within RTA management procedures.

Land Use

According to Chapter 8, the Tinian Leaseback Area (LBA) is approximately 7,779 ac (3,148 ha) and located in the middle third of the island. The CNMI government issues permits for LBA lands to Tinian residents for grazing and agricultural uses. There are 35 lessees, leasing 48 parcels in the LBA for a total agriculture/grazing permit area estimated at 2,552 ac (1,032 ha). Only an estimated 134 ac (55 ha) of the total agricultural lease area would be terminated because these areas would be located within the proposed Alternative 1 range footprints and associated SDZs.

The LBA is used for ground element training including MOUT-type training, command and control, logistics, bivouac, vehicle land navigation, convoy training, and other field activities. Under Alternative 1, permits within the LBA located in the range footprints or SDZs would be terminated, causing less than significant impact to land ownership, but significant impact to agricultural land use.

Tier 1: *Are there any racial minorities, low-income, or children populations adjacent to the proposed action site?*

Nearly 99% of the Tinian population is a racial minority, and the island has a very high percentage of people living in poverty relative to the U.S. and Dededo (refer to Table 19.1-2). The disadvantaged populations are not adjacent to the site, but they access the leased lands for their work.

Tier 2: Are the applicable disadvantaged groups disproportionately affected by the negative environmental consequences of the proposed action(s)?

Tinian ranchers would be disproportionately impacted by the proposed actions because their grazing rights in the leased land areas would end. Local workers who currently collect and sell wild chili-peppers in the leased area (most of whom are presumably part of the low-income population of the island) would also be disproportionately impacted by the proposed operations because their access to these resources would be restricted. The health and safety of children would not be disproportionately affected.

Tier 3: *Would the disproportionate adverse effects be significant?*

The impacts on the agricultural land uses would result in disproportionately high and adverse effects on low-income populations, and these effects would be significant. Grazing opportunities in the more densely-developed south are limited, and the movement of grazing animals to other areas may be restricted by the need to protect native forest habitat of concern for ESA-listed species (refer to Chapter 10, Terrestrial Biological Resources).

Socioeconomics

Restricted access to the military leased land areas would also impede the work of Tinian ranchers and other local agricultural workers. The grazing rights of Tinian ranchers with leases within the range footprints and associated SDZs would be terminated and incomes of local workers who currently collect and sell wild chili-peppers in the leased area would be affected.

Tier 1: *Are there any racial minorities, low-income, or children populations adjacent to the proposed action site?*

Nearly 99% of the Tinian population is a racial minority, and the island has a very high percentage of people living in poverty relative to the U.S. and Dededo (refer to Table 19.1-2). The disadvantaged populations are not adjacent to the site, but they access the leased lands for their work.

Tier 2: Are the applicable disadvantaged groups disproportionately affected by the negative environmental consequences of the proposed action(s)?

Tinian ranchers would be disproportionately impacted by the proposed actions because their grazing rights in the leased land areas would end, adversely affecting their income. Local workers who currently collect and sell wild chili-peppers in the leased area (most of whom are presumably part of the low-income population of the island) would also be disproportionately impacted by the proposed operations because their access to these resources that they sell for income would be restricted. The health and safety of children would not be disproportionately affected.

Tier 3: *Would the disproportionate adverse effects be significant?*

The impacts on the agricultural land uses would result in disproportionately high and adverse effects on low-income populations, and these effects would be significant. Grazing opportunities in the more densely-developed south are limited, and the movement of grazing animals to other areas may be restricted by the need to protect native forest habitat of concern for ESA-listed species (refer to Chapter 10, Terrestrial Biological Resources).

19.2.2.2 Summary of Alternative 1 Impacts

Table 19.2-1 summarizes Alternative 1 impacts.

Table 19.2-1. Summary of Alternative 1 Impacts

Potential Impacts on Tinian by Resource
Land Use and Socioeconomics
Ranchers and agricultural workers would lose access to leased lands needed to perform their work. This would result in a disproportionately high and adverse impact to low-income groups, and this impact would be significant. There would be no disproportionate health and safety impacts to children.
Alternative 1
Land Use and Socioeconomics • SI (low-income) • NI (children)

Legend: SI = Significant impact, NI = No impact.

19.2.2.3 Alternative 1 Proposed Mitigation Measures

Implementation of the mitigation measures in Chapter 16 for impacts related to socioeconomics would also reduce associated impacts related to environmental justice.

19.2.3 Alternative 2

19.2.3.1 Tinian

Construction

The impacts for this alternative are the same as for Alternative 1.

Operation

The impacts for this alternative are the same as for Alternative 1.

19.2.3.2 Summary of Alternative 2 Impacts

Table 19.2-2 summarizes Alternative 2 impacts.

Table 19.2-2. Summary of Alternative 2 Impacts

Potential Impacts on Tinian by Resource
Land Use and Socioeconomics
The potential impacts for Alternative 2 are the same as for Alternative 1.

19.2.3.3 Alternative 2 Proposed Mitigation Measures

Mitigation measures are the same as Alternative 1.

19.2.4 Alternative 3

19.2.4.1 Tinian

Construction

The impacts for this alternative are the same as for Alternative 1.

Operation

The impacts for this alternative are the same as for Alternative 1.

19.2.4.2 Summary of Alternative 3 Impacts

Table 19.2-3 summarizes Alternative 3 impacts.

Table 19.2-3. Summary of Alternative 3 Environmental Justice Impacts

Potential Impacts on Tinian by Resource
Land Use and Socioeconomics
The potential impacts for Alternative 3 are the same as for Alternative 1.

19.2.4.3 Alternative 3 Proposed Mitigation Measures

Mitigation measures are the same as Alternatives 1.

19.2.5 No-Action Alternative

Under the no-action alternative, no new construction or new training activities associated with the Marine Corps relocation to Guam would occur in Tinian, and the Marine Corps would not meet training needs and requirements in support of the proposed action. The purpose and need for training in Tinian as described in Chapter 1 would not be met. Existing operations at the proposed project areas would continue. Ranchers would continue to utilize the more ample grazing land opportunities in the leased area. Therefore, the no-action alternative would have no impacts to minority, low-income, or child populations.

19.2.6 Summary of Impacts

Table 19.2-4 summarizes the potential impacts of each action alternative and the no-action alternative. The proposed action would have disproportionate impacts to low-income population on the island of Tinian related to land use and socioeconomics. Significant land use and economic impacts may be experienced by Tinian ranchers and locals who pick and sell wild chili-peppers from the leased land because they would be restricted from accessing the land needed to perform their work. Mitigation measures discussed in Chapter 16 would reduce impacts to low-income people of Tinian.

Table 19.2-4. Summary of Volume 3 Environmental Justice Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*No-Action Alternative*
Land Use /Socioeconomics: SI • Low-income	Land Use /Socioeconomics: SI • Low-income	Land Use /Socioeconomics: SI • Low-income	LandUse/ Socioeconomics: NI

Legend: SI = Significant impact, NI = No impact.

19.2.7 Summary of Proposed Mitigation Measures

Table 19.2-5 summarizes the proposed mitigation measures.

Table 19.2-5. Summary of Proposed Mitigation Measures

Alternative 1	*Alternative 2*	*Alternative 3*
Land Use/Socioeconomics: • Mitigation measures discussed in Chapter 16	Land Use/Socioeconomics: • Mitigation measures discussed in Chapter 16	Land Use/Socioeconomics: • Mitigation measures discussed in Chapter 16

CHAPTER 20.
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