CHAPTER 3 AFFECTED ENVIRONMENT

3.0 INTRODUCTION

This chapter serves as a discussion of the existing conditions within the region of influence (ROI) for each resource area analyzed. The ROI is defined as the area that could be affected by implementing the Proposed Action (modernization of PTA). The Army reviewed 16 potentially affected resource areas in this EIS. These resource areas include land use and recreation, airspace, visual resources, air quality, noise, transportation and traffic, water resources, geology and soils, biological resources, cultural resources, hazardous materials and waste, depleted uranium, socioeconomics and environmental justice, public services and utilities, wildfires, and sustainability.

This chapter is organized into sections that address each of the resources areas identified above. Each section contains a description of the resource, a definition of the ROI, and provides an overview on the existing environment for the resource area at PTA. The assessment of these resource areas serves as a baseline against which the impact of the Proposed Action can be measured.

The Army's Proposed Action of modernizing PTA encompasses many projects that are identified in Chapter 2 and described in more detail in Appendix A. Some of these projects are specific to the Cantonment Area, some to the Range Area, and some projects may relate to both areas of PTA. This affected environment chapter includes subsections for the Cantonment Area and the Range Area in order to better assist the reader in assessing which portions of PTA may be affected by a particular action. In general, projects proposed in this document may be implemented over the course of the next ten (10) years so this document can only broadly discuss the affected environment (installation-wide). The Army would prepare tiered NEPA documentation for most of these modernization projects when these projects are ready for a site-specific analysis.

One notable exception is the first project on the Army's proposed modernization list, to build and operate the IPBA. This chapter further identifies the affected environment for the three alternative locations that the Army considers as being reasonable and carried forward for full analysis. The three alternative locations are specific to the western and southwestern portion of the PTA impact area. The Army conducted several field investigations in order to determine the feasibility of constructing the IPBA at the preferred location. These investigations are fully addressed in Section 3.10 Cultural Resources, Section 3.11 Hazardous Materials, and Section 3.9 Biological Resources. Should the Army decide, based on this analysis and public input, that another alternative location (other than the preferred alternative) would better meet the purpose and need for the IPBA, than the Army would conduct additional surveys and prepare supplemental NEPA documentation.

Each of the proposed IPBA alternatives are situated within PTA. Aspects of the existing environment most relevant to evaluation potential impacts of the proposed IPBA are addressed for each of the alternative IPBA locations. The Army prepared technical analyses for the following resource areas:

- Air Quality estimates (Section 3.4);
- Noise modeling (Section 3.5);
- Airborne Depleted Uranium modeling (3.12); and,

- Economic impact assessment for constructing the IPBA (Section 3.13).

Other information regarding the existing environment for the IPBA specific project was provided from existing references discussed in each section.

3.1 Land Use and Recreation

3.1.1 Introduction and Region of Influence

The term “land use” refers to real property classifications that indicate either natural conditions or the types of human activity that occur or are permitted on a parcel. There is no nationally recognized convention or uniform terminology for describing land use categories; definitions are typically promulgated at the local level in the form of zoning ordinances. As a result, the meanings of land use descriptions and definitions vary among jurisdictions.

Land use plans are usually established to ensure that development proceeds in an orderly fashion, encouraging compatible uses for adjacent land. There are many tools used in the planning process, including master plans, geospatial databases, and zoning ordinances. A master plan is generally written by a county or municipality to provide a long-term strategy for growth and development. The foremost factor affecting land use is compliance and compatibility with master plans and zoning regulations. Other relevant factors include existing land use at project sites, the types of land uses on adjacent properties and their proximity to a Proposed Action, the duration of a proposed activity, and project permanence as a change in land use.

The ROI for PTA includes all the lands within PTA’s boundaries, and land directly adjacent to PTA. Hawai‘i Island is approximately 2.5 million acres, of which PTA occupies approximately 132,000 acres, or 5% of the island. PTA is located in the north-central portion of the island, just to the west of the plateau formed by Mauna Loa and Mauna Kea volcanoes. Access to PTA is from Saddle Road, which connects the towns of Hilo to the east and Waimea to the north. Land uses at PTA include the Cantonment Area, BAAF, maneuver training areas, drop zones, live-fire training ranges, artillery firing points, an ordnance impact area, and areas unsuitable for maneuver activities. Table 3.1-1 identifies land ownership at PTA and further distinguishes when various parcels of land were acquired for use by the Army at PTA. Figure 3.1-1 is a map of land ownership for parcels at and surrounding PTA.

Table 3.1-1. Land Ownership at PTA

Unit Ownership	Reference	Expiration Date	Size	
			Acres	Hectares
Ceded to Army	Governor’s EO No. 1719		758	307
Ceded to Army	Presidential EO No. 11167		84,057	34,017
State of Hawai‘i	Lease No. DA-94-626-ENG-80	16 August 2029	22,988	9,303
Parker Ranch	Acquired by purchase		24,988	10,112

Other	Acquired by purchase		16	6
Other	Acquired by purchase		6	2
Other	Used under license		1	<1

Source: USAEC, 2009b
*Rounded to the nearest hectare

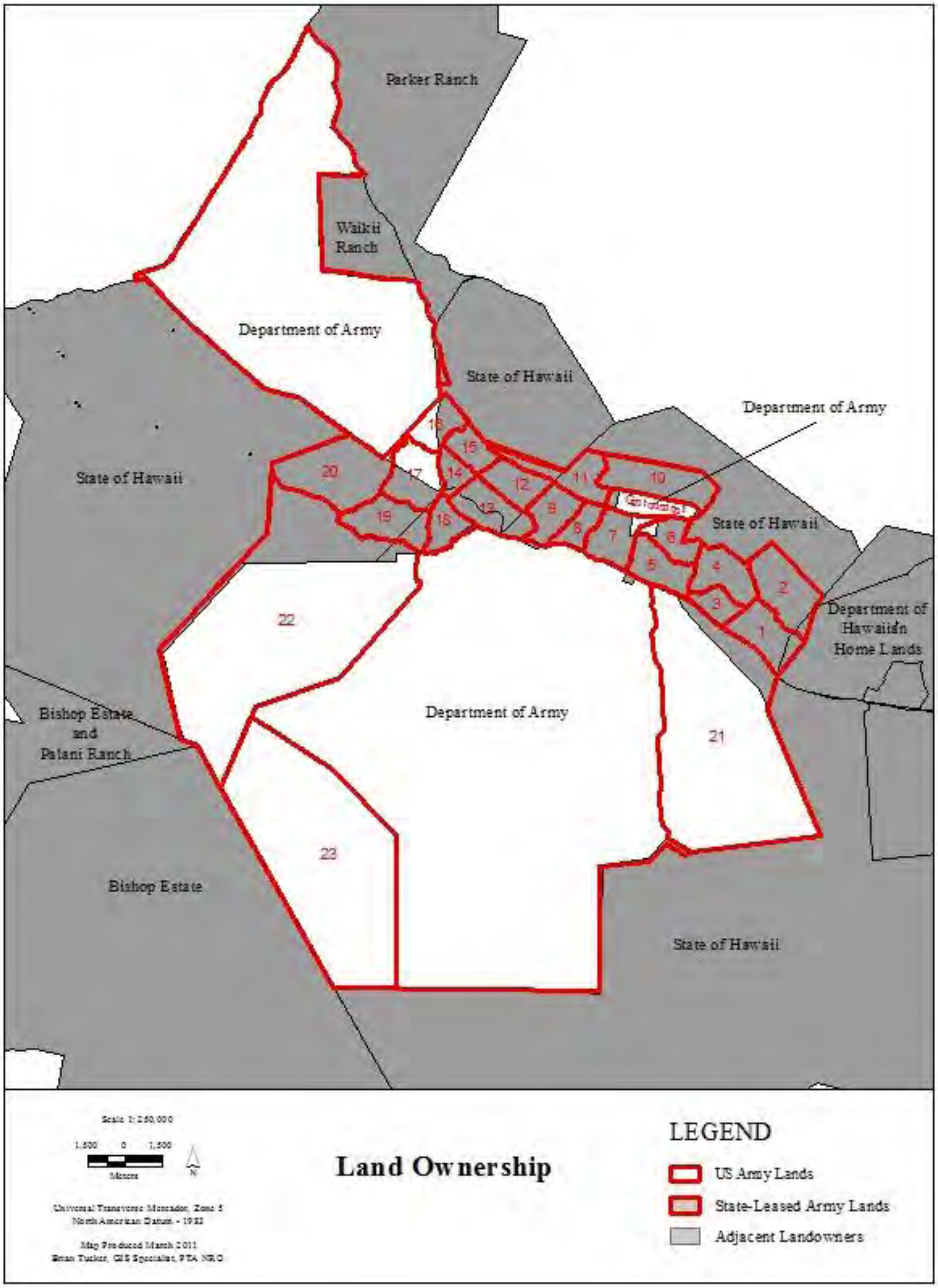

Figure 3.1-1. Land Ownership Map of PTA and Surrounding Areas

3.1.2 Applicable Statutes and Regulations

Land use within the ROI is governed by the Federal and State statutes and regulations discussed below.

The Hawai‘i State Land Use law under Hawai‘i Revised Statutes, Section 205, places all land under one of four land use districts: urban, agricultural, conservation, and rural. The State Land Use Commission administers the land use law, and the Hawai‘i Department of Land and Natural Resources (DLNR) administers the law in regard to land placed in the conservation districts. Specific land use planning and land use designations are done by county and city governments; the County of Hawai‘i’s General Plan, written in February 2005 and amended in December 2006, is the policy document for long-range development planning on Hawai‘i Island.

As an island chain, the entire State of Hawai‘i is classified as being in the coastal zone. The Coastal Zone Management Act (CZMA) is administered by the Department of Commerce’s Office of Coastal Resource Management and National Oceanic and Atmospheric Administration (NOAA) and applies to all coastal States and to all States that border the Great Lakes. The CZMA was established to help prevent any additional loss of living marine resources, wildlife, and nutrient-enriched areas; alterations in ecological systems; and decreases in undeveloped areas available for public use. The CZMA gives States the authority to determine whether activities of governmental agencies are consistent with Federally approved CZM programs.

The guiding document for the Hawai‘i Coastal Zone Management Program (CZMP) is the Hawai‘i Ocean Resources Management Plan (ORMP). The ORMP establishes management priorities protecting coastal natural resources, fish, and wildlife; managing development along coastal shorelines; providing public access to the coast for recreational purposes; and incorporating public and local coordination for coastal decision making.

The Federal Consistency provision, contained in Section 307 of the CZMA, allows affected States to review Federal activities to ensure that they are consistent with the State’s coastal management program. Any activities that may have an effect on any land or water use or on any natural resources in the coastal zone must conform to the enforceable policies of the approved State coastal zone management program.

The Sikes Act Improvement Act (SAIA) of 1960 (16 U.S.C. §670a-670o), requires that an installation’s INRMP shall reflect the mutual agreement of the parties concerning conservation, protection, and management of fish and wildlife resources[45]. The Sikes Act further permits that these management plans are consistent with the use of military installations to ensure the preparedness of the Armed Forces, and the sustainable multipurpose use of the [installation’s] resources that include hunting, fishing, trapping, and nonconsumptive uses. The Act further states that these uses are subject to safety requirements and military security while allowing for public access to military installations. DoDD 4715.3 Environmental Conservation Program establishes that installation lands are available for “educational and recreational use of natural and cultural resources when such access is compatible with military mission activities,

[45] Cooperating parties according to the regulation are the U.S. Department of Interior (DOI) and the USFWS. The PTA INRMP was further developed in cooperation with the Hawai‘i State DLNR, other Federal and State agencies, and Native Hawaiian organizations.

ecosystem sustainability, and other considerations such as security, safety, and fiscal soundness." The PTA INRMP (2010-2014) limits recreational activities to the hunting of birds and feral ungulates.

3.1.2.1 Recreation

Recreational opportunities at PTA are strictly limited to archery and bird-shot hunting in designated training areas with special permission from range control. In addition, an annual motocross race is held on Hawai‘i Island that transits a small portion of Training Area 2. A portion of the installation is made available for public hunting, in accordance with terms of the lease with the State (1964). Regularly scheduled hunting at PTA helps to control feral animal populations (for sheep and goats) and enhances Army community relations (USAEC, 2009b).

During scoping of this Programmatic EIS, members of the public raised concern over increasingly stringent enforcement of recreational hunting at PTA, including the recent completion of fencing around certain areas that were historically used for hunting. Fencing of these areas serves the purpose of protecting listed plant species from ungulates that otherwise would consume these plants, as required by the 2003 BO. The Army, by Federal regulation under the Endangered Species Act of 1973 (ESA), the Sikes Act, and through agreements with the USFWS, has a responsibility to protect endangered species on PTA lands. The Army dually has a force protection responsibility that it shares with all Federal agencies to protect and preserve certain assets. Recreational hunting is made available in designated Training Areas (see Section 3.1.4.1).

3.1.3 PTA Cantonment Area

The PTA Cantonment Area is located north of the impact area to the east of the BAAF (the BAAF is technically a part of the Cantonment Area). The Cantonment Area consists of 566 acres (229 hectares) with 154 buildings. The structures are mostly Quonset huts and include a theater and a recreation center.

3.1.4 PTA Range Area

3.1.4.1 General Range Area

PTA primary range uses are for live-fire and maneuver training. Section 1.3 (Chapter 1) discusses the live-fire areas at PTA. PTA has two light maneuver training areas totaling approximately 82,169 acres (33,253 ha). Most of PTA's ranges border the impact area and are oriented so that munitions are fired toward that area. Two exceptions to the impact area are two M16 ranges oriented to the east of Red Leg Trail. Previously, several small "dudded areas", where MEC/UXO accumulates were found east of Red Leg Trail. Two dudded areas east of Red Leg Trail were cleared, declared low hazard, and removed from Installation maps (PTA Range Special Edition 4-29, August 2010). SDZs for ranges at PTA terminate within the common impact area, where access is restricted due to hazards from fired munitions.

As discussed in greater detail in Section 3.9 (Biological Resources), the presence of threatened and endangered species and their critical habitat throughout PTA has resulted in restrictions on activities that may be performed in multiple training areas. Some of these restrictions include no off-road driving, restricted driving to existing roads on cinder cones, restriction of fire-prone munitions based on the Burning Index (see Wildfires, Section 3.15), no vehicles inside the Kīpuka ‘Alalā or Kīpuka Kālawamauna fence units without prior approval, training units must clean all vehicles at wash rack facilities, and restrictions on live fire activities, as well as seasonal restrictions. KMA, a 24,000 acre parcel that was purchased in 2006, is designated for command and control operations, dismounted non-live-fire, helicopter, and tactical vehicle maneuver exercises only. No live-fire is permitted in the KMA in order to reduce fire potential, and no training activities are permitted in fenced units constructed around Pu‘u Papapa and Pu‘u Nohona o Hae, sites of endangered plant taxa (USAG-HI, 2010). Approximately 22.36 percent of the installation is subject to land use restrictions based on the presence of critical habitat, threatened or endangered species, and cultural resources.

Recreational hunting on PTA is limited to Training Areas 1-4 and Training Areas 9-16. Available hunting periods are intermittent, and the schedule is indeterminable at PTA. Hunting is superseded in priority by training activities and weather conditions, such as drought. Hunting availability by Training Areas, dates, and times is offered through the PTA Hunting Hotline, a local phone number (808-969-3474) that is updated on an “as needed” basis by the PTA Range Control Supervisor and the PTA Garrison Commander. All hunting on PTA is archery only; no live-fire is allowed. The only exception is during upland bird game season (November through mid-January) which allows for the use of firearms with bird-shot. Game harvested in these Training Areas is primarily feral sheep and goats. Recreational hunting on PTA must follow hunting restrictions and bag limits as designated by the Hawai‘i Division of Forestry and Wildlife’s Game Mammal Hunting Regulations Web site[46]. There are plans to develop some recreational hunting access within the KMA in the future.

Training Areas 17-23 are closed permanently at PTA as they are now enclosed by large-scale fences (generally 6-ft [1.8 m] tall) in compliance with Federal mandates under the 2003 BO (ADD REF). Before these areas were fenced, they were cleared of feral ungulates and a long-term inspection program is conducted to remove any ungulate incursions.

3.1.4.2 IPBA at Western Range Area

The proposed Western Range Area site is located entirely within the impact area on Army owned and operated land. This area has historically been entirely restricted to public access and there would be no change to that restriction.

3.1.4.3 IPBA at Charlie’s Circle

The Charlie’s Circle alternative is similar to the Western Range Area alternative. Public access to this area is restricted.

3.1.4.4 IPBA at Southwest of Range 20

The proposed Southwest of Range 20 site is located within the southern portion of the dudded impact area, adjacent to Training Area 23. Given this alternative’s location within the impact area, this location has historically been restricted to public access and there would be no change to that restriction.

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[46] http://www.state.hi.us/dlnr/dofaw/hunting/hawmammregs.html

3.1.5 Land Uses Surrounding PTA

Hawaiʻi County has nine land use districts; these are Puna, South Hilo, North Hilo, Hāmākua, North Kohala, South Kohala, North Kona, South Kona, and Kaʻu District (County of Hawaiʻi, 2005). PTA is located primarily within the Hāmākua district in Hawaiʻi County, as well as relatively small portions of the South Kohala and North Kona districts. Approximately 60 percent of the Hāmākua district is classified as a conservation district. PTA is surrounded mainly by State-designated Conservation Lands and private lands (Bishop Estate, Parker Ranch, and Waikii Ranch (County of Hawaiʻi, 2005). Land uses in the areas include cattle grazing, game management, forest reserves, and undeveloped land. Land to the northwest of PTA is agricultural, primarily for cattle grazing, and also provides limited hunting opportunities for big game species and upland game birds. Land to the north of PTA includes the Puʻu Anahulu Game Management Area, Mauna Kea State Park, Mauna Kea Forest Reserve, and the Mauna Kea National Natural Landmark. Land to the east and south is included in the Mauna Loa Forest Reserve.

3.2 AIRSPACE

3.2.1 Definition of Resource

The Federal Aviation Administration (FAA) is responsible for the control and use of navigable airspace in the U.S. The definition of airspace includes vertical and horizontal boundaries and time of use. In addition to airspace, the FAA manages the air navigation system, equipment, airports, and the rules and regulations relating to powered flight. The FAA is responsible for managing the airspace for commercial airliners and air carriers, general aviation (GA), and government agencies, including the U.S. military.

Aircraft operate under two distinct categories of operational flight rules: VFR and IFR. These flight rules are linked to the two categories of weather conditions: visual meteorological conditions (VMC) and instrument meteorological conditions (IMC). VMC exist during generally fair to good weather, and IMC exist during time of rain, low clouds, or reduced visibility. During VMC, aircraft may operate under VFR, and the pilot is primarily responsible for seeing other aircraft and maintaining safe separation. During IMC, aircraft operate under IFR and ATC exercises positive control over all aircraft in controlled space and is primarily responsible for aircraft separation.

Navigable airspace over the U.S. is categorized as either controlled or uncontrolled. Controlled airspace is that airspace within which all aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements as outlined in the FAA's "General Operating and Flight Rules" (14 CFR Part 91). By contrast, uncontrolled airspace is outside the parameters of controlled airspace where aircraft are not subject to those operating and flight rules.

Controlled airspace is defined in FAA Order 7400.2 as being "airspace of defined dimensions within which ATC service is provided to IFR flights and to VFR flights in accordance with the airspace classification." For IFR operations in controlled airspace, a pilot must file an IFR flight plan and receive an appropriate ATC clearance.

The FAA has designated six classes of airspace. Airspace designated as Class A, B, C, D, or E is controlled airspace. Class G airspace is uncontrolled airspace. Within controlled airspace, ATC service is provided to aircraft in accordance with the airspace classification (Class A, B, C, D, or E). Aircraft operators are also subject to certain pilot qualification, operating rules, and equipment requirements. Within uncontrolled airspace (Class G), no ATC service to aircraft is provided, other than possible traffic advisories when the air traffic control workload permits and radio communications can be established. Essentially, the controlled airspace system protects IFR aircraft from VFR aircraft during IMC and in close proximity to busy airports.

Controlled airspace is designated as Class A, B, C, D, and E, while uncontrolled airspace is designated as Class G, as described below.

Class A airspace, generally, is that airspace from 18,000 feet above mean sea level (AMSL) up to and including 60,000 feet or Flight Level (FL) 600. FLs are altitudes AMSL based on the use of a directed barometric altimeter setting, and are expressed in hundreds-of-feet. Therefore, FL600 is equal to approximately 60,000 feet AMSL. Class A airspace includes the airspace overlying the waters within 12 nautical miles (NM) of the coast of the 48 contiguous States and Alaska (FAA, 2008).

Class B airspace, generally, is that airspace from the surface to 10,000 feet AMSL around the nation's busiest airports. The primary purpose of this class is to reduce the potential for midair collisions in the airspace surrounding those airports with high density air traffic operations. The actual configuration of Class B airspace is individually tailored but essentially resembles an inverted wedding cake consisting of a surface area and two or more layers, and is designed to contain all published instrument procedures for the runway environment (FAA, 2008).

Class C airspace, generally, is that airspace from the surface to 4,000 feet above the airport elevation (charted in AMSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the actual configuration of Class C airspace is individually tailored, it usually consists of a surface area with a 5 NM radius, and an outer circle with a 10 NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation (FAA, 2008). The primary purpose of Class C airspace is to improve aviation safety by reducing the risk of midair collisions in the terminal area and enhancing the management of air traffic operations therein.

Class D airspace, generally, is that airspace from the surface to 2,500 feet above the airport elevation (charted in AMSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be designated as Class D or Class E airspace (FAA, 2008).

Class E airspace consists of the following seven types of airspace that are not considered to be A, B, C, or D classes as defined above.

- **Surface Area Designated for an Airport.** When so designated, the airspace will be configured to contain all instrument procedures.
- **Extension to a Surface Area.** These airspace areas serve as extensions to Class B, C, and D surface areas designated for an airport. This airspace provides controlled airspace to contain

standard instrument approach procedures without imposing a communications requirement on pilots operating under VFR.

- **Airspace Used for Transition.** These areas begin at either 700 or 1,200 feet above ground level (AGL) for use in transitioning aircraft to/from the terminal or enroute environment.
- **En Route Domestic Airspace Areas.** These areas extend upward from a specified altitude to provide controlled airspace where there is a requirement for IFR enroute ATC services, but where the Federal airway system is inadequate.
- **Federal Airways.** Federal Airways (Victor Routes) are Class E airspace areas, and, unless otherwise specified, extend upward from 1,200 feet to, but not including, 18,000 feet AMSL.
- **Other.** Unless designated at a lower altitude, Class E airspace begins at 14,500 feet AMSL up to, but not including, 18,000 feet AMSL overlying: a) the 48 contiguous States, including the waters within 12 miles from the coast of the 48 contiguous States; b) the District of Columbia; c) Alaska, including the waters within 12 miles from the coast of Alaska, and that airspace above FL600; d) excluding the Alaska peninsula west of 160°00’00” west longitude, and the airspace below 1,500 feet above the surface of the earth unless specifically so designated.
- **Offshore/Control Airspace Areas.** This includes airspace areas beyond 12 NM from the coast of the U.S., wherein ATC services are provided (FAA, 2008).

Class G is airspace that has not been designated as Class A, B, C, D, or E airspace. This is considered uncontrolled airspace in which ATC does not have authority over aircraft operations. This airspace follows the contours of the earth’s surface with vertical altitude limits up to 700 feet AGL, 1,200 feet AGL, or 14,500 feet AMSL, as applicable. VFR GA pilots are the primary users of this airspace (FAA, 2008).

Figure 3.2 -1 provides a graphic representation of the different airspace classifications.

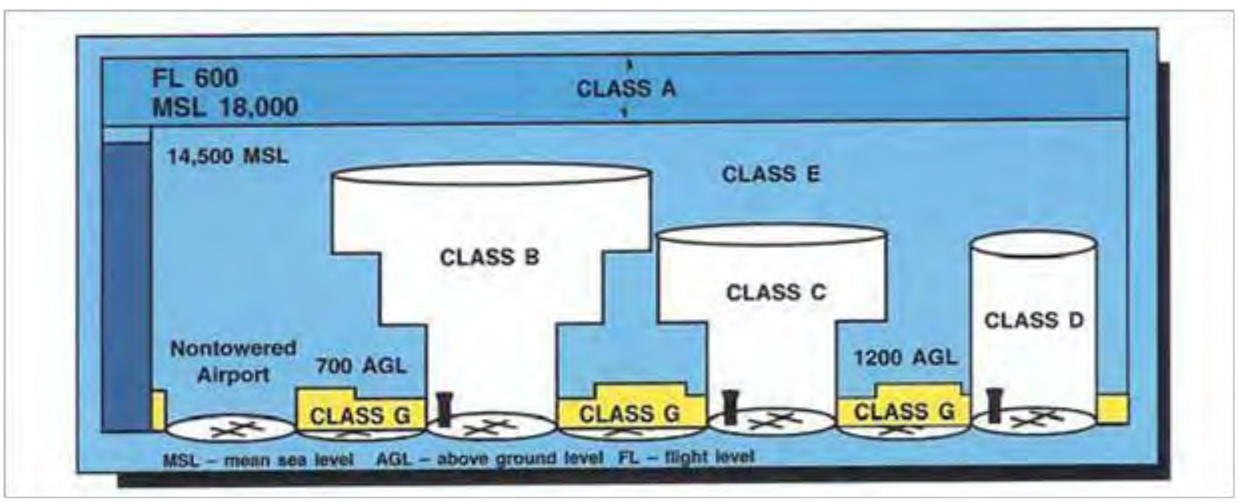

Figure 3.2-1. Airspace Classification

Use of airspace is required for the successful operation of the U.S. military. Some military flight activities are not compatible with civilian uses of airspace, whereas other military activities may potentially conflict with other uses of military airspace. Airspace restrictions are needed within military installations to ensure safety and to avoid possible conflicts of airspace use.

Large segments of controlled and uncontrolled airspace have been designated as SUA. Operations within SUA are considered hazardous to civil aircraft operating in the area. Consequently, civil aircraft operations may be limited or even prohibited, depending on the area. SUA is divided into prohibited, restricted, warning, alert, and military operations area (MOA).

3.2.2 Airspace ROI

Most of the airspace above the northern half of Hawaiʻi Island is controlled airspace of various classes. Class G (uncontrolled) airspace extends from the surface to 700 ft (213 m), except around Kona and Hilo International Airports and BAAF, which are surrounded by Class D airspace. The Restricted Airspace (RA) that overlays PTA (R3103) extends from the surface to 30,000 feet as depicted in Figure 3.2-2. Restricted areas contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature, and limitations imposed upon aircraft operations that are not a part of those activities or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. Restricted areas are published in the Federal Register, and constitute 14 CFR Part 73.

The northern part of Hawaiʻi Island has one SUA area, the R-3103 restricted area over PTA in the central part of the island with an effective altitude of 30,000 ft (9,144 m) and intermittent time of use (Table 3.2-1). Honolulu Combined Center Radar Approach Control controls this airspace (US Army and USACE, 2004).Projected annual use of PTA's airspace is based on the estimated number of sorties that would be conducted by the different participating aircraft types for US Army and US Marine Corps exercises and transient activities. These projections are based on analysis of the flight training requirements by service, respective subordinate units and by aircraft type over a typical 12-month period.

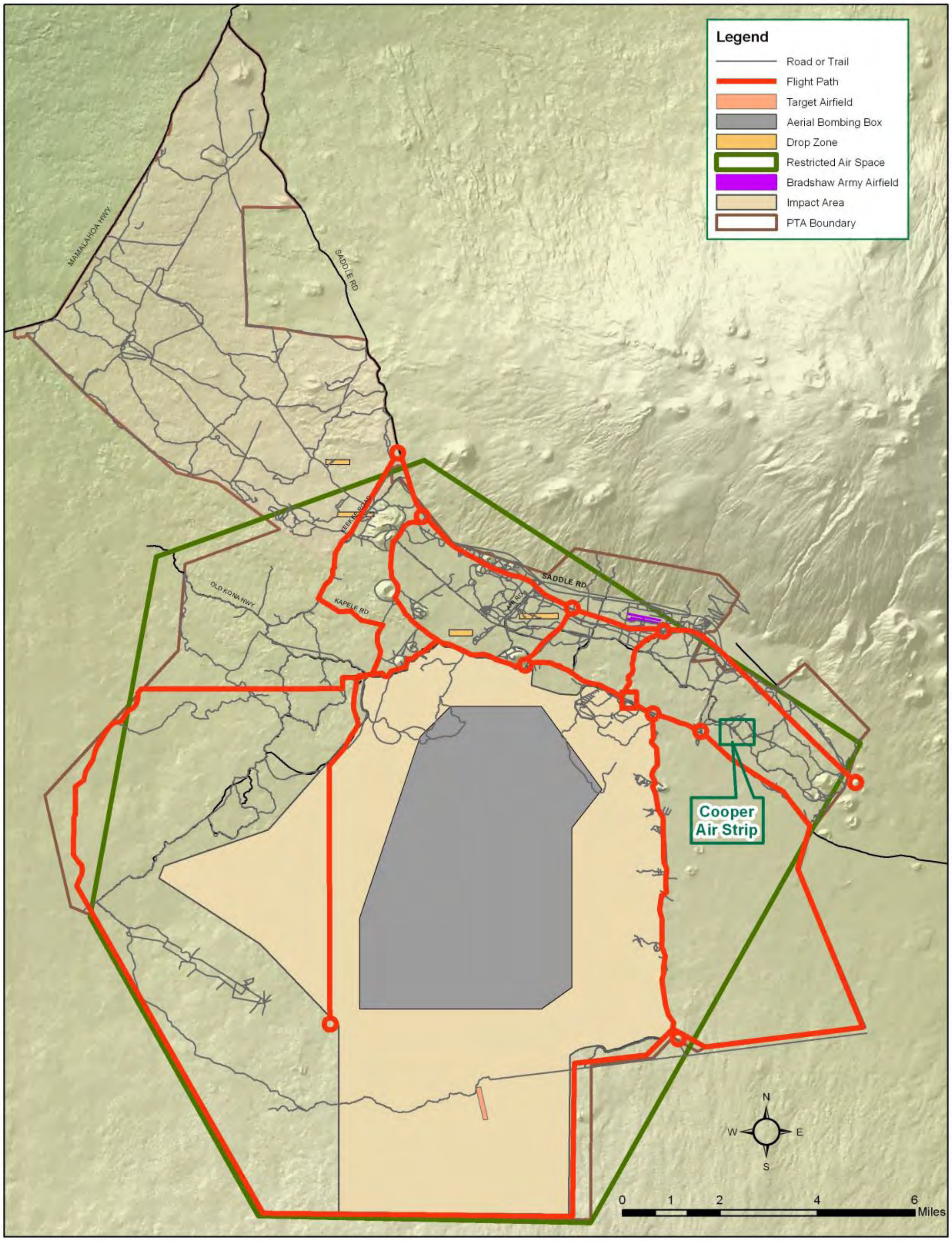

Figure 3.2-2. Airspace Over PTA

Table 3.2-1. PTA Airspace

Airspace	Area (Square NM)	Lower Limit	Upper Limit	Availability	Associated Range
R-3103	128	Surface	30,000’	Notice to Airmen (NOTAM)	PTA

3.2.2.1 Commercial/General Aviation

In addition to commercial traffic that utilize the low altitude en route airways, general aviation (GA) aircraft use the airspace over Hawai‘i Island. This includes all civil aviation operations, other than scheduled air services and unscheduled air transport operations for payment or hire. For example, 50 percent of Kona International Airport’s 281 average daily operations; 28 percent of Hilo International Airport’s 316 average daily operations; and 78 percent of ‘Upolu Airport’s 27 average daily operations involve GA (U.S. Army and USACE, 2004).

3.2.2.2 Aviation Safety

The Honolulu Air Traffic Control Center manages air traffic in the ROI within the 12 NM (22 km) territorial waters limit of the US. All military aircraft fly in accordance with Federal Aviation Regulations (FAR) Part 91, Subchapter F (Air Traffic and General Operating Rules), which governs the following:

- Use of airports, heliports, and other landing areas;
- Local flying rules; and
- SUA.

For example, installation commanders having Army aircraft assigned, attached, or tenant to their command, must prepare and publish local flight rules to include the use of tactical training and maintenance test flight areas, arrival/departure routes, and airspace restrictions as appropriate to help control air operations.

There are no formal or special flight plans or restrictions for the air transport of munitions used in the live-fire exercises. Traffic pattern altitudes at Army airfields for airplanes are set at 1,500 ft (457 m) AGL. Helicopter traffic pattern altitudes are at least 700 ft (213 m) AGL. Installation commanders may set different altitudes based on noise abatement, fly-neighborly policies, or other safety considerations. These are displayed in flight operations and published in flight information publications for all pilots.

3.2.3 Cantonment Area

BAAF is surrounded by Class D airspace, but is also restricted to military activities.

3.2.4 PTA Range Area

Airspace over the range area at PTA is restricted (R-3103), to be used for military operations only. Private and commercial aircraft may not enter airspace over the range area at PTA.

3.3 VISUAL RESOURCES

3.3.1 Introduction and Region of Influence

This section addresses the visual resources issues related to modernization activities proposed at PTA by describing the visual character of the area, identifying potentially sensitive visual resources, and summarizing local policies relating to maintaining visual quality.

Visual resources are usually defined as the visual quality or character of an area, consisting of both the landscape features and the social environment from which they are viewed. The landscape features that define an area of high visual quality may be natural (e.g., mountain views) or manmade (e.g., city skyline).

In order to assess the quality of visual resources in the action area, this section describes the overall visual character and distinct visual features on or in the viewshed at PTA, as well as any sensitive viewpoints within these viewsheds. The analysis of visual resources examines the impacts on visual resources from both the installation and at a distance from the installation. In general, features beyond 1 mile (1.6 kilometers) are so distant that only forms and outlines are discernable, and visual impacts are negligible. Visual resources also include places of cultural importance or Traditional Cultural Properties (TCP) (defined in Section 3.10.1 Cultural Resources). A TCP, as discussed by Parker and King (1990; Revised 1998) should be documented by both its contemporary physical appearance and its historical appearance, if known. Parker and King also place emphasis on describing or documenting a TCP in the way it is relevant to traditional belief or practice.

The visual character of an area is defined in terms of four primary components, including water, landform, vegetation, and cultural modifications. These components are characterized or perceived in terms of the design elements form, line, color, texture, and scale. Visual components also may be described as being distinct (unique or special), average (common or not unique), or minimal (a liability) elements of the visual field and in terms of the degree to which they are visible to surrounding viewers (e.g., foreground, middle ground, and background) (USAEC, 2009b).

The visual quality of an area is defined in terms of the visual character and the degree to which these features combine to create a landscape that has the following qualities: vividness (memorable quality), intactness (visual integrity of environment), and unity (compositional quality). An area of high visual quality usually possesses all three of these characteristics.

Visual quality of an area is also defined in terms of the visual sensitivity within the viewshed of the Proposed Action. Locations of visual sensitivity are defined in general terms as areas where high concentrations of people may be present or areas that are readily accessible to large numbers of people. They are further defined in terms of several site-specific factors important to the local population, including the following:

- Areas of high scenic quality (i.e., designated scenic corridors or locations);
- Recreation areas characterized by high numbers of users with sensitivity to visual quality (i.e., parks, preserves, and private recreation areas);
- Important historic or archaeological locations; and

- The natural beauty of Hawai‘i Island includes lush tropical forests, waterfalls, sandy beaches turquoise ocean waters, active and dormant volcanoes, and towering mountains.

PTA is within the County of Hawai‘i, covering Hawai‘i Island. Although the county does not have jurisdiction over the use of federal lands, the Army considers the guidance contained in the general plans in its decisions, to the greatest extent practicable, in order to avoid or minimize conflicts with surrounding nonfederal lands. The county general plans provide policies and objectives with respect to scenic resources.

3.3.2 General Plan for the County of Hawai‘i

The *County of Hawai‘i General Plan* is a statement of development objectives, standards, and principles with respect to the most desirable use of land within the county (County of Hawai‘i, 2005). The long-range goals with respect to the natural beauty of Hawai‘i Island include the following:

- Protect, preserve, and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources;
- Protect scenic vistas and view planes from becoming obstructed; and
- Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

PTA is within the planning area of the *County of Hawai‘i General Plan* (County of Hawai‘i, 2005). Specific standards provide guidelines for designating sites and vistas of extraordinary natural beauty that must be protected, including the following types of features:

- Distinctive and identifiable landforms distinguished as landmarks, such as Mauna Kea, Mauna Loa, and Hualālai;
- Coastline areas of striking contrast;
- Vistas of distinctive features; and
- Natural or native vegetation, which makes a particular area attractive (USAEC and COE, 2009).

3.3.3 Landscape Character of the Cantonment Area

The Cantonment Area was constructed in April 1955 from World War II prefabricated Quonset huts, and the airfield was constructed in 1956. The Cantonment Area, with its concentration of buildings (primarily Quonset Huts), is a visually distinct element of the landscape.

3.3.4 Landscape Character of the Range Area

3.3.4.1 General Range Area

The landscape of PTA is characterized by panoramic views of the broad open area between Mauna Kea and Mauna Loa. The gently sloping form and smooth line of Mauna Kea to the north and Mauna Loa to the south are dominant background features of the visual landscape. Terrain in the PTA area is gently sloping and open, periodically interrupted by remnant volcanic cinder cones (Pu‘u). Lava flows create dark visually receding areas throughout PTA.

Vegetation generally consists of grasses and shrubs that tend to be sparse and low in height. Observatories are located on Mauna Loa and Mauna Kea to the south and northeast of PTA. Observatories are available for visitors only on select days and is by appointment only[47]; general access is not provided. Visible cultural features within the range area include walls, platforms, and rock shelters.

Almost the entire area is characterized by having few trees or deep gullies to inhibit training. However, a portion of the general area is almost completely unusable for maneuvers and training due to the rough lava flows that are found over much of the surface area.

Geological features within the general range area at PTA includes puʻus formed from the latest volcanic activity on Mauna Kea, found in the northern part of the installation. The lava flows that surround the pu'us in the training areas at PTA range from 200 to 750 before present (BP), 750 to 1,500 years BP, 1,500 to 3,000 BP, and in a few cases date to the historic era (since 1790) from Mauna Loa. These newer flows are the most notable features of the central and southern landscape; together with the northern lava flows, they cover nearly one-third of the training area. The range area exhibits both types of lava found throughout Hawaiʻi, pāhoehoe[48] and ʻaʻā[49].

The extremely uniform vegetation and topography result in middle ground and background views of PTA that lack visual complexity but that are dramatic in their expansiveness. However, the panoramic views, integrated visual space, and unity of the natural features give this area a high overall visual quality, despite the uniformity of the landscape.

3.3.4.2 IPBA at Western Range Area

The proposed Western Range Area site is located within the impact area, north of Training Area 23. The Western Range Area site is oriented toward the impact zone, running northwest to southeast, and is located within the dudded impact zone and Training Area 21. The landscape at the IPBA at the Western Range Area is generally rough terrain, consisting of both ʻaʻā and pāhoehoe lava flows, with sparse vegetation (USACE, 2011a). The Western Range Area is an average visual element of the landscape.

3.3.4.3 IPBA at Charlie's Circle

The landscape at Charlie's Circle shares the same general characteristic features as the Western Range Area alternative.

3.3.4.4 IPBA at Southwest of Range 20

The landscape at the IPBA alternative southwest of range 20 is generally rugged, rough terrain that is steep in some areas, and consists of both ʻaʻā and pāhoehoe lava flows (personal communication with USAG-HI DPTM Range Division personnel, January 2011). The area southwest of Range 20 is an average visual element of the landscape.

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[47] http://www.esrl.noaa.gov/gmd/obop/mlo/visitingandtours/generalvisitors.html
[48] Pāhoehoe flows have smooth undulating surfaces and can be traversed on foot for short distances.
[49] 'A'a flows are jagged, slag-like piles of impassable material.

3.3.5 Land Character Surrounding PTA

Māmalahoa Highway forms the northwestern boundary and Saddle Road forms most of the northern and northeastern boundary of PTA. These roads offer the only publicly accessible views of the installation. The landscape surrounding the installation in this area is characterized by cattle grazing, limited hunting, quarrying, and occasional Army training (maneuvers at the KMA). The area surrounding PTA includes the Waikii Paddock Game Management Area, the Puʻu Anahulu Game Management Area, the Mauna Loa Forest Reserve, the Upper Waiakea Forest Reserve, and the Mauna Kea State Park. Some recreational activities are offered at these areas (see Section 3.1 Land Use and Recreation).

3.3.6 Sensitive Views

The General Plan of the County of Hawaiʻi (County of Hawaiʻi, 2005) lists island locations as examples of natural beauty and includes the scenic countryside around Waikiʻi (Tax Map Key (TMK) 6-7-01:003); the mauka and makai (mountain and sea) view plane from various locations along Queen Kaʻahumanu Highway in South Kohala and North Kona; the Mauna Kea State Park area (TMK 4-4-16:003); and the Puʻukoholā Heiau National Historic Site. Sensitive views may occur in areas of recreational or high public use. These include Mauna Kea State Recreation area adjacent to PTA; beach areas, and the Puʻukoholā Heiau National Historic Site, and adjacent roadways. There is one designated scenic byway on Hawaiʻi, the Kona Heritage Corridor, which is a segment of Mamalahoa Highway (County Route 180) that runs between Kalaoa and Honalo, passing through Holualoa[50].

The primary public viewing area near PTA is along the Saddle Road corridor. Public traffic through the area is generally light, and travelers typically drive through without stopping. While the typical public view of the PTA area is from a vehicle traveling at normal speed, some hikers, photographers, and artists pause along Saddle Road to appreciate the views. Areas within PTA are also visible from the Mauna Kea Observatory, which, as discussed above, allows limited public access. While public access into the observatories themselves is limited, the public is allowed general access on much of Mauna Kea, including at the Science Reserve. Pu`u Poliahu is a location of particular interest, and, as it is on the southwestern side of the summit it provides views of the PTA area. The public may also access Lake Waiau, or may hike to the summit of Mauna Loa on a trail that begins at the NOAA observatory on the northern slopes of the mountain. Portions of PTA are visible from these areas.

3.4 AIR QUALITY

This section addresses air quality resources describing Federal and State air quality standards and regulations, weather and meteorology of the area, and existing air quality conditions at PTA.

Air quality is a factor of the type and amount of pollutants emitted into the atmosphere, those that currently exist in the atmosphere, the size and topography of the air basin (e.g., airshed), and the prevailing meteorological and weather conditions. Proposed projects could involve localized impacts to

[50] More information on this scenic byway is found at the following Web site: http://www.byways.org/explore/byways/81305/.

air quality as the result of emissions from construction equipment, supply vehicles, and generators; dust from construction activities and training exercises; and the release of volatile compounds from painting and fueling activities.

3.4.1 Introduction and Region of Influence

The ROI for air quality issues depends on the pollutant and emissions sources being considered, as well as weather patterns, terrain, and prevailing winds. Secondary pollutants are those that are not emitted directly but are formed through chemical reactions in the atmosphere from precursor pollutants. Ozone is one example of a secondary pollutant and would generally have a ROI that reaches island-wide. The ROI for primary pollutants is an area potentially subject to measureable air quality impacts under unfavorable dispersion conditions. The ROI for a primary pollutant will depend on the rate of emissions from a source, the elevation of the source, the type of pollutant, and the meteorological conditions that limit its dispersion and dilution during transport away from the emissions source. The ROI for a primary pollutant is usually relatively small, and includes an area that reaches less than a few miles from the emissions source; for smaller emissions sources the ROI may extend less than one mile from the source.

Hawai‘i has established its own air quality agency, Hawai‘i Department of Health’s Clean Air Branch, for regulating emissions sources of air pollutants. This agency has adopted federal rules and has established some of its own rules and standards that are specific to attaining air quality goals in the State.

The entire State is classified as being in attainment with all National Ambient Air Quality Standards (NAAQS). Air pollution levels in Hawai‘i are generally low due to the small size and isolated location of the islands. Hawai‘i’s small size limits the accumulation and recirculation of locally generated air pollutants before being transported offshore and away from land. High concentrations of suspended particulate matter (PM) can occur in some areas, mostly due to agricultural burning of sugarcane or fireworks. Other natural air pollutants occur from gaseous emissions from volcanic activity (referred to as volcanic smog or VOG) and geothermic development as well as marine aerosols from the ocean.

3.4.2 Air Quality Standards

3.4.2.1 Ambient Air Quality Standards for Criteria Pollutants – National and State of Hawai‘i

The Environmental Protection Agency (EPA) has established NAAQS for several different air pollutants that are considered harmful to public health and the environment. These pollutants, also referred to as criteria pollutants, include sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), suspended PM, and lead (Pb). Standards for suspended PM have been set for two size fractions—inhalable coarse particles (PM-10) and fine particles (PM-2.5). The NAAQS are based primarily on evidence of air quality criteria. The NAAQS are divided into two categories; primary standards, which are set to protect the public health with an adequate margin of safety, and secondary standards, which protect the public welfare, including protection against visibility impairment, and damage to animals, crops, vegetation, and buildings

Hawai‘i, along with other States, has adopted State ambient air quality standards which in some aspects are more stringent than the NAAQS. The State ambient air quality standards are based primarily on health effects data but can reflect other considerations such as protection of crops, protection of materials, or avoidance of nuisance conditions (such as objectionable odors). Each ambient air quality standard corresponds to a specific averaging time; some pollutants may have standards for more than one averaging time. The averaging time is defined as the time period over which air pollutant concentrations are averaged for the purpose of determining attainment with ambient air quality standards (e.g., the NAAQS or State ambient air quality standards). Table 3.4-1 summarizes National and State Ambient Air Quality Standards and their corresponding averaging times applicable in Hawai‘i.

Table 3.4-1. State and National Primary Standards Applicable in Hawai‘i

Pollutant	Averaging Time	Ambient Air Quality Standards	
		Hawai‘i	**National**
Ozone (O_3)	8 Hours	0.08 ppm	0.075 ppm
Carbon Monoxide (CO)	8 Hours	4.4 ppm	9 ppm
	1 Hour	9 ppm	35 ppm
Coarse PM (PM-10)	Annual Average	50 $\mu g/m^3$	NA
	24 Hours	150 $\mu g/m^3$	150 $\mu g/m^3$
Fine PM (PM-2.5)	Annual Average	NA	15 $\mu g/m^3$
	24 Hours	NA	35 $\mu g/m^3$
Nitrogen Dioxide (NO_2)	Annual Average	0.04 ppm	0.053 ppm
	1 Hour	NA	100 ppb
Sulfur Dioxide (SO_2)	Annual Average	0.03 ppm	0.03 ppm
	24 Hours	0.14 ppm	0.14 ppm
	3 Hours	0.5 ppm	NA
	1 Hour	NA	75 ppb
Lead (Pb)	3- month	1.5 $\mu g/m^3$ (calendar quarter)	1.5 $\mu g/m^3$ (quarterly average)
Hydrogen Sulfide (H2S)	1 Hour	0.025 ppm	NA

ppb- parts per billion by volume
ppm- parts per million by volume
µg/m3 – micrograms per cubic meter of air
NA- Not Applicable

Sources: 40 CFR Parts 50, 53, and 58; Hawai‘i Administrative Rules Chapter 11-59

3.4.2.2 Hazardous Air Pollutants

Federal air quality management programs for hazardous air pollutants (HAPs) focus on establishing emission limits for particular industrial processes rather than setting ambient exposure standards. Some States have established ambient exposure guidelines for various HAPs and use those guidelines as part of the permit review process for industrial emission sources.

Hawai‘i has established significant ambient air concentration thresholds and criteria for HAPs under Administrative Rules Title 11 Chapter 60.1, Section 179. These rules are applied under the permit review process for emission sources that require State or Federal air quality permits and includes the following thresholds and criteria:

- For noncarcinogenic compounds, an 8-hour average concentration equal to one percent of the corresponding 8-hour threshold level value (TLV) value adopted by the Occupational Safety and Health Administration (OSHA);
- For noncarcinogenic compounds, an annual average concentration equal to 1/420 (0.238 percent) of the 8-hour TLV value adopted by OSHA;
- For noncarcinogenic compounds for which there is no OSHA-adopted TLV, the Director of Health is authorized to set ambient air concentration standards on a case-by-case basis so as to avoid unreasonable endangerment of public health with a reasonable margin of safety; and
- For carcinogenic compounds, any ambient air concentration that produces an individual lifetime excess cancer risk of more than 10 in 1 million assuming continuous exposure for 70 years.

3.4.3 Air Quality Designations

The Federal Clean Air Act (CAA) requires each State to identify areas that have ambient air quality in violation of the NAAQS. The status of areas with respect to the NAAQS is categorized as nonattainment (any area that does not meet an ambient air quality standard, or that is contributing to ambient air quality in a nearby area that does not meet the standard), attainment (meets the national standards), or unclassifiable (cannot be classified based on available information). The unclassified designation includes attainment areas that comply with Federal standards, as well as areas that lack monitoring data. Unclassified areas are treated as attainment areas for most regulatory purposes. Areas that have been reclassified from nonattainment to attainment are considered maintenance areas. States are required to develop, adopt, and implement a State Implementation Plan (SIP) to achieve, maintain, and enforce the NAAQS in nonattainment areas. The plans are submitted to, and must be approved by the EPA. Deadlines for achieving the NAAQS vary according to the air pollutant at issue, and the severity of existing air quality problems.

The entire State of Hawai‘i is categorized as attainment or unclassified for each of the NAAQS.

3.4.4 Clean Air Act Conformity

Section 176(c) of the CAA, the General Conformity Rule, requires Federal agencies to ensure that actions undertaken in nonattainment or maintenance areas are consistent with the CAA and with federally enforceable SIPs. Conformity analysis procedures do not apply to Army actions in Hawai‘i because none of the Hawaiian Islands are classified as nonattainment or maintenance areas. However, the *de minimis*[51] level thresholds in the Conformity Rule provide a basis for assessing the relative significance of emissions generated from a Proposed Action.

3.4.5 Climate Change / Greenhouse Gas Emissions

The EPA defines climate change as any distinct change in temperature, rainfall, snow, or wind patterns that last for decades or longer. These changes may result from naturally occurring events including changes in the sun’s energy or in the Earth’s orbit, natural processes within the climate system (such as

[51]De minimis is defined as so small as to be negligible or insignificant. If total direct and indirect emissions from the Proposed Action are below the de minimis levels, then the emissions are considered insignificant and a conformity determination pursuant to the CAA is not required.

changes to circulation patterns of oceans), or human activities. Human activities such as combustion of fossil fuels and deforestation alter the composition of the atmosphere by increasing the amount of CO_2 which intensifies the Greenhouse Gas (GHG) affect and increases the surface temperature of the Earth. Studies have shown that the amount of CO_2 has increased by about 35 percent during the industrial era. The Intergovernmental Panel on Climate Change (IPCC) scientists believe that most of the warming experienced since the 1950s is from human activities resulting in an increase in GHG emissions. (IPCC, 2007)

GHGs are compounds found naturally within the Earth's atmosphere, which trap and convert sunlight into infrared heat. Increased levels of GHGs in the atmosphere have been correlated to a greater overall temperature on Earth (global warming). The most common GHGs emitted from natural processes and human activities include CO_2, methane (CH_4), and nitrous oxide (N_2O). CO_2 is the primary GHG emitted by human activities in the U.S., with the largest source from fossil fuel combustion.

No universal standard or regulation has been established to determine the significance of cumulative impacts from GHG emissions. In addition, there is no requirement as part of the General Conformity Rule (40 CFR Parts 51 and 93) or NEPA requirements to consider GHG emissions and impact of the Proposed Action to climate change, however, this may change in the near future. At the national level, both the EPA and the Obama administration are considering the inclusion of an analysis of climate change impacts from proposed Federal actions in NEPA assessments. In February 2010 CEQ issued a draft guidance memorandum for public consideration and comment on the ways in which Federal agencies can improve their consideration of the effects of GHG emissions and climate change in their evaluation of proposals for Federal actions under NEPA (75 Fed. Reg. 8046). The guidance includes a presumptive threshold of 25,000 metric tons of CO_2 and suggests if CO_2 emissions from a proposed action are greater than this threshold, an agency should perform a more quantitative analysis and assess the effects of climate change on the proposed action and their design.

3.4.6 Climate and Meteorology

Air quality within a region is affected by the distribution and quantity of air pollutant emission sources, as well as the meteorology and topography of the region. The number, type, and spatial distribution of emission sources determine the quantity of pollutants emitted to the ambient air. The meteorology (wind and temperature) of the region affects how the pollutants will be dispersed both horizontally and vertically to produce ground-level ambient air concentrations of pollutants.

PTA is located in a high plateau between the lower slopes of the Mauna Kea volcano to approximately 6,800 feet (2,100 m) in elevation and to about 9,000 feet (2,700 m) up Mauna Loa volcano. The proximity of these volcanic mountains exerts a strong influence on the climatology and meteorology of the area. The climate at PTA is relatively cool and dry and characterized by a two-season year. Mild and fairly uniform temperatures are found everywhere except at higher elevations where reports of frost or snow occur periodically. The summer season (May through September) is generally warmer and drier than the winter months (October through April). Most major storms occur during the winter season. Cloudy, humid conditions occur along the east coast with drier conditions on the west coast. There is a general dominance of trade-wind flow from the northeast.

Temperatures on Hawai‘i Island are mild with cool nights due to the high elevations. The annual mean temperature in the lower elevations around PTA is about 15.6° C (60° F) and 10° C (50° F) at higher elevations (WRCC, 2011). The area experiences light winds in the dry summer months with stronger gusts in the winter. Though the trade-winds are fairly constant in speed and blow a high percentage of the time across the ocean and onto the island, the relatively uniform trade-wind flow is distorted and disrupted by the mountains, hills, and valleys. The average annual wind speed reported at BAAF is 11.9 mph (19.2 km/h) (WRCC, 2011). The area is subject to occasional fog and frost, with frequent light rains in the winter months. Annual rainfall is variable because PTA is located in the middle of a trade-wind inversion zone between 1,524 to 2,134 m (5,000-7,000 ft) in elevation (WRCC, 2011). Rainfall decreases above 610 to 914 m (2,000-3,000 ft), on the high mountains of Mauna Kea and Mauna Loa. Near the summits of Mauna Loa and Mauna Kea, rainfall is slight and skies are clear a majority of the time. The annual rainfall averages 51cm (21 in) and less in leeward coastal areas and near the summits of the high mountains. At the other extreme, the annual rainfall average exceeds 7 m (23 ft) along the lower windward slopes of these mountains (WRCC, 2011)

Air quality at PTA is affected by a number of emission sources, including volcanic activity. PTA is situated between three volcanoes on Hawai‘i Island: Mauna Kea, Mauna Loa, and the much smaller peak of Hualalai. Volcanoes emit sulfur dioxide (SO_2), as well as other gases, including hydrogen sulfide, hydrogen chloride, hydrogen fluoride, and trace metals like mercury. Sulfur dioxide reacts with sunlight, oxygen, dust particles, and water in the air to form VOG. VOG creates a haze that obscures visibility and contributes to development of acid rain. When hot lava from the volcanoes reaches sea water it rapidly boils and vaporizes the water and a hydrochloric acid mist, called laze, is formed. In addition to the laze, marine aerosols can be present, which can further diminish visibility.

Air quality at PTA is not affected by pollutant sources from urban areas due to its rural location. Emissions from transportation and explosives detonations can be locally important during troop transportation and maneuver and firing exercises. Localized fugitive dust can be generated by wind on exposed soils and unpaved roads, especially in conjunction with construction activities and vehicle maneuvers (both on and off-road). Sources of fugitive dust associated with military vehicle traffic include vehicle convoys on military vehicle trails, vehicle maneuver training on gravel or dirt roads inside military installations, and off-road military vehicle maneuvers inside military installations (U.S. Army and USACE, 2008a).

Visibility impairment in the form of regional haze obscures the clarity, color, texture, and form of what can be seen. Haze-causing pollutants (mostly fine particles) are directly emitted into the atmosphere or are formed when gases emitted to the air form particles as they are carried downwind. Emissions from manmade and natural sources can spread across long distances that result in regional haze. Visibility, expressed as visual range, is calculated from the measured levels of different components within airborne particles and these components' light extinction efficiencies. Visibility measurements have been made at Hawai‘i Volcanoes National Park approximately 40 miles (64 km) straight-line distance from PTA and are available through the IMPROVE (Interagency Monitoring of Protected Visual Environments)

Network (IMPROVE, 2011). The most current data available (2008) indicates an annual deciview (dv) of 27.5.[52]

3.4.7 Monitoring Data

The State of Hawai'i Department of Health currently operates 12 ambient air quality monitoring stations, five on the Island of O'ahu, one station on the Island of Maui, and six stations on Hawai'i Island. All of the monitoring stations are located in coastal regions, with many of the monitoring stations in or near urbanized areas. None of the State monitoring stations are located at or near PTA, or any other Army training area. The monitoring station on Maui monitors the air quality impacts of sugar cane burning. The monitoring stations on Hawai'i Island have been located primarily to monitor the impacts of emissions from volcanic eruptions and geothermal development. The Kīlauea volcano on Hawai'i Island is the single largest emission source in the State, usually producing more than 2,000 tons of SO_2 per day. Since a second vent at Halema'uma'u opened in early 2008, the SO_2 emissions from the Hawai'i Volcanoes National Park have been as high as 9,000 tons per day. Because of the potential health and welfare impacts, monitoring of volcanic emissions continues to be a priority for the State. The criteria pollutants of concern are SO_2 and PM-2.5 depending on the wind direction and distance from the vents.

There are at least six cruise ship docks on the Hawaiian Islands. On Hawai'i Island, commercial cruise lines originate or terminate at two docks, one at Hilo and one at Kona. Prevailing winds can carry cruise ship emissions on-shore into nearby communities. The State is proceeding with establishing one monitoring station on the island of Kauai to monitor the impact of cruise ship emissions that dock in Nawiliwili Harbor (State of Hawai'i, 2010).

Although there has been no long-term ambient air quality monitoring at PTA, air quality is generally considered to be good (USARHAW and 25th ID(L), 2001) (USAG-HI, 2009a). A 12-month air monitoring program was conducted at PTA during January 2006 to January 2007. The primary purpose of this monitoring effort was to determine the impact of fugitive dust from training activities at PTA. Seven monitoring stations were located at remote sites around the installation. Figure 3.4-1 illustrates the location of the air quality monitoring stations at PTA. Almost all of the monitoring data collected in recent years for the area shows that ambient air quality levels remain well below the values of the relevant State and NAAQS. Only the State and Federal 24-hour PM-10 standards have ever been approached (State of Hawai'i, 2010; USAEC, 2009b).

[52] A deciview is the unit of measure for evaluating visibility under regional haze regulations. This is generally a measurement that the EPA and National Park use to monitor trends in light extinction where viewsheds are considered resources. The deciview for Volcanoes National Park shows a trend towards a slight decline in visibility.

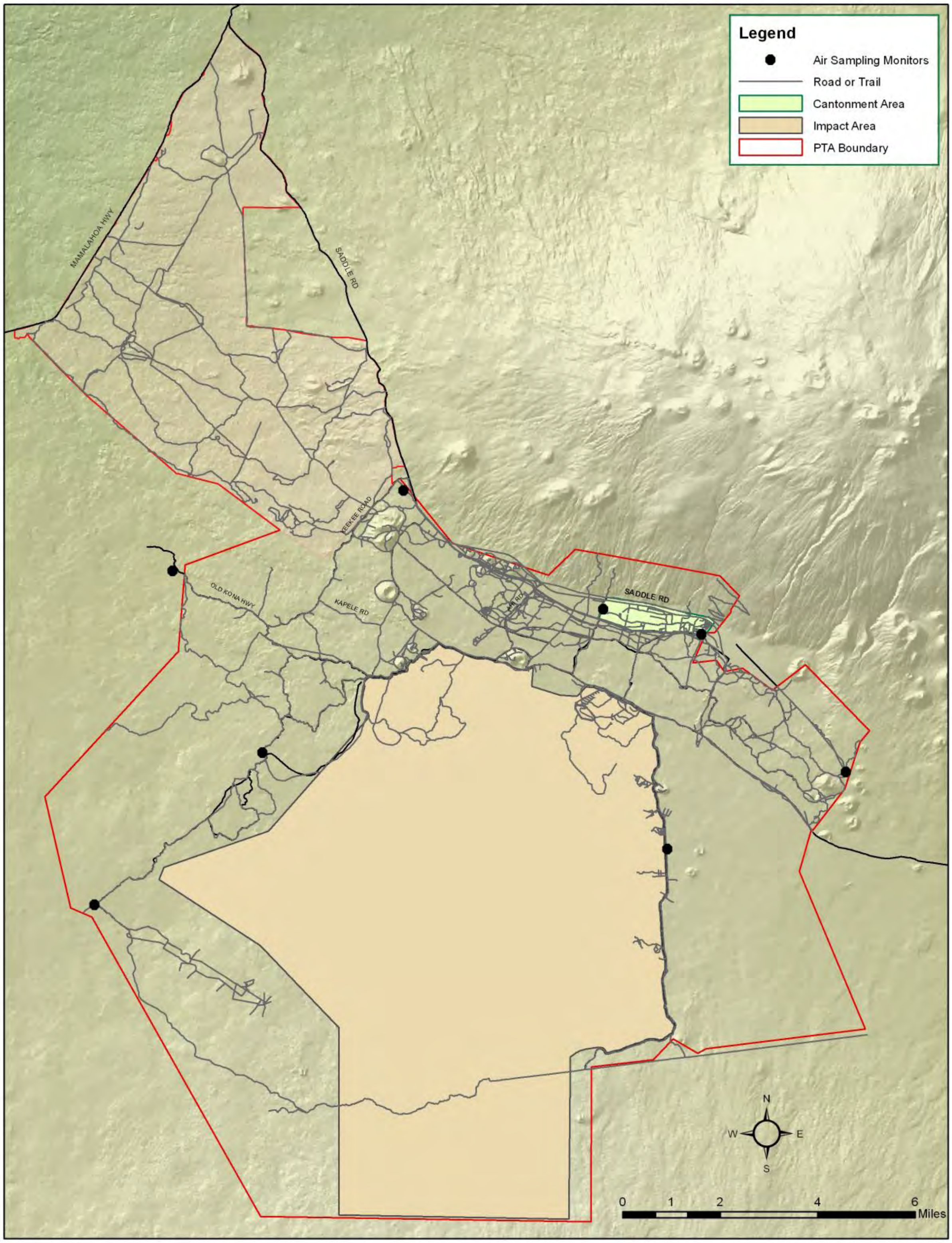


Figure 3.4-1. PTA Monitoring Sites (2006-2007)

3.4.8 Cantonment Area

Air quality in the Cantonment Area is similar to the rest of the island. As detailed in the U.S. Army PTA Air Monitoring Program, one monitoring station (S-1) was established at the Cantonment Area and another is located near the BAAF (S-3) (See Figure 3.4-1). There are additional monitoring stations at or near the Cantonment Area, but these are specifically for Depleted Uranium (DU) (See Section 3.12). Monitoring results from Stations S-1 and S-3 show the annual average total suspended particulates (TSP) concentrations measured were well below the current annual PM-10 standard of 50 $\mu g/m^3$. The values were also all well below the former 24-hour NAAQS secondary TSP standard of 150 $\mu g/m^3$ which was superseded by a primary PM-10 standard of 150 $\mu g/m^3$ in 1987.

Based on the temperature and precipitation data monitored at the stations, the site would be classified as a Group "BS" climate (dry, semi-arid steppe) under the widely used Köppen climate classification system (Morrow, 2007). The average annual precipitation at PTA is 275 millimeters (mm) (10.8 inches [in])**.** Mean hourly wind speeds were light, but strong winds averaging up to 21 knots occurred about 1% of the time. Wind directions at the site were predominantly from the southeast and west (Morrow, 2007).

3.4.9 Range Area

3.4.9.1 General Range Area

Air quality data was collected from several air quality monitoring stations near the Range Area during the 12 month study period. Monitoring Station 2 (S-2) was positioned on the Red Leg Trail that runs directly through the area where most of the live-fire ranges are located along the east side of the impact area. Station 4 (S-4) and Station 5 (S-5) are located near the KMA. The monitoring values from data collected at all these stations during the 12-month air monitoring program all found air quality to be well below the former 24-hour NAAQS secondary TSP standard and current PM-10 standard of 150 $\mu g/m^3$. The annual average concentrations measured were also well below the annual PM-10 standard of 50 µg /m3 (Morrow, 2007).

On an annual basis, mean annual wind speeds were light to moderate at S-2 and S-4, but occasionally average wind speeds exceeded 16 knots. Wind direction on an annual basis at S-2 was predominantly from the southeast and predominantly from the north-northwest and east-southeast at S-4. Annual precipitation in 2006 was recorded at 425.5 mm (16.8 in) for S-1 and 335.2 mm (13.2 in) and 447 mm (17.6 in) at S-4 and S-5 respectively (Morrow, 2007).

Vehicle traffic and aircraft flight operations represent the major emissions sources that presently exist at the Range Area. Other emissions at the Range Area include localized fugitive dust that can be generated by wind on exposed soils and unpaved road. Specifically, PM emissions are generated in conjunction with construction activities, vehicle traffic from vehicle convoys, construction vehicles, personally occupied vehicles (POVs), as well as vehicle maneuver training on gravel or dirt roads inside the installation and on off-road trails. Other sources of fugitive dust may occur from military helicopter flight operations and fixed wing aircraft operating at BAAF. Ordnance firing and detonations may generate PM emissions during live-fire training exercises.

3.4.9.2 IPBA at Western Range Area

Air quality at the Western Range area is similar to much of the island and generally considered to be good. Air quality monitoring and meteorological data collected at monitoring Station 6 (S-6), closest to the proposed IPBA at the Western Range Area site revealed a cool (15.3o C [60o F] mean) and semi-arid climate with 336.3 mm (13.2 in) annual rainfall. Wind speeds were generally light, averaging 5 knots. On an annual basis, hourly wind speeds rarely (0.1% of the time) exceeded 16 knots. The predominant daytime wind directions at the site were northwest and nighttime winds were from the southeast (Morrow, 2007). The air quality monitoring results at Station 6 located at Training Area 22 indicated that all measured values were below the former 24-hour NAAQS secondary TSP standard and current PM-10 standard of 150 $\mu g/m^3$ (Morrow, 2007).

3.4.9.3 IPBA at Charlie's Circle

Air quality conditions at the IPBA at Charlie's Circle site would be the same as those described in 3.4.8.2 for the IPBA at Western Range Area.

3.4.9.4 IPBA at Southwest of Range 20

Air quality at the area Southwest of Range 20 is similar to much of the island and generally considered to be good. There are no air quality monitoring stations located near the area that is southwest of Range 20. Air quality conditions would be the similar as those described in 3.4.8.2 for the IPBA at Western Range Area.

3.5 NOISE

The sensation of sound is produced when pressure variations having a certain range of characteristics reach a receptive ear. Sound is the term describing pressure variations that are pleasant or useful for communication. Noise is generally defined as unwanted sound, although noise and sound are often used interchangeably.

Noise is among the most pervasive pollutants today. Unwanted sounds from road traffic, aircraft, commercial trucks, construction equipment, manufacturing processes, and home maintenance— to name a few sources— are among the noises routinely broadcast into the environment. Noise negatively affects the health and well-being of both humans and wildlife in many ways (NPC, 2001). Responses to noise vary, depending on the type and characteristics of the noise, expected level of noise, distance between the noise source and the receptor, the receptor's sensitivity, and the time of day. The most conspicuous problems related to noise are hearing loss and hearing impairment. Other health impacts include stress, exacerbation of mental health problems, high blood pressure and restricted blood flow, sleep loss, distraction, loss of productivity, and a general reduction in quality of life and opportunities for tranquility. Noise can provoke annoyance responses and changes in social behavior. The effects of noise can be immediate or latent as a result of long-term exposure (Plog, 1993; EPA, 1974; Berglund et al., 1995).

3.5.1 Noise Effects, Standards, and Guidelines

Noise may influence the environment in one of three ways: influence on wildlife, influence on humans, and by change to ambient sound characteristics.

Sources of noise that have the potential to affect wildlife include aircraft overflights; recreational activities, such as motor boating; domestic sources, such as leaf blowers, lawnmowers, and chainsaws; automobile traffic; and heavy machinery and equipment. Responses vary among species of wildlife, as well as among individuals of a particular species (Busnel and Fletcher, 1978, cited in Radle, no date), although the problems are similar to those found in humans. Increased noise levels mask sounds used by wildlife for communication; for example, they mask mating calls and the sounds that parents use to locate their young (Dooling, no date; Schubert and Smith, 2000). Disturbed mammals sometimes trot short distances; birds might walk around flapping their wings or may be flushed from their roost. Panic and escape behavior results from more severe disturbances. Behavioral and physiological responses have a potential to cause injury, energy loss due to movement away from the noise source, decreased food intake, habitat avoidance and abandonment, and reproductive losses (National Park Service 1994; Nature Sounds Society 2001). All species, wildlife and humans, initially respond to an impulse noise with some form of startle response that diminishes with each subsequent exposure. In general, aircraft noise plays a minor role as a disturbance factor, but in combination with optical stimuli can trigger a reaction such as a startle response. However, animals can adapt to high noise exposure. There is also a strong tendency for species to acclimate or habituate to a repetitive noise disturbance (Kempf and Hueppop, 1997).

One common human response to noise is annoyance. A person's expectation of a sound level associated with an activity has a direct bearing on the level of annoyance. For example, noise is tolerated at a bowling alley, but it is not tolerated at a library. The annoyance might be personal or experienced as a group. The five factors identified as indicators for estimating community complaint reaction to noise are:

- Type of noise;
- Amount of repetition;
- Type of neighborhood/location;
- Time of day; and
- Amount of previous exposure.

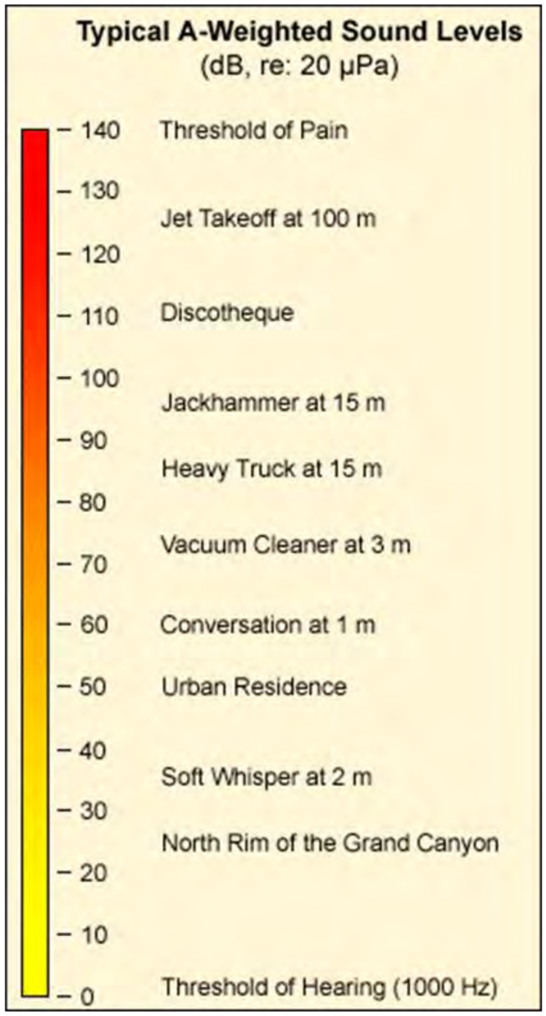
An additional consideration is the preservation of natural "soundscapes" within preserved areas such as U.S. National Parks. A natural soundscape is defined as "acoustic resources including both natural sounds (wind, water, wildlife, vegetation) and cultural and historic sounds (battle reenactments, tribal ceremonies, quiet reverence)" by the National Park Service (NPS). The NPS Organic Act mandates the preservation and/or restoration of natural resources within parks, including the acoustical environment (16 USC Chapter 1).

Sound levels, reported in decibels (dB), are used to summarize how people hear sound and to determine the impact of noise on public health and welfare. Figure 3.5-1 presents a range of sound levels by various sources of noise. The following are four metrics used to equate noise impacts on humans:

- ADNL (A-weighted day-night average sound level) is used to evaluate human response or annoyance to noise, typically aircraft and ground transportation. Represents a 24-hour average noise level.
- CDNL (C-weighted day-night average sound level) is used to evaluate human response or annoyance to impulsive noise such as blasts, commonly associated with large-caliber ammunition and explosives. Represents a 24-hour average noise level.
- PK15(met) (Peak sound level) is used to evaluate human response or annoyance to impulsive noise such as blasts, commonly associated with small arms. This metric factors in the statistical variations caused by weather in order to predict the noise level that is likely to be exceeded 15% of the time (i.e., 85% certainty that sound will be at this level).
- dBP (Unweighted Peak sound level) is used to evaluate human response to a sudden sharp noise for a single event. Unlike PK15(met), there is no particular confidence built in that the number is reliable in other situations.

For the PK15(met) metric, even if there are multiple weapon types fired from a particular location (or multiple firing locations), the single event level used to create a noise contour is the loudest level that occurs. As such, PK15(met) contours are the same size no matter how many shots are fired. In contrast, ADNL and CDNL are 24-hour average metrics which reflect the number of shots fired.

More discussion of the terms presented above is found in the glossary.



Source: OSHA.gov (U.S. Department of Labor, 2011)

Figure 3.5-1. Weighted Decibel Values from Example Noise Sources

3.5.1.1 Federal and State Noise Standards and Guidelines

Federal Guidelines

Several laws require the Federal government to set and enforce uniform noise control standards for aircraft and airports, interstate motor carriers and railroads, workplace activities, medium- and heavy-duty trucks, motorcycles, and portable air compressors and for federally-assisted housing projects located in noise-exposed areas. Among these laws are the Noise Control Act of 1972 (Public Law 92-574), Aviation Safety and Noise Abatement Act of 1979, Control and Abatement of Aircraft Noise, and Sonic Boom Act of 1968.

The EPA enforces the Noise Control Act, and recommends the use of the ADNL for environmental noise. The ADNL is the A-weighted equivalent sound level for a 24-hour period, with an additional 10-dB weighting imposed on the equivalent sound level occurring during the nighttime hours (10:00 PM to 7:00

AM) to account for the intrusiveness of nighttime noise. These sound levels represent an annual average exposure, where on any given day the level may be greater. Note that the Army uses C-weighted DNL (CDNL), a different metric from A-weighted DNL (ADNL).

Criteria for evaluation of noise levels has been expanded beyond the normal A-weighted DNL descriptor. Criteria include the use of C-weighted DNL values to characterize major blast noise sources and the use of PK15(met) to characterize small arms firing. These levels are in agreement with the planning use guidelines and percent of population annoyed, published by the Department of Housing and Urban Development (HUD), the World Health Organization (WHO), and other numerous studies performed over the past two decades.

Army Guidelines

The Federal Interagency Committee on Urban Noise (FICUN) has developed land use guidelines for areas located near noise-producing sources, such as highways, airports, and firing ranges. The DoD began developing noise evaluation programs in the early 1970s. Initial program development involved the Air Installation Compatible Use Zone (AICUZ) program for military airfields. Early application of the AICUZ program emphasized Air Force and Navy airfields.

The Army's Installation Operational Noise Management Plan (IONMP) program designates Noise Zones for land use planning. The IONMP program considers areas with noise-sensitive land uses and exposure to generally unacceptable noise levels. Noise-sensitive land uses include, but are not limited to, residences, schools, medical facilities, and churches.

The Army implemented the IONMP program by addressing both airfield noise issues and other major noise sources, such as weapons testing programs and firing ranges. For Hawai‘i, the Army has instituted the 2010 Hawai‘i Statewide Operational Noise Management Plan (SONMP) in lieu of an IONMP for each installation.

The Army uses three Noise Zones, described in AR 200-1 (US Department of the Army, 1997) and DA PAM 200-1 (US Department of the Army, 2002), referred to as Land Use Planning Zones (LUPZ). The IONMP outlines procedures to meet the objectives of minimizing the impact of environmental noise on the public without impairing the mission of the installation. The Army's three Noise Zones are as follows:

- Zone I — Compatible with noise-sensitive land use;
- Zone II — Normally incompatible with noise-sensitive land use; and
- Zone III — Incompatible with noise-sensitive land use.

These Zones serve as guidance for land use planning and may be used as tools for both noise abatement planning and noise complaint management as seen in Table 3.5-1.

Table 3.5-1. Land Use Planning Guidelines

Noise Zone	Percent Population Highly Annoyed	Transportation/ Aviation (ADNL)	Small Arms Noise PK15(met)	Large Arms Noise (CDNL)
Zone I	<15	<65	<87	<62
Zone II	>15	65-75	87-104	62-70
Zone III	>39	>75	>104	>70

Source: US Army, AR 200-1
Notes:
Noise levels from all sources should be evaluated in terms of annual averages of the identified noise metric.
Noise from transportation sources (aircraft and vehicles) and common industrial sources should be evaluated using ADNL values.
Noise from impulsive sources (such as armor, artillery, and demolition activities) should be evaluated using CDNL values.
Noise from small arms ranges should be evaluated using PK15(met).
Noise-sensitive land uses include housing, schools, and medical facilities.

The historical expected annoyance within each Zone is identified as (US Army CHPPM, 2001):

- Zone I is defined by the noise exposure that would be expected to result in less than 15 percent of the population described as "highly annoyed";
- Zone II is defined by the noise exposure that would be expected to result in more than 15 percent of the population described as "highly annoyed"; and
- Zone III is defined by the exposure resulting in more than 39 percent of the population describing themselves as "highly annoyed."

According to the Army's Environmental Noise Management Program (ENMP) handbook (U.S. Army CHPPM, 2001), many of the complaints received by military installations are from residents living in Zone I. The ENMP handbook further states, "These are people who are living in quiet areas but who are disturbed by infrequent events such as helicopter flyovers, or a single large detonation of explosives" (U.S. Army CHPPM, 2001).

The U.S. Army Public Health Command (USAPHC), formerly the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM), assists Army installations in developing environmental noise management plans. The USAPHC also undertakes special noise studies to evaluate noise problems associated with various types of noise sources. When investigating noise conditions related to weapons firing or ordnance detonations, the USAPHC typically measures peak decibel levels and/or C-weighted DNL levels and develops noise contours using computer models (Small Arms Range Noise Assessment Model [SARNAM] and Blast Noise Model [BNOISE], respectively) for land use guidelines. Table 3.5-2 indicates compatible land uses for the identified Zones.

Table 3.5-2. Compatible Land Use Guidelines

Noise Zone	Residential	Schools and Hospitals	Industry
Zone I	Yes	Yes	Yes
Zone II	Not Recommended	Not Recommended	Yes
Zone III	Not Compatible	Not Compatible	NLR* = 30

Source: U.S. Department of the Army, 2002
*NLR (Noise Level Reduction) of a structure, which is approximately the difference between outdoor and indoor sound levels

The Army has stated that "In light of this (Noise Control Act), we think the correct Army policy with respect to the Noise Control Act is that all Army activities should endeavor to comply with all federal, state and local requirements respecting the control of noise as stated in Section 4(b) of the Act, unless to do so would conflict with the Army's mission. The obligation to comply arises out of the Army's policy of cooperation on environmental matters generally" (U.S. Department of the Army, 2002).

State Regulations

The State of Hawai'i has adopted statewide noise standards (Title 11 of Chapter 46 of the Hawai'i Administrative Rules) that apply to fixed stationary noise sources, agricultural equipment, and construction equipment. The alternatives under the Proposed Action do not involve introduction of or modifications to stationary sources, and thus these standards do not apply.

3.5.2 PTA Cantonment Area

PTA is used for year round live-fire exercises by all branches of the U.S. Military. Noise conditions on PTA vary depending on location and time of day. Principal sources of noise on PTA are generated through small arms and large caliber weapons firing. Within the Cantonment Area, the main sources of noise result from aircraft operating at BAAF and support vehicles operating within PTA, however, portions of the Cantonment Area may be affected by noise from large arms fire generated at the Range Area. The SONMP states that "the low number of military aircraft utilizing the flight corridors at BAAF will not generate ADNL noise contours" (U.S. Army Public Health Command, 2010).

Figure 3.5-2 depicts existing noise contours from small arms firing at PTA as established in the SONMP. Since there are multiple training activities occurring at any given time on PTA, all of which have the ability to generate substantial noise, it is prudent to include the sum of these activities rather than all the individual parts as the existing condition. Therefore, all noise contours modeled for PTA are for combined training operations unless stated otherwise. The noise contours generated consisted of training data provided by PTA from September 30, 2007 through October 1, 2008 (see Table 3.5-3). As shown in Figure 3.5-2, Zone III noise conditions are completely contained within the boundaries of PTA. Zone II noise conditions extend beyond the limits of PTA in an area southeast of the PTA Cantonment Area that is designated forest reserve. Public assess is granted to the Forest Reserve, permit required, for hunting and special uses (e.g., weddings, community events, etc.). Noise impacts to the forest reserve are not well documented. The Army has committed to conduct a noise study for impacts from a separate proposed project (HAMET EA), which is unrelated to the activities proposed in this Programmatic EIS. The parameters of that study include noise impacts to the Forest Reserve adjacent to PTA.

The noise contours shown in figure 3.5-2 were generated based on noise modeling performed by USAPHC. Only the Zone II and III contours were modeled in their analysis. Note that Zone I contours represent noise levels compatible with all types of land uses. Therefore, any land areas located outside the extents of the Zone II contour are considered compatible in terms of noise exposure levels, and are by definition considered Zone I.

Table 3.5-3. Small Arms Utilization – Existing Conditions

Ranges	PISTOL 9MM, LIVE	RIFLE 5.56MM LIVE	RIFLE 7.62MM, LIVE	MACHINE GUN 50 CAL, LIVE	MACHINE GUN 50 CAL, BLANK	RIFLE 5.56MM BLANK	RIFLE 7.62MM BLANK	SHOTGUN 12 GAUGE	SHOTGUN .410
PTA FP 424/12						◊	◊		
PTA FP 429/13						◊			
PTA FP 501/16						◊			
PTA LZ ROB/1						◊			
PTA POW CAMP						◊	◊		
PTA RG 01 DEF		◊		◊		◊	◊		
PTA RG 01 OFF	◊	◊	◊	◊	◊	◊	◊		
PTA RG 02	◊							◊	
PTA RG 03				◊					
PTA RG 04		◊							
PTA RG 05		◊							
PTA RG 05A		◊							
PTA RG 07		◊	◊						
PTA RG 08	◊	◊	◊	◊			◊		◊
PTA RG 08B				◊					
PTA RG 08S		◊	◊	◊					
PTA RG 10		◊		◊	◊	◊			
PTA RG 10 OFF	◊	◊	◊	◊	◊	◊	◊		
PTA RG 11T		◊	◊	◊	◊	◊	◊		
PTA RG 12		◊	◊	◊	◊	◊	◊	◊	
PTA RG 12A		◊	◊	◊	◊	◊	◊		
PTA RG 13		◊	◊	◊	◊	◊			
PTA RG 13A	◊		◊						
PTA RG 20		◊	◊	◊		◊			
PTA RG 8C SHOOTHOUSE	◊	◊	◊			◊			
PTA TA 03		◊			◊	◊		◊	
PTA TA 08					◊	◊		◊	
PTA TA 12							◊	◊	
PTA TA 13						◊	◊		
PTA/RG 01		◊	◊			◊			

Source: Hawai‘i SONMP 2010

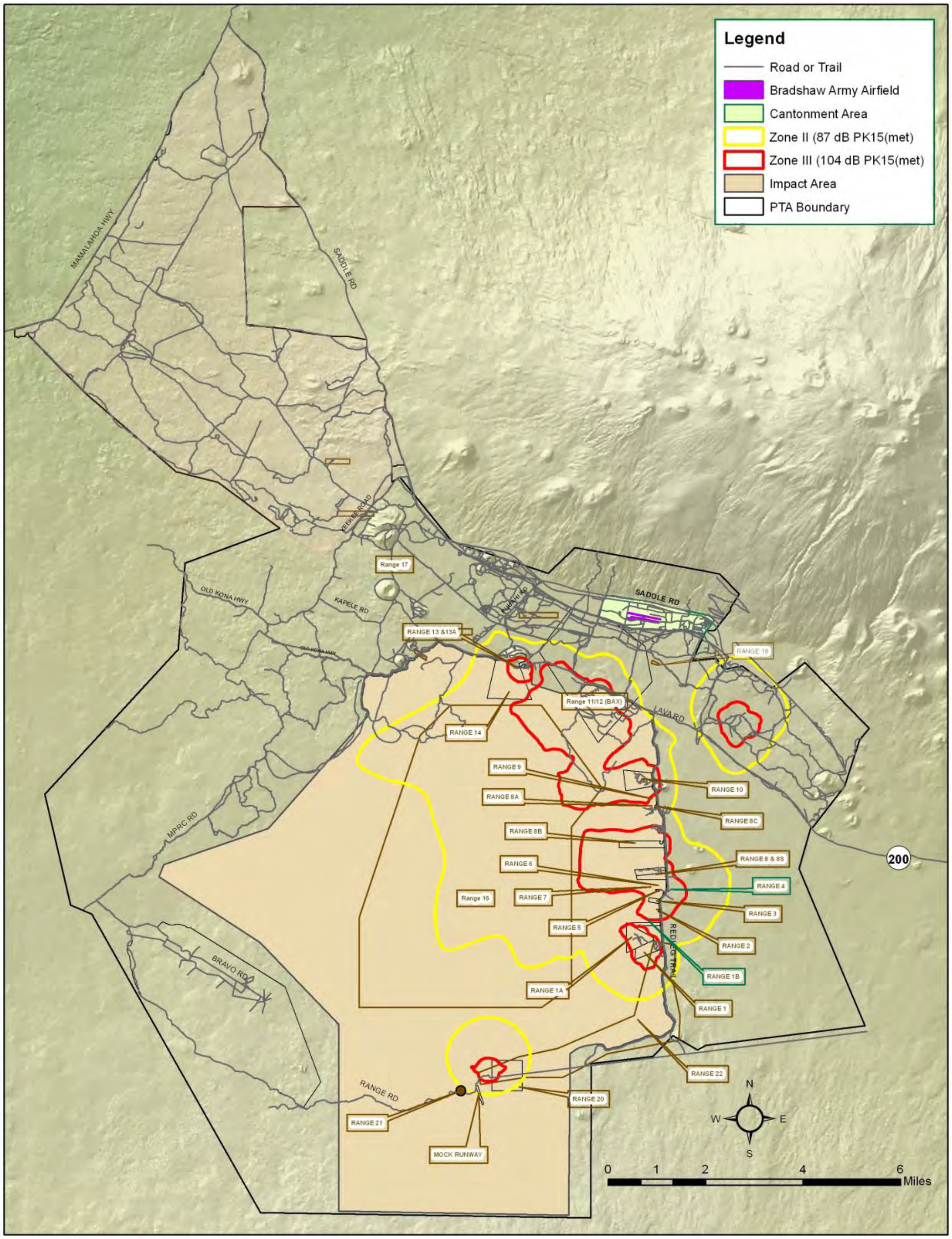


Figure 3.5-2. Existing Conditions PTA Small Arms Noise Contour

Figure 3.5-3 depicts existing estimated noise contours from large arms firing at PTA. The noise contours generated consisted of training data during the daytime (7 a.m. to 10 p.m. [0700-2200]), and nighttime (10 p.m. to 7 a.m. [2200-0700]), provided by PTA from September 30, 2007 through October 1, 2008 (see Table 3.5-4). Zone III noise conditions are generally contained within the present boundaries of PTA except for a small portion to the north in an area designated as forest reserve. Zone II noise conditions affect BAAF and the western portion of the Cantonment Area. Zone II noise conditions extend beyond the boundaries of PTA from BAAF westward to the northwest corner of the installation. The SONMP states that, except for the Cantonment Area, no noise-sensitive land uses are affected by existing Zone II noise conditions. No Soldiers are permanently based at PTA; all troop housing is used by Soldiers visiting PTA to participate in training exercises. The SONMP indicates a moderate risk of noise complaints from persons occupying on-post PTA buildings and offices (which are shown in blue in Figure 3.5-3).

Table 3.5-4. Large Arms Utilization – Existing Conditions (Day and Night)

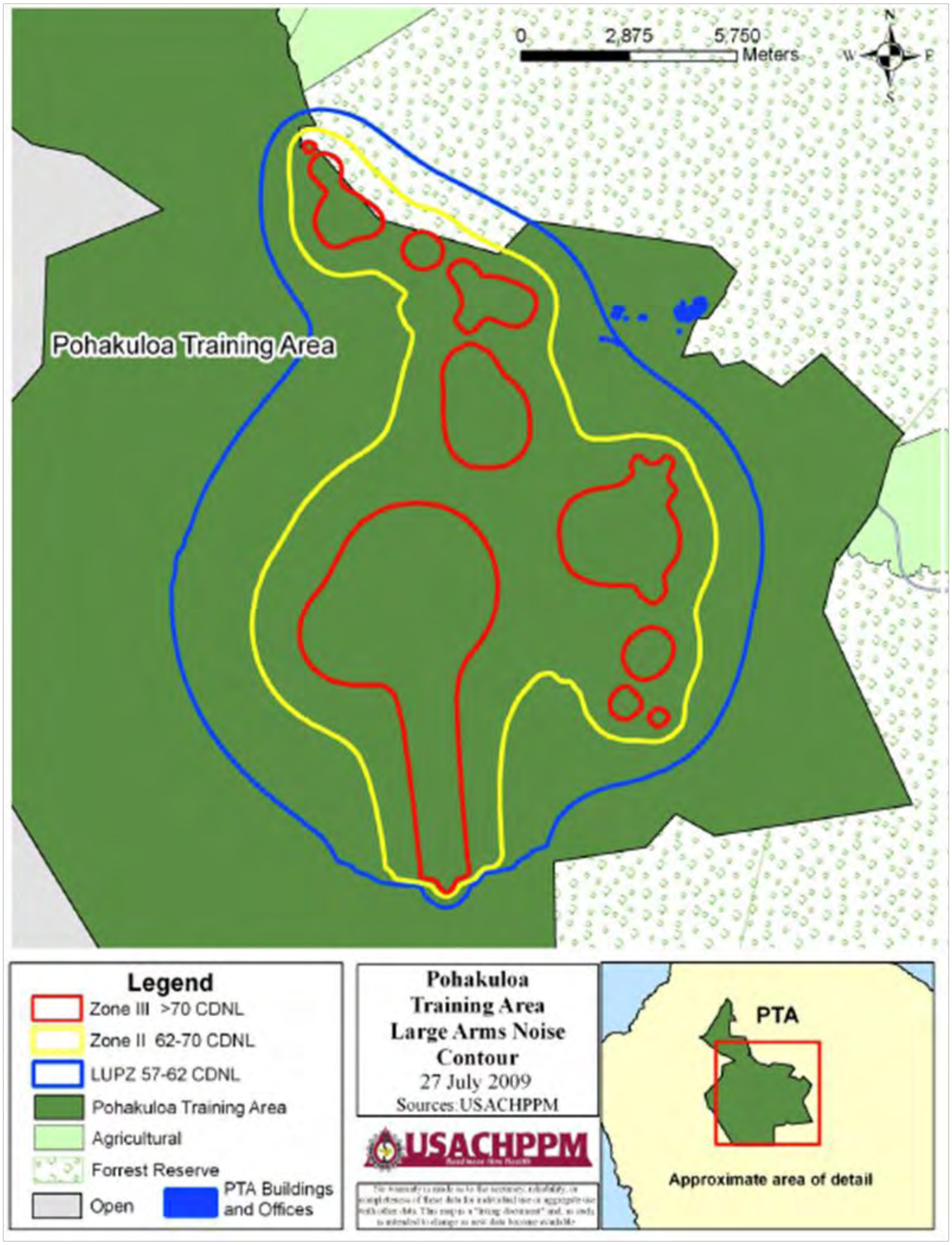
RANGE	WEAPON	DAYTIME (0700-2200)	NIGHTTIME (2200-0700)
PTA FP 401/9	105mm Howitzer, Inert	51.3	5.7
	105mm Howitzer, HE	1552.5	172.5
	155mm Howitzer, HE	174.6	19.4
PTA FP 402/9	105mm Howitzer, Inert	270.9	30.1
	105mm Howitzer, HE	602.1	66.9
	155mm Howitzer, HE	108.9	12.1
PTA FP 405/9	155mm Howitzer, Inert	11.7	1.3
	155mm Howitzer, HE	297	33
PTA FP 409/9	155mm Howitzer, HE	38.7	4.3
PTA FP 410/12	155mm Howitzer, Inert	46.8	5.2
	155mm Howitzer, HE	153	17
PTA FP 411/9	155mm Howitzer, Inert	31.5	3.5
	155mm Howitzer, HE	114.3	12.7
PTA FP 420/12	155mm Howitzer, Inert	107.1	11.9
	155mm Howitzer, HE	489.6	54.4
PTA FP 424/12	105mm Howitzer, Inert	16.2	1.8
	105mm Howitzer, HE	100.8	11.2
PTA FP 431/15	155mm Howitzer, Inert	11.7	1.3
	155mm Howitzer, HE	350.1	38.9
PTA FP 435/15	155mm Howitzer, Inert	99	11
	155mm Howitzer, HE	383.4	42.6
PTA FP 436/15	155mm Howitzer, Inert	10.8	1.2
	155mm Howitzer, HE	48.6	5.4
PTA FP 438/15	105mm Howitzer, Inert	426.6	47.4
	105mm Howitzer, HE	321.3	35.7
	155mm Howitzer, Inert	42.3	4.7
	155mm Howitzer, HE	218.7	24.3
PTA FP 442M/9	60mm Mortar, Inert	164	0
	60mm Mortar, HE	232	0
	81mm Mortar, Inert	1072	0
	81mm Mortar, HE	2729	0
	120mm Mortar, Inert	177	0
	120mm Mortar, HE	68	0
	90mm Gun, HE	15	0
PTA FP 501/16	105mm Howizer, HE	108	12
	155mm Howitzer, Inert	24.3	2.7
	155mm Howitzer, HE	292.5	32.5
PTA FP 503/16	155mm Howitzer, HE	36.9	4.1
PTA FP 801M	60mm Mortar, Inert	6	0
	120mm Mortar, Inert	441	0
	120mm Mortar, HE	197	0

RANGE	WEAPON	DAYTIME (0700-2200)	NIGHTTIME (2200-0700)
PTA FP 802M	60mm Mortar, Inert	32	0
	60mm Mortar, HE	666	0
	81mm Mortar, Inert	875	0
	81mm Mortar, HE	235	0
	120mm Mortar, Inert	7	0
	120mm Mortar, HE	78	0
	Demolition, MK74 (M832), 0.31 lbs	22	0
PTA FP 804M	60mm Mortar, Inert	96	0
	60mm Mortar, HE	1389	0
	120mm Mortar, Inert	902	0
	120mm Mortar, HE	22	0
PTA FP 807M	60mm Mortar, Inert	193	0
	60mm Mortar, HE	898	0
PTA POW CAMP	Simulator, Ground Burst M115A2	5	0
PTA RG 01 DEF	2.75 IN Rocket, HE	21	0
	Demolition Sheet, 38 Ft 0.5 lbs/Ft	2	0
PTA RG 01 OFF	Simulator, Hand Grenade M116	20	0
	Demolition, 1 lbs	400	0
PTA RG 03	40mm Grenade, HE	1772	0
PTA RG 05	Hand Grenade, Fragmenting	1696	0
PTA RG 05A	Hand Grenade, Fragmenting	206	0
PTA RG 08A	AT4 Rocket, HE	9	0
	Dragon Rocket, HE	4	0
	TOW Missile, HE	20	0
PTA RG 09	Bangalore, Kit (M1A1)	36	0
	Bangalore, Kit (M1A2)	5	0
	Cratering Charge, 40 lbs	5	0
	Demolition, 1 lbs	142	0
	Demolition, 1.25 lbs	202	0
	Demolition, 2 lbs	2	0
	Demolition, 2.25 lbs	2	0
	Demolition, 2.5 lbs Block M5	45	0
	Demolition, 2.5 lbs Block M2	6	0
	Demolition Flex Linear, 0.1926 lbs (MM46)	1	0
	Demolition Flex Linear, 0.44 lbs (MM30)	4	0
	Demolition Kit, 1.25 lbs (M757)	150	0
	Demolition Sheet, 25 Ft 0.8 lbs/Ft	32	0
	Mine, Claymore M18A1	25	0
	Shape Charge, 15 lbs	6	0
	Shape Charge, 40 lbs	5	0

RANGE	WEAPON	DAYTIME (0700-2200)	NIGHTTIME (2200-0700)
PTA RG 10	Simulator, Ground Burst M115A2	1	0
PTA RG 10 OFF	60mm Mortar, HE	48	0
	81mm Mortar, Inert	2	0
	AT4 Rocket, Inert	57	0
	AT4 Rocket, HE	57	0
	Hand Grenade, Fragmenting	107	0
	40mm Grenade, HE	96	0
PTA RG 13	105mm Howitzer, Inert	163.8	18.2
PTA RG 13A	AT4 Rocket, Inert	41	0
	AT4 Rocket, HE	11	0
	40mm Grenade, HE	2284	0
	Demolition, 0.25 lbs	64	0
	Demolition Kit, APOBS (MN79)	8	0
PTA RG 15	2.75 IN Rocket, Inert	7133	0
	Hellfire Missle, HE	38	0
PTA RG 16	20mm Gun, Inert	2600	0
	20mm Gun, HE	200	0
	30mm Gun, HE	400	0
	Bomb, CBU-59A/B (E016)	6	0
	Bomb, MK82 500 lbs.	181	0
	Bomb, MK83 1000 lbs.	22	0
	Bomb, 2000 lbs. (E756)	16	0
	Bomb, Practice 9 lbs. (E962)	34	0
	Bomb, Practice 25 lbs. (E969)	10	0
	2.75 IN Rocket, Inert	36	0
PTA RG 20	2.75 IN Rocket, Inert	91	0
	Hellfire Missle, HE	19	0
PTA RG 8C SHOOTHOUSE	Simulator, Hand Grenade M116	15	0

NOTE: Inert is defined as any round that does not make noise upon impact, (i.e. Smoke, Illum, Training Practice)

Source: USAPHC Operational Noise Consultation, May 2011 (Appendix C)



Source: Hawai'i SONMP, 2010

Figure 3.5-3. Existing Conditions PTA Large Arms Noise Contour

The 2010 SONMP states that there are no incompatible land uses on or off post resulting from small arms training within the PK15(met) Noise Zone II and Zone III and that there are no incompatible land uses on or off post resulting from large arm and demo training within the annual average CDNL Noise Zone II and Zone III.

3.5.2.1 General Range Area

The main sources of noise in the General Range Area result from explosive detonations and vehicular traffic. As presented in Section 3.5.1, Zone III noise conditions are contained within the present boundaries of PTA. Existing estimated noise contours from small arms firing at PTA, as shown in Figure 3.5-2, illustrate that in the Range Area, Zone II noise conditions extend beyond the limits of PTA into a designated forest reserve area. Existing estimated noise contours from large arms firing at PTA (Figure 3-6) illustrate that Zone III noise conditions are generally contained within the present boundaries of PTA except for a small portion to the north in an area designated as forest reserve. Zone II noise conditions extend beyond the boundaries of PTA from the BAAF westward to the northwest corner of the Installation. No noise-sensitive land uses are affected by existing Zone II noise conditions in the General Range Area.

3.5.2.2 IPBA at Western Range Area

The alternative location for the Western Range Area IPBA is outside the existing small arms PTA noise contours as shown in Figures 3.5-2 and 3.5-3. Existing small arms noise conditions are within Zone I.

3.5.2.3 IPBA at Charlie's Circle

Similar to the IPBA alternative location in the Western Range Area, the alternative location for the IPBA in Charlie's Circle is outside the existing small arms PTA noise contours as shown in Figures 3.5-2 and 3.5-3. Existing small arms noise conditions found at Charlie's Circle within Zone I.

3.5.2.4 IPBA at Southwest of Range 20

Similar to the other two alternative locations for the IPBA, the alternative location Southwest of Range 20 is outside the existing small arms PTA noise contours as shown in Figures 3.5-2 and 3.5-3. Existing small arms noise conditions are within Zone I.

3.5.3 Noise Surrounding PTA

Because of the unpopulated nature of the area and the relatively low volume of traffic on Saddle Road, ambient noise levels surrounding PTA are generally low (see Section 3.6, Transportation and Traffic). As shown in Figures 3.5-2 and 3.5-3, Zone II and Zone III contours are contained mostly within PTA and impact small areas of forested land outside PTA. In addition, Figures 3.5-2 and 3.5-3 illustrate that PTA is surrounded by forested reserve land and open area, most of which is mountainous terrain. These are considered compatible land uses.

3.6 TRAFFIC AND TRANSPORTATION

3.6.1 Introduction

This section describes the traffic and transportation resources related to PTA, including roads and traffic, and the regional transportation agencies and applicable standards. This section encompasses the infrastructure within the affected area along with its use, operation, and governing requirements. It includes specifics related to the road network, airport facilities, and harbors which are components of the transportation infrastructure and also covers the expected traffic of the primary routes.

The movement of vehicles (and pedestrians) is referred to as traffic and circulation along and adjacent to roads. The Hawaiʻi DOT has jurisdiction for the State of the freeways and major roads; local counties have jurisdiction for other streets and roads. Roadways in the area can be multilane road networks with asphalt surfaces to unpaved gravel or private roads. Depending on location, the traffic conditions on the island vary. During peak hours, significant traffic delays can result within urban areas with multilane roads, as well as less developed areas with only two-lane roads.

The major urban centers of Hawaiʻi Island are Hilo, which is on the eastern side of the Island, and Kailua-Kona, which is on the western side (Figure 1.3-1, Chapter 1). Air service to these cities is provided by Hilo International Airport and Kona International Airport, respectively.

Broadly, the major cities are linked by State highways. The primary roadways on the Island are Queen Kaʻahumanu Highway, Māmalahoa Highway, Hawaiʻi Belt Road, Volcano Highway, Kawaihae Road, and Waikoloa Road. Saddle Road is the only roadway that runs across the central part of the Island and connects PTA to the surrounding areas between Hilo and Waimea (north of Kailua-Kona). Most major roads in the area are two-lane roads.

Nearby harbors include Hilo Harbor and Kawaihae Harbor. Hilo Harbor is located on the coast of Hilo and provides access by water to Hilo. Kawaihae Harbor which is north of Kailua-Kona includes a fueling station, shipping terminal, and landing area. Kawaihae Harbor is the only harbor used by the military on Hawaiʻi Island.

3.6.2 Public Roads

3.6.2.1 Saddle Road

Saddle Road (SR 200), a two-lane, two-way road between Hilo and its junction with Māmalahoa Highway, is the shortest route across the Island and it is the primary road providing access to and from PTA. In addition, to serving as the key roadway to PTA, it is the only road to several observatories, ranches and residential locations, and other recreational areas located towards the island's interior.

Saddle road is often referred to by its different sections which include Section I from Milepost 41-53, Section II from Milepost 28-41, Section III from Milepost 9-28, and Section IV from Milepost 1-9. Improvements to this road are carefully considered in a separate Final EIS and Supplemental EIS prepared by the State and County of Hawaiʻi in 1999 and 2010, respectively.[53]

The posted speed limit in some sections is 45 miles (72 kilometers) per hour; however, a more practical speed limit at those portions of Saddle Road is 30 to 35 miles (48 to 56 kilometers) per hour because of deteriorated pavement conditions, constrained alignment, and several one-lane bridges. Advisory speed

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[53] Both EISs for the Saddle Road Realignment may be found online at the Hawaiʻi Office of Environmental Quality Control: http://oeqc.doh.hawaii.gov/default.aspx

limits are as low as 25 miles (40 kilometers) per hour. Some sections of Saddle Road have been, or are in the process of being improved. The posted speed limit on recently improved sections of Saddle Road (Section II and III) is 55 mph, unless otherwise marked. The average daily traffic (ADT) is approximately 1,400 vehicles per day, and is expected to triple to approximately 4,058 by 2013 resulting from improvements of Saddle Road that would make driving conditions safer for motorists, and would result in greater use of this central island route rather than the belt system to get across the island (County of Hawai‘i, State of Hawai‘i, 2010).

Figure 3.6-1 demonstrates the locations of the four sections of Saddle Road under realignment. Sections I and II are located directly adjacent to PTA. This map also shows the location of some projects the Saddle Road EIS considers in that document's cumulative effects section (recent past, present, and foreseeable future project list). This Programmatic EIS also addresses many of these projects in Chapter 5.

Section I will be completed in the near future (year TBD) and is expected to result in a new portion of Saddle Road that cuts across the KMA at PTA. This realignment is anticipated to considerably improve traffic conditions along the route.

Section II of Saddle Road is where the PTA Cantonment Area is located, and is the primary access point for all Soldiers and civilians accessing PTA. Sections II and III between Mileposts 8.5 and 41 has already been improved. According to the Saddle Road Improvement Supplemental EIS (County of Hawai‘i, State of Hawai‘i, 2010), prior to realignment there were significant safety hazards and conflicts posed from civilian traffic encountered military convoys and equipment. The Section II realignment involved moving the roadway north of the PTA Cantonment Area and effectively reducing those conflicts. The redesigned entrance to PTA also incorporates extended turning lanes and center lanes to mitigate and ease traffic congestion where military and civilian traffic enter the installation.

Section IV will be upgraded in the future (TBD) and is currently pending final design, permitting, and funding.

The 2010 Saddle Road Improvement Supplemental EIS identifies a current inadequate capacity, or Level of Service (LOS), for traffic flow along portions of Saddle Road, and assigns a LOS of E. Table 3.6-1 identifies LOS in terms of traffic volume and capacity on two-lane roadways. A LOS of E indicates that current operation of Saddle Road is at traffic volume capacity. Ongoing improvements to Saddle Road are anticipated to mitigate capacity issues and significantly improve conditions supporting traffic volume; including accommodating projected growing use of the road.

Table 3.6-1. LOS and volume/capacity ration on two-lane roadways

LOS	Volume/Capacity Ratio	Description
A	Less than 60%	Free-flow operation
B	60% to less than 70%	Reasonably free-flow
C	70% to less than 80%	Flow at or near free-flow speed
D	80% to less than 90%	Borderline unstable
E	90% to less than 100%	Operation at capacity
F	100% or Greater	Breakdown

Source: Wang and vom Hofe, 2007, Table 7.3, p. 338

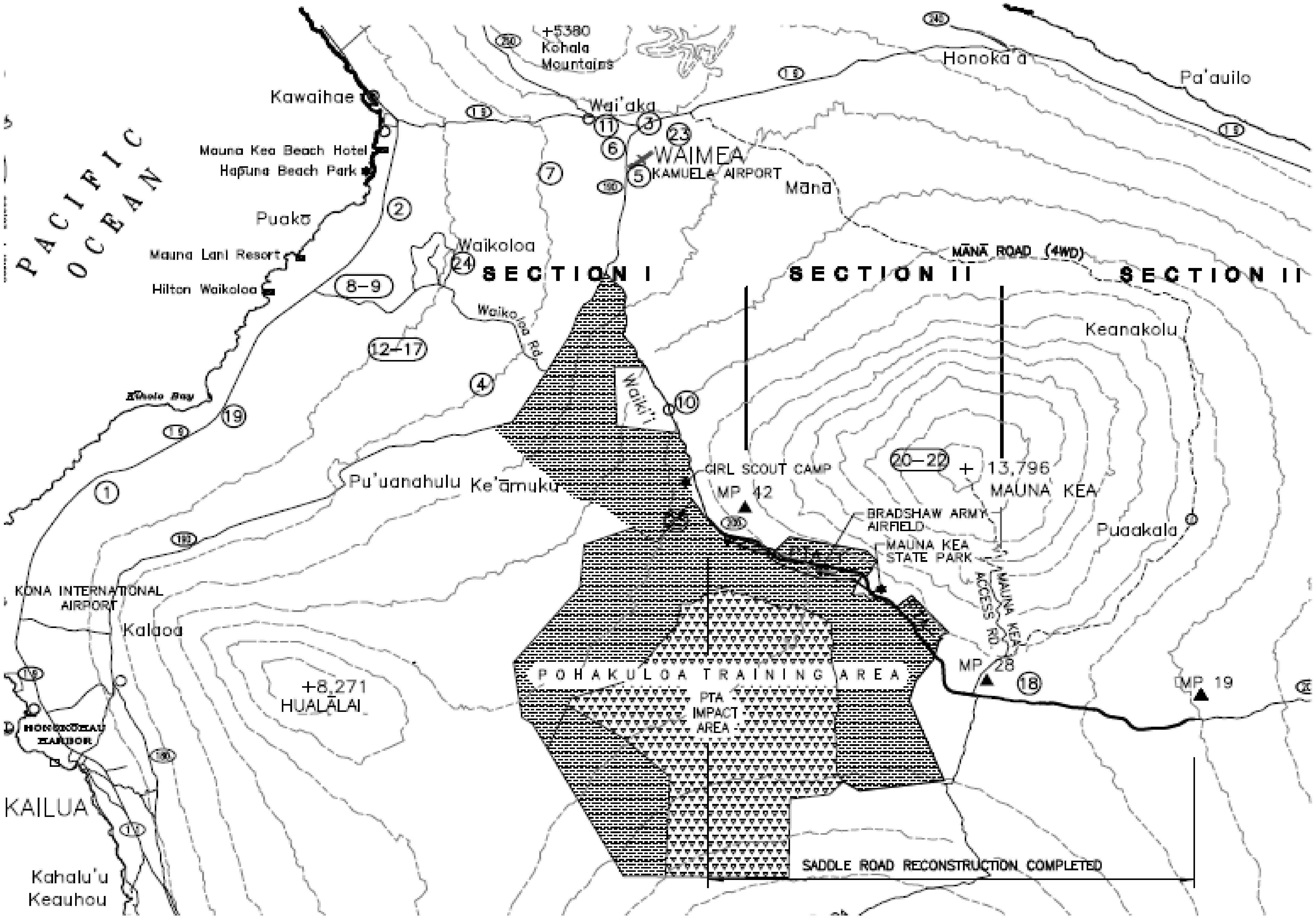

Figure 3.6-1. Saddle Road realignment including upgrades surrounding PTA

1. SR 19 (Queen Ka‘ahumanu Hwy) widening, Keahole Airport to Waikoloa Road
2. SR 19 (Queen Ka‘ahumanu Hwy) widening, Waikoloa Rd to Kawaihae
3. Mamalohoa Hwy widening in Waimea
4. Saddle Road extension
5. Waimea Connector Road
6. Lalamilo Connector Road
7. Kawaihae bypass
8. Paniolo Ave. project
9. Ke Kumi Housing Area Connector
10. Paving of existing Saddle Road
11. Lalamilo Residential Lots
12. Wehilani, Kikaha, and Makeni Kai at Waikoloa
13. Bridge Aina Le‘a
14. Waikoloa Makai, Waikoloa Ma Lai LLC
15. Waikoloa Heights, Waikoloa Land and Cattle
16. Hawai‘i County/Workforce Housing Project, Waikoloa
17. Kilohana Kai, Waikoloa
18. Dept. of Hawaiian Home Lands Aina Mauna Legacy Program
19. Master Plan for West Hawai‘i Sanitary Landfill
20. Mauna Kea Management Plan
21. Thirty Meter Telescope
22. Panoramic Survey Telescope & Rapid Response System (PAN-STARRS)
23. Waimea Town Center (Parker Range 2020)
24. Industrial Use Development; Bay Pacific Development, Waikoloa
25. Transformation of 2/25th Light Infantry Division (L) to SBCT

Source: Final Supplemental EIS and Final 4(f) Evaluation for Saddle Road (State Route 200) Mamaloahoa Highway (State Road 190) to Milepost 41, February 2010

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3.6.2.2 Māmalahoa Highway

Māmalahoa Highway (SR 190) is a two-lane undivided State highway connecting Kailua-Kona with Waimea. The posted speed limit is 55 miles (89 kilometers) per hour between Waikoloa Road and approximately 1 mile (1.6 kilometers) south of Waimea; the remaining section is 35 miles (56 kilometers) per hour. A 2007 Waimea Traffic Circulation Study (County of Hawai‘i, 2007) analyzed trafficability at roads and intersections surrounding Waimea, including Māmalahoa Highway. The study found heavy congestion where Māmalahoa Highway intersects with other key connectors in the town of Waimea. The study reported that most congestion was caused by a number of factors, primarily a high amount of through traffic (regional traffic) travelling through Waimea to get to work destinations, housing development projects, and road improvement efforts including a bypass that is expected to lessen traffic pressure in Waimea from congestion. That report found it difficult to report a LOS due to the constant congestion of the area, and instead reported traffic as a measure of effectiveness using vehicular speed and distance as variables. While the results showed heavy congestion in town, the report acknowledged that little traffic problems were reported on routes outside of town.

3.6.2.3 Waikoloa Road

Waikoloa Road runs between Queen Ka‘ahumanu Highway on the west and Māmalahoa Highway on the east. It is a two-lane undivided roadway, except for a short section midway that is a four-lane divided roadway. This section is posted for a 35–mile- (56–kilometer-) per-hour speed limit; west of this section, the speed limit is 45 miles (72 kilometers) per hour. The speed limit to the east is 55 miles (89 kilometers) per hour. Military traffic does not generally use this road except when using the airport facilities in Kona. Data on LOS or existing traffic conditions is not available.

3.6.2.4 Queen Ka‘ahumanu Highway

Queen Ka‘ahumanu Highway (SR 19) is a two-lane State roadway connecting Kailua-Kona with Kawaihae. The posted speed limit is 55 miles (89 kilometers) per hour. A 2006 Traffic Impact Analysis Report (M&E Pacific) calculated traffic volume at vehicles per hour, and LOS. Traffic flow and times (taken in 15 minute intervals) indicates a LOS of acceptable. That report also provided details on traffic and intersection enhancements occurring through early 2011 that would improve the LOS to a higher rating.

3.6.2.5 Kawaihae Road

Kawaihae Road runs east-west between Waimea and Kawaihae. East of Waimea, the speed limit varies between 35 and 55 miles (56 and 89 kilometers) per hour with speed limits reduced to 25 miles (40 kilometers) per hour near schools and at the intersection of Kawaihae Road at SR 250, which is a congested area. The 2007 County of Hawai‘i traffic Study (discussed above) also looked at Kawaihae Road. The 2007 study cited several traffic improvement projects that the County of Hawai‘i expects to significantly improve traffic conditions in Waimea.

3.6.3 Region of Influence

The affected area for traffic and transportation is the travel corridor of Saddle Road that extends from Milepost 1 (Section IV) to Milepost 53 (Section 1). Modernization of PTA does not involve the transport of Soldiers, military equipment, or ammunition to PTA; rather, it involves improving upon the infrastructure and facilities at the installation or building new infrastructure and facilities.

When considering the site-specific action of building and operating the IPBA, it should be noted that use of the IPBA does not involve additional Soldiers or units travelling to PTA. Army units would continue to travel to PTA semi-annually to meet their doctrinal training requirements. No additional deployments to PTA would occur as a result of constructing the IPBA. Therefore, discussion of the military transportation route to access PTA does not apply to the Proposed Action of this EIS. Some discussion is offered on unit movement as it relates to safety (Section 3.6.4); this is offered to demonstrate that the Army follows strict safety procedures when deploying Soldiers and equipment to PTA to conduct semi-annual training. Traffic impact assessments have been conducted on these procedures in prior NEPA documents (e.g., Permanent Stationing of the 2/25th SBCT (2004/2008), and Military Training Activities at Makua Military Reservation, HI (PTA Alternative 4) (2009).

Construction traffic related to modernization projects could originate from many locations across the island. The projects proposed would require different levels of effort and would be based on plans and contracts that are not yet defined, but would be defined better in future tiered NEPA document. Therefore, only potential impacts to Saddle Road could reasonably be assessed.

3.6.4 Safety

Safety, as it relates to primary traffic conditions surrounding PTA is best discussed in terms of roadway deficiencies, conflicts/hazards with military operations, and capacity limitations contribute to safety concerns on Saddle Road. The 2010 Saddle Road Realignment Supplemental EIS reported that the most important factors causing accidents there were horizontal and vertical alignment (leading to limited sight distance), road width, and pavement conditions. These factors also contribute considerably to slower response of emergency vehicles responding to fires, accidents, and other incidents along Saddle Road. Because construction workers (skilled labor) and equipment could take many routes on the island to get to Saddle Road to access PTA, it is infeasible to conduct a safety analysis for construction-related traffic other than on Saddle Road. It should be further noted that enhancements to Saddle Road are expected to noticeably improve safety conditions.

As reported in the Saddle Road Supplemental EIS, the 1996 accident rate of 5.43 accidents per million vehicle miles (ACC/MVM) was significantly higher than the average rate for rural two-lane highways throughout the State of Hawaiʻi (3.0 ACC/MVM). One conclusion from that EIS was that the planned improvements to Saddle Road would raise the LOS from E to B (in the year 2014), and that accidents would significantly decrease in that time period.

3.6.4.1 Safe Operations of Military Traffic

Chapter 2 of this EIS discusses the routes that Army units use when deployed to PTA from Oʻahu. These routes include accessing Kawaihae Harbor using LSVs, or via air corridors using fixed and rotary winged aircraft and landing at either BAAF or using commercial airports and convoying to PTA.

To summarize, the primary route for military convoys travelling to PTA is Māmalahoa Highway to Saddle Road; but convoys may also use Māmalahoa Highway to Waikoloa Road, which is south of the harbor, to access Saddle Road. Per command guidance, convoys normally maintain a gap of at least 30 minutes between serials (a group of military vehicles moving together), and 100 m (330 ft) between vehicles on highways and 7.5 to 15 m (25 to 50 ft) while in town traffic. Hawai‘i State regulation normally restricts convoys from operating on state highways between 6:00 AM and 8:30 AM and between 3:00 PM to 6:00 PM during the normal work week. This is to avoid peak traffic hours and to reduce the risk of accidents. In addition, convoys and ammunition movements normally are not authorized to pass through school zones when students are in transit; that is, when school zone lights are flashing Monday through Friday. Movements on Saturday, Sunday, and holidays are by special request only.

There are also special requirements for transporting ammunitions. While the Army encourages the transport of ammunitions by air, if ammunition must be transported on the ground, it is done with a front and back escort at a maximum speed of 45 miles (72 kilometers) per hour. Transport is conducted in accordance with all Hawai‘i DOT rules and regulations for transporting explosive materials (Husemann, 2003). For Army transportation of ammunition: operators transporting explosives, grenades, mines, artillery rounds, anti-tank rounds, and mortar rounds avoid using certain highways from 5:00 AM to 7:00 PM; and operators transporting other munitions and ordnance on certain highways avoid using the highway during peak traffic hours and at times when children are traveling to and from school (5:30 AM to 8:30 AM and 12:30 PM to 6:30 PM).

The Army, to mitigate potential safety hazards for civilians, publishes Media Releases when military units travel to PTA. The Media Releases contain information on dates and times when units will convoy, the route taken along public roads, and contact information[54].

3.6.5 Governing Requirements

There are two primary transportation agencies with governing authority over travel to PTA. These agencies are the Hawai‘i Department of Transportation (Hawai‘i DOT), and the County of Hawai‘i DPW. These agencies utilize national standards for traffic impact studies, when studies are necessary. The Army may also incorporate guidelines established by the Institute of Transportation Engineers (ITE) when evaluating traffic conditions. The *Transportation for O‘ahu Plan 2025* (TOP 2025) and *Hawai‘i Long Range Land Transportation Plan* (LRLTP) contain the transportation goals and policies for Hawai‘i’s transportation development. In addition, detailed policies and instruction have been issued to provide guidance on specialized transport activities such as convoy operations and transporting ammunitions.

In addition to these instructions, the Hawai‘i DOT Policy, Section 19-104-14, Hawai‘i Administrative Rules provide further guidance on requirements for vehicles needing an escort as a result of being oversized or overweight according to the criteria in the policy. According to the policy, these vehicles are not allowed to travel in convoy on two-lane highways, and a separate escort shall be provided for each vehicle moved under escort. It further states that these vehicles must also be spaced about 15 minutes apart. In the case of convoys on multilane highways the district engineer may permit oversize or overweight vehicles to travel by pairs under escort. The spacing requirement of 15 minutes also applies between pairs of vehicles as well.

[54] Media Releases may be found at the following USAG-HI Web page: http://www.garrison.hawaii.army.mil/sites/news/mediareleases/index.asp

3.6.6 PTA Cantonment Area

The Cantonment Area is used to temporarily house military personnel being trained at PTA and it is also used by the Command staffs and Army and contractor personnel that are responsible for the day-to-day management of PTA. Persons working at PTA travel on Saddle Road from Waimea and Kailua-Kona (west of PTA), and from Hilo (east of PTA) and from communities surrounding those urban/semi-urban areas.

Traffic in the Cantonment Area and range areas is restricted and therefore are limited to military users of PTA and civilians authorized to work at the installation.

The main entranceway to PTA is designed to handle up to one vehicle at a time. Soldiers and civilians authorized to enter PTA are assigned badges and vehicle decals to allow quick access. Visitors who are not authorized for PTA cantonment access must stop at the front gate with the proper identification and are issued temporary access to the installation. This is a process that may take up to five (5) minutes per vehicle (estimating up to four (4) passengers per vehicle). As indicated on the USAG-HI Web page for gate access procedures, vendors and contractors (including construction contractors) with commercial vehicles who do business on Army installations on a regular basis can receive extended passes for individual and fleet vehicles, for periods up to six months[55].

From the Cantonment Area, the Range Area is typically reached by briefly exiting the installation onto Old Saddle Road and travelling west to Menehune Road and exiting onto Lava Road. Lava Road can access ranges to the north and west of the impact area at PTA, and ranges east and south of the impact area by using Red Leg Trail.

3.6.7 Range Area

As shown on Figure 2.2.1 in Chapter 2, most of the ranges at PTA are to the north and east of the impact area. The primary maneuver area, KMA is northwest of the impact area.

3.6.7.1 General Range Area

KMA is bounded on the northwest side by Māmalahoa Highway which is a two-lane undivided state highway and on the east by Saddle Road which is a two lane two way roadway and on the south by Ke‘eke‘e Road which is an unpaved road, single lane road with a cinder surface. Lighting Trail, which is an unpaved single lane road with a gravel surface, runs parallel to Old Saddle Road to the south.

In the range area south of KMA is Ka Pele Road and Kipuka Road. Moving to the east, nearby are Leilani Road and Malahani Road. Malahani Road feeds into Mikilua Road, and runs parallel to Lightening Trail and Lava Road. These Mikilua, Lightening Trail and Lava Road traverse the northern tier of training areas at PTA. Red Leg Trail runs north to south from Laval Road on the eastern side of the PTA impact area.

A key roadway in the southern portion of the Range Area is Hilo Kona Road, a single lane road which has a crushed lava surface.

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[55] http://www.garrison.hawaii.army.mil/sites/about/GateAccess.asp

In the range area west of the impact area are MPRC Road, Bob Cat Trail, Charlie's Circle Road, and Bravo Road. These are gravel surfaced roads.

Construction of East-West MSR within KMA is being considered for tactical vehicles in the Maneuver Area. Modifications would include grading, paving, drainage improvements, culverts, and guardrails.

The Army, as part of its modernization plans is considering widening portions of Red Leg Trail and Hilo Kona Road to ease conflicts with military traffic conditions adjacent to the USMC CLF range, and also to improve access to areas west of the CLF range.

3.6.7.2 IPBA at Western Range Area

The proposed IPBA at Western Range Area is located in the west central portion of the impact area. This alternative is central to MPRC Road on the northwest and Bravo Road on the south; but would be accessed by a new road proposed to run from the southern bend of Charlie's Circle. Charlie's Circle trail would need to be improved for the use of the Western Range Area alternative. The Army is proposing upgrades to Charlie's Circle to insure improved safety for users of the road network there. Improvements would be conducted to the MIL STD (military standard). The proposed new access road from Charlie's Circle would be approximately 6,400 ft (1,951 m) in length and would possibly branch to access the IPBC, Live-fire Shoothouse and MOUT. The road would be built according to MIL STD design using UFC 3-250-09FA Aggregate Surfaced Roads and Airfield Areas (January 2004).

3.6.7.3 IPBA at Charlie's Circle

The proposed IPBA at Charlie's Circle runs vertically (north to south) and partially overlaps the IPBA at Western Range Area. The same transportation network as described in Section 3.6.7.2 for the Western Range Area is present at Charlie's Circle.

If this alternative were selected, Charlie's Circle trail would need to be improved for the use of this alternative. Similar to the Western Range Area, the Army would upgrade Charlie's Circle to insure improved safety for users of the road network there. Improvements would be conducted to the MIL STD. The proposed new access road from Charlie's Circle would be shorter than what is proposed for the Western Range Area alternative.

3.6.7.4 IPBA at Southwest of Range 20

The proposed IPBA at this location is accessible from the Hilo Kona Road running westward through the southern portion of the impact area from Red Leg Trail. If the Army selected this alternative a relatively short access road would be designed and built to the MIL STD to access the ranges of the IPBA.

3.7 WATER RESOURCES

Water resources are streams, lakes, rivers, and other aquatic habitats in an area to include surface water, groundwater, wetlands, floodplains, coastal resources, and wild and scenic rivers. Water resources—such as lakes, rivers, streams, canals, and drainage ditches—compose the surface hydrology of a given watershed. The term "waters of the U.S." applies only to surface waters—including rivers, lakes, estuaries, coastal waters, and wetlands—used for commerce, recreation, industry, sources of fishing, and other purposes.

3.7.1 Introduction and Region of Influence

The ROI for water resources is all areas in which project-related activities may occur, including the footprint of each training, and construction area and the corridors of the military vehicle roads. The ROI studied for the purpose of this analysis is defined by the legal boundaries of PTA, because there is a lack of hydrologic connection between proposed project areas on the installation and receptors off the installation boundary.

3.7.1.1 Watersheds

Hawai‘i watersheds are unique when compared to the contiguous U.S. A watershed is defined as the area of land where all of the water that is under it or drains off it goes into the same place (USEPA). Each of the major islands has a separate hydrologic systems and related drainage areas. The watersheds of Hawai‘i are relatively small and characterized by fast flowing streams. Most river or stream courses are just a few miles long and are subject to flash floods. Watersheds in Hawai‘i are steep, with highly permeable volcanic rocks and soils (State of Hawai‘i, 2000).

PTA lies within the Northwest Mauna Loa and the West Mauna Kea watersheds of the Hawai‘i Island, which drain to the northern Haulalai and southern Kohala coasts (Mink and Lau, 1993). Hawai‘i Island is made mostly of highly permeable rock and soil deposits, creating an environment that generally absorbs precipitation without forming stream channels or gulches, which is why intermittent streams typically only appear during periods of steady rain.

3.7.1.2 Surface Water

Surface water is generally defined as waters in a river, lake, stream or estuary. Surface water is naturally replenished by precipitation and lost through natural processes such as discharge to oceans, evaporation, and subsurface seepage. The total quantity of water in any surface water system and proportions of water lost are dependent on precipitation in its watershed, storage capacity, soil permeability, runoff characteristics of land in the watershed, timing of the precipitation, and evaporation rates.

There are no surface streams, lakes or other bodies of water within the boundaries of PTA; and there are no perennial streams within 15 miles (24.1 km) of PTA. Lake Waiau, which is located near the summit of Mauana Kea, is approximately 8 miles (12.9 km) from the installation, and is the nearest known surface water body. However, there are at least seven intermittent streams that drain surface water off the southwestern flank of Mauna Kea and lie within the same drainage area as PTA. Popo's Gulch is the closest stream to PTA boundaries. Popo's Gulch converges with ‘Auwaiakeakua Gulch to drain surface water toward the Waikoloa community to the west of PTA. There are three intermittent streams located within two miles (3.2 km) of the Cantonment Area (Waikahalulu Gulch, Pōhakuloa Gulch, and an unnamed gulch, which collect runoff from the southern flank of Mauna Kea) (U.S. Army and USACE, 2008a). One perennial stream runs downstream of PTA, the Waikoloa Stream, which heads towards the Kohala Mountains, runs north parallel to State Highway 19, and discharges into Kawaihae Bay through the Waiulaula Gulch (State of Hawaiʻi, 2002b). According to the 303(d) List of Impaired Waters in Hawaiʻi, Kawaihae harbor is identified as an impaired body of water due to turbidity, and is assigned low priority for development of total maximum daily loads (TMDLs) (HDOH, 2004).

Water Supply

Groundwater describes any water that is located beneath the ground surface in soil pore spaces and fractures in subsurface rock. This water is stored in an aquifer—which is defined as a porous substrate, typically an underground layer of permeable rock or unconsolidated material (e.g., sand, gravel, silt, or clay)—and may either flow naturally to the surface or be extracted using pumps or wells (Purdue, 2005). Rainfall is the primary source of groundwater recharge on Hawaiʻi Island; additionally this island has the highest recharge rate among the Hawaiian Islands (U.S. Army and USACE, 2008a). Rainfall, fog drip and occasional frost are the main sources of water for the biological resources found on PTA. PTA experiences an average rainfall of 10 to 16 inches annually (NOAA, 2008). As there is no water supply at PTA, all water must be trucked approximately 40 miles. Neither Lake Waiau nor springs which occur in Pōhakuloa Gulch are used to supply potable water to PTA. Groundwater at PTA is estimated at greater than 1,000 ft below the soil surface (USARAW, 2002b). Data to evaluate groundwater at PTA is very limited at this time. The majority of PTA lies within the Northwest Mauna Loa aquifer sector, which has an estimated sustainable yield of 30 million gallons per day (MGD) (HDLNR, 2008).

Based on regional hydrogeological information, it is believed that the groundwater beneath PTA occurs primarily as deep basal water within older Pleistocene age basalts (U.S. Army and USACE, 2004). Exploratory well drilling was conducted in March 1965 by the DLNR near the PTA Cantonment Area. A test hole, Pōhakuloa test hole T-20 located half mile west of Mauna Kea State Park at an elevation of 6,375 feet mean sea level (msl), was drilled to a depth of 1,001 ft below ground surface (bgs); no groundwater was encountered in this test hole (U.S. Army and USACE, 2004).

Wastewater

PTA does not currently have any wastewater infrastructure (e.g., sewer system). In 2004 EPA Region IX required the conversion or removal or all large capacity cesspools (LCC). The Army complied with Federal and State cesspool regulations by converting its LCCs to septic systems and utilizing underground injection control (UIC) wells. Permits for UICs are issued by Hawaiʻi Department of Health (HDOH), Safe Drinking Water Branch (SDWB) (HDOH-SDWB). All wastewater at PTA is handled through a combination of portable latrines, septic tanks and/or underground injection wells in accordance HDOH- SDWB, UIC permit UH-2609. Injectant from permit UH-2609 is limited to septic tank-treated domestic wastewater from five separate septic tank wastewater treatment systems at PTA. Under this permit, the State requires the Army to conduct daily monitoring, quarterly sampling, periodic inspections, and annual status reporting. On-site staff at PTA completes these regulatory requirements for submittal to HDOH-SDWB.

Stormwater

The vast majority of PTA consists of variable permeable surfaces that easily allow rain to infiltrate naturally. PTA has a Stormwater Management Plan in place. Currently, an independent review of PTA is being conducted to verify the installation's stormwater exemption for storm water associated with industrial activity. In the event the exemption request is not approved by SDOH Clean Water Branch (CWB), PTA will submit the required forms and comply with the terms and conditions of the National Pollution Discharge Elimination System (NPDES) permit (discussed in the Regulatory Environment section). According to a recent drainage report (Mitsunaga & Associates, 2010), the areas surveyed were mainly lava flow and cinder with very high percolation rates (60%). The conclusion of the drainage report determined that stormwater flows off of the project site and sheet flows over land; although there is an additional 1.00 cubic feet per second (cfs) of runoff due to an increase in impervious surface area, this added runoff will not alter any existing storm water flow or affect and sites down-stream from the proposed site due to high percolation rates on the existing site and surrounding areas[56].

3.7.2 Regulatory Environment

Federal and State statutes, EOs, and State agency regulations and directives protect water quality and the beneficial uses of water resources.

EO 11988 (Floodplain Management) requires Federal agencies to determine whether a Proposed Action would occur within a floodplain and to take action to minimize occupancy and modification of floodplains. A floodplain is defined as the lowlands and flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands. At a minimum, areas designated as floodplains are susceptible to 100-year floods.[57] EO 11988 requires that Federal agencies proposing to site a project in the 100-year floodplain must consider alternatives to avoid adverse effects and incompatible development in the floodplain.

EO 11990 (Protection of Wetlands) required Federal agencies to ensure their actions minimize the destruction, loss or degradation of wetlands. This EO also assures the protection, preservation, and enhancement of US wetlands to the fullest extent practicable during the planning, construction, funding and operation of transportation facilities and projects.

The Clean Water Act (CWA), as amended, is the primary Federal law regulating water pollution (P.L. 92–500, 33 U.S.C. §1251). The CWA regulates water quality of all discharges into "waters of the U.S." Both wetlands and "dry washes" (channels that carry intermittent or seasonal flow) are considered "waters of the U.S." Administered by EPA, the CWA protects and restores water quality using both water quality standards and technology-based effluent limitations. The EPA publishes surface water quality standards and toxic pollutant criteria at 40 CFR Part 131. Water quality standards are the foundation of the water quality–based control program mandated by the CWA.

The CWA also established the NPDES permitting program (Section 402) to regulate and enforce discharges into waters of the U.S. The NPDES permit program focuses on point-source outfalls associated with construction, industrial wastewater, and municipal sewage discharges. Congress has delegated to many States the responsibility to protect and manage water quality within their legal

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[56] During the scoping period, the public raised concern that water originating from Mauna Loa and Mauna Kea and flowing from PTA could be contaminated with byproducts from military activities. The Army's ORAP initiative, discussed in Section 3.8, Geology and Soils, discusses a lack of hydrologic connection between PTA and outside receptors, this subject addresses the concern raised during scoping.

[57] Defined as a flood having a 1 percent chance of occurring in any given year. Zones A and V of FIRMs encompass the area of the 100-year floodplain.

boundaries by establishing water quality standards and identifying waters not meeting these standards. The HDOH administers the NPDES program under Title 11, Chapter 55, Hawai‘i Administrative Rules (HAR).

The CWA also requires Federal agencies to accommodate concerns for the potential impacts from Federal projects with State nonpoint source pollution control programs. “Nonpoint source water pollution” now more commonly called “polluted runoff” is a term for all the material originating from natural and human activity that are carried by rainwater from the land and the air into streams and oceans. Polluted runoff is a major cause of water quality degradation nationwide.

Section 404 of the CWA provides for the protection of the nation’s waters and wetlands by establishing a program regulating the discharge of dredge and fill material within waters of the U.S., including wetlands, and requiring a permit for such activities. The USACE, EPA, and USFWS jointly administer the wetlands program. The USACE administers the day-to-day program, including authorizing permits to place dredge and fill material in waters of the U.S. and making jurisdictional determinations of waters of the U.S., including wetlands. USACE permits are required for all activities resulting in the discharge of dredged or fill material to U.S. waters, including wetlands.

Section 401 of the CWA provides authority for States to require that a Water Quality Certification (WQC) which for Hawai‘i may be obtained from HDOH before issuance of a Section 404 permit. Additional protection to surface water and aquatic biological resources from impacts associated with stormwater runoff is provided by Section 402, which requires a NPDES permit for various land development activities. Proposed facility construction or modifications may require one or more of the following permits from HDOH, CWB:

- NPDES General Permit. This permit may be required for a constructed or relocated facility if the facility discharges any waters other than to the sanitary sewer.
- NPDES General Permit authorizing discharges of stormwater associated with construction activity. This permit is required for any construction activities, including excavation, grading, clearing, demolition, uprooting of vegetation, equipment staging, and storage areas that result in the disturbance of equal to or greater than one acre of total land area. Specifically excluded is construction activity that includes “routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility.”
- NPDES General Permit authorizing discharges of stormwater associated with industrial activities. Stormwater permits are currently required for most industrial properties. If modifications are made or if an industrial facility is relocated the permit must be modified to reflect these changes.

The CZMA encourages States to manage and conserve coastal areas as a unique, irreplaceable resource – such as Hawai‘i Island. Federal activities that directly affect the coastal zone are to be conducted in a manner consistent with the enforceable policies of the federally approved State program to the extent practicable.

As a DoD entity, compliance with Section 438 of the Energy Independence and Security Act (EISA) is required. This act applies to facilities construction projects with a footprint greater than 5,000 gross ft^2.

The objective of Section 438 of EISA is to maintain predevelopment hydrology and to prevent any net increases in stormwater runoff[58]. EISA requires project site design options to be evaluated to achieve the design objective to the maximum extent technically feasible. The "maximum extent technically feasible" criterion requires full employment of accepted and reasonable stormwater retention and reuse technologies, subject to site and applicable regulatory constraints. EISA requirements do not apply to internal renovations, maintenance, or resurfacing of existing pavements. In some cases EISA requirements actually improve the existing hydrological function of a project area. For example, rainfall rates at PTA are on average much lower than the rest of the Hawaiian Islands, which is partly why the project area is not highly vegetated. Vegetation helps to mitigate heavy rainfall flows, so in some cases at PTA when the area is under a threat of flashfloods (when rain exceeds the infiltration rate over an extended period of time) the lack of vegetation could pose a threat for areas within the drainage paths of PTA at lower elevations. Implementing EISA design requirements for the modernization of the cantonment area would be a mitigative measure that would have long lasting positive affects for areas within the drainage paths of PTA.

The State Water Code, Chapter 174, HRS was enacted into law by the 1987 Hawai'i State Legislature for the purpose of protecting Hawai'i's water resources. It provides for the legal basis and establishment of the Commission on Water Resource Management. All inland water of the State are subject to these regulations.

The Safe Drinking Water Act (SDWA) provides for the protection of public health by regulating the U.S. public drinking water supply (P.L. 93–23, 42 U.S.C. §300f). The SDWA aims to protect drinking water and its sources (e.g., rivers, lakes, reservoirs, springs, and groundwater wells) and authorizes EPA to establish national health-based standards for drinking water to protect against naturally occurring and man-made contaminants. Every public water system in the U.S. is protected by the SDWA. Under Section 1424(e) the SDWA prohibits Federal agencies from funding actions that would contaminate a sole-source aquifer [59] or its recharge area. Any Federally funded project (including those that are partially Federally funded) with the potential to contaminate a designated sole-source aquifer is subject to review by EPA. EPA's regulations implementing the SDWA requirements are found in 40 CFR 141–149. Federal SDWA groundwater protection programs are generally implemented at the State level.

In the State of Hawai'i, the SDWB of DOH is responsible for safeguarding public health by protecting Hawai'i's drinking water sources (surface water and groundwater) from contamination and assure that owners and operators of public water systems provide safe drinking water to the community. The SDWB administers these programs through UIC and groundwater protection.

The UIC program serves to protect the quality of Hawai'i's underground sources of drinking water from chemical, physical, radioactive, and biological contamination that could originate from injection well activity. Underground injection wells are wells used for injecting water or other fluids into a groundwater aquifer. HDOH Administrative Rules, Title 11, Chapter 23 provides conditions governing the location,

[58] DoD defines "predevelopment hydrology" as the pre-project hydrological conditions of temperature, rate volume, and duration of stormwater flow from the project site.

[59] A sole-source aquifer is defined as supplying at least 50 percent of the drinking water consumed in an area overlying the aquifer.

construction and operation of injection wells so that injected fluids do not migrate and pollute underground sources of drinking water. Section 4 of the Administrative Rules identifies the criteria used to classify aquifers into those that are designated as underground sources of drinking water and those that are not. The boundary between non-drinking water aquifers and underground sources of drinking water is generally referred to as the “UIC Line”. Restrictions on injection wells differ, depending on whether the area is inland or seaward of the UIC line.

The SDWB also regulates groundwater and potable water in the state of Hawaiʻi; establishing a new drinking water well below the UIC line can negatively affect injection well viability in the water well’s capture zone. Outreach measures may be required by the applicant to seek, notify, and solicit comments from affected property owners. The notification and solicitation of such comments shall inform the affected property owners about the proposed drinking water well and the implications that protective measures for the drinking water well will have on properties within or near to the well’s capture zone. Material and information contained in public notices and direct mailings, must be reviewed

Some of the Proposed Actions may require some of the following permits to be issued from HDOH, SDWB:

- UIC well permits used for the subsurface disposal of wastewater, sewage effluent, and or surface runoff are subject to environmental regulation and permitting under Hawaiʻi Administrative Rules, Title 11, Chapter 11-23. The DOH, SDWB approval must be obtained before and injection well construction commences.
- Federal and state regulations define a public water system that serves 25 or more individuals at least 60 days per year or has at least 15 service connections. All public water system owners and operators are required to comply with Hawaiʻi Administrative Rules, Title 11, Chapter 20, titled Rules Relating to Potable Water Systems.

3.7.3 PTA Cantonment Area

3.7.3.1 Watersheds

The PTA Cantonment Area plays much of the same role that all areas of PTA have for watersheds of Hawaiʻi. Due to the lack of documentation, it is assumed that the major function of the area is the recharge of the groundwater system from rainfall and infiltration. The Cantonment Area is located on land that slopes gently to the west. The National Flood Insurance Boundary Maps shows PTA in an area designated “Zone X,” which means “areas determined to be outside the 500-year flood plain” (National Flood Insurance Program, 2010). There are no surface streams, lakes or other bodies of water within the boundaries of PTA. Lake Waiau, located near the summit of Mauana Kea approximately 8 miles from PTA, is the nearest known surface water body. There are three intermittent streams located within 2 miles of the Cantonment Area (Waikahalulu Gulch, Pōhakuloa Gulch, and an unnamed gulch) which collect runoff from the southern flank of Mauna Kea (U.S. Army and USACE, 2004).

3.7.3.2 Water Supply

Federal and State regulations define a public water system as one that serves 25 or more individuals at least 60 days per year or has at least 15 service connections. All public water system owners and operators are required to comply with Hawai‘i Administrative Rules, Title 11, Chapter 20, titled Rules Relating to Potable Water Systems. The PTA Cantonment Area does not provide any sources of potable water due to the naturally porous environment. Potable water is currently trucked approximately 40 miles into PTA. Therefore, PTA does not have a public water system.

3.7.3.3 Wastewater

There is currently no wastewater system at PTA; all wastewater in the Cantonment Area is either treated via a septic system and/or discharged into a UIC well or disposed of off-site at a permitted facility. All septic systems and/or UIC wells in this particular area are regulated by HDOH and currently permitted with the HDOH-SDWB.

3.7.3.4 Stormwater

The Cantonment Area consists of the BAAF and the majority of other impervious land areas of PTA. A recent drainage report of the Cantonment Area concluded that even an additional 34,000 sf (for the paving of a new airstrip) of new impervious surface area would not alter any existing stormwater flow or affect any sites downstream of this proposed project site due to the high percolation rates on the existing site and surrounding areas(Mitsunaga & Associates, 2010). Under some circumstances (flash floods, or continuing episodic rainfall events), the runoff from the south slope of Mauna Kea could exceed the drainage capacity of the area and result in temporary flooding or localized ponding in this area of PTA; however, the soils in the area are permeable and the underlying lava flows contain sufficient secondary permeability that infiltration to the subsurface is rapid.

3.7.4 PTA Range Area

3.7.4.1 General Range Area

Water resources in the General Range Area are similar to the water resources, or lack thereof, described for the Cantonment Area (Section 3.7.4.1). The Range Area does not provide a source of potable water. Potable water is trucked from a public water source to PTA and into the Range Area. The major role or function for the watershed is from the recharge of groundwater that occurs from rainfall. The Range Area remains mostly in its natural environmental state (for the purposes of this section that means, it consists mostly of unpaved permeable and very porous lava rock which does not naturally allow surface water to remain); therefore there has been no alternation to the function that this areas play on the watershed for Hawai‘i in that it allows water to infiltrate naturally.

There is currently no wastewater system at PTA; all wastewater in the Range Area is either treated via a septic system and/or discharged into a UIC well or disposed of off-site at a permitted facility.

3.7.4.2 IPBA at Western Range Area

The Western Range Area remains mostly in its natural environmental state consisting primarily of very porous lava rock which does not naturally allow surface water to remain but to infiltrate, which is the function that this area plays for the watersheds of Hawai‘i. There are no surface streams, lakes or other bodies of water within the boundaries of PTA, including at the Western Range Area. The Western Range Area does not provide any sources of potable water due to the naturally porous environment. Recent surveys of the Western Range Area for archaeological resources or listed plant species did not indicate the presence of gulches or other dry water beds that could otherwise transport stormwater to off-installation receptors (USAG-HI, 2010c).

There is currently no wastewater system at the PTA Range Area. Waste treatment for new ranges would continue to be austere.

3.7.4.3 IPBA at Charlie's Circle

Existing water resources conditions at Charlie's Circle would be the same as discussed under Section 3.7.4.2, Western Range Area.

3.7.4.4 IPBA at Southwest of Range 20

Existing water resources conditions Southwest of Range 20 would be similar to the Western Range Area (Section 3.7.4.2). There are no surface streams, lakes or other bodies of water within the boundaries of PTA, including Southwest of Range 20. Range Planners, in a meeting dated 14 January 2011 (Garo), indicated that the terrain in this area is extremely rocky and rugged, and largely barren of vegetation which indicates the lack of moisture near the surface in this part of the impact area.

3.7.5 Water Resources Surrounding PTA

As described earlier, the nearest known surface water body to PTA is Lake Waiau, located near the summit of Mauana Kea approximately 8 miles from the installation. There are seven irregular streams that drain surface water off the southwestern flank of Mauna Kea and lie within the same drainage area as PTA (U.S. Army and USACE, 2008a). One perennial stream occurs downstream of PTA, the Waikoloa Stream, which heads towards the Kohala Mountains, runs north parallel to State Highway 19, and discharges into Kawaihae Bay through the Waiulaula Gulch (State of Hawaiʻi 2002b). According to the 303(d) List of Impaired Waters in Hawaiʻi, Kawaihae harbor is identified as an impaired body of water due to turbidity and was assigned low priority for development of TMDLs (HDOH, 2004).

3.8 GEOLOGY AND SOIL RESOURCES

Geologic resources include substrate types, composition and characteristics, physiography, topography, and soils. Discussions of geology and soils also cover geologic processes, such as erosion, faulting, and volcanic eruptions, and geologic hazards such as earthquakes, landslides, and liquefaction. These are presented below as they pertain to the existing conditions used to assess the potential environmental consequences of the Proposed Action. The soils potentially affected are summarized with respect to those areas covered by soils exhibiting rapid runoff, severe erosion potential, high compaction or shrink-swell potential, or other soil hazards that could impact infrastructure related to associated activities. Geologic hazards and seismicity associated with the potentially affected applicable installations are also considered.

3.8.1 Introduction and Region of Influence

ROI for geologic and soil impacts of the project is all areas in which project-related activities may occur, including the footprint of each training and construction area and the corridors of the military vehicle roads. The ROI also includes adjacent areas that may be affected by geologic processes in the project area, such as downslope areas adjacent to roadcuts or embankments that might be affected by slope failure. The ROI studied for the purpose of this analysis is defined by the legal boundaries of PTA (see Figure 1.3-2).

The Army conducted an Operational Range Assessment Program (ORAP) assessment at PTA in 2009 as part of the Army's overall SRP (USAEC, 2009c). The ORAP assessment evaluates the potential for munitions constituents of concern resulting from live-fire training activities at the installation's ranges to move off range and impact surrounding areas. These results, as they relate to soils, will be incorporated within the ROI at PTA.

3.8.1.1 Geologic Setting

PTA is located on Hawai'i Island, the largest and youngest of the islands in the Hawaiian island chain. The island was formed by the lava flows of five shield volcanoes, Kohala (extinct in the Middle Pleistocene), Mauna Kea (the tallest and presently dormant), Hualālai (last eruption 1800 to 1801), Mauna Loa (last eruption 1985) (Macdonald et al., 1983), and Kīlauea (still active). PTA is situated in the Humu'ula Saddle area between the two largest volcanoes, Mauna Kea to the northeast and Mauna Loa to the southwest. The Humu'ula Saddle was formed by the convergence of lava flows from both these volcanoes; most of the surface of PTA is covered by lava flows from these two volcanoes. These lava flows are a diverse assemblage of extrusive volcanic rocks, including flows that occurred during the present shield-stage of Mauna Loa and were formed during the latter part of the Pleistocene (Figure 3.8-1) (Stearns and Macdonald, 1946, Langenheim and Clague, 1987).

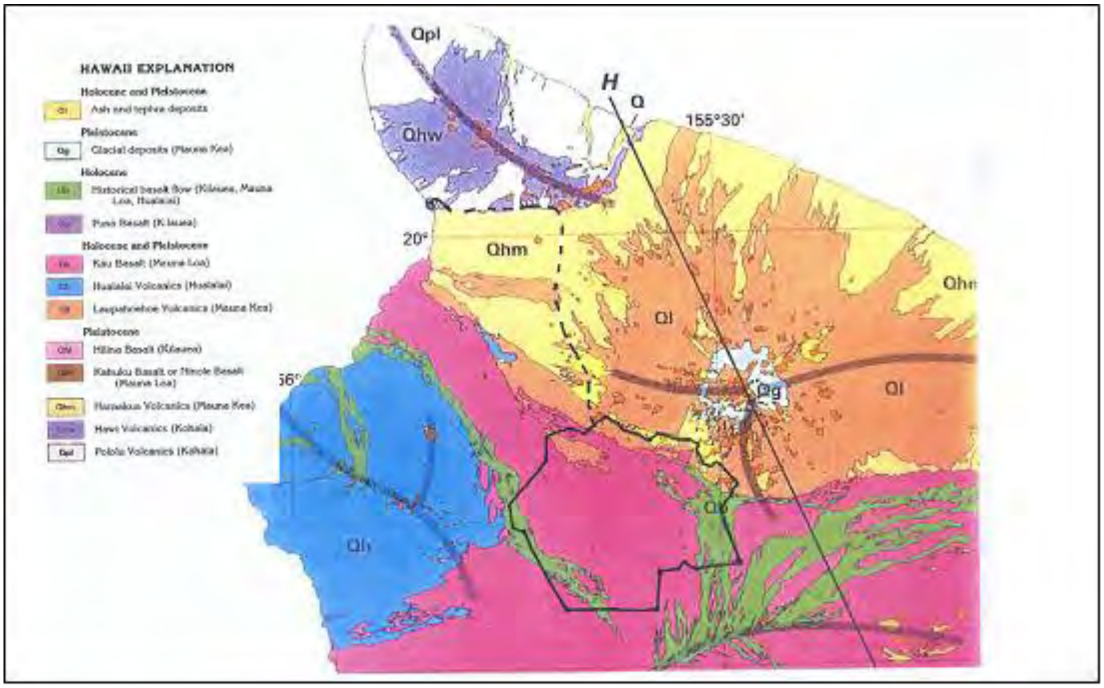

Figure 3.8-1. Geology of PTA and the surrounding saddle region

Most of PTA is level or gently sloping, uninhabited, with few trees or deep gullies to inhibit training (see Figure 3.8-1); however, only about 12,950 ha (32,000 ac) are free of recent lava flows and are considered fully usable for large maneuver exercises. Many areas at PTA are almost completely unusable for maneuvers due to the rough lava flows that occur over much of the surface area. About 35,600 ha (88,000 ac) at PTA are classified by the Natural Resources Conservation Services (NRCS) as lava flows, equally split between ‘a‘ā flows (16,424 ha [40,584 ac] and pāhoehoe flows (19,434 ha [48,024 ac].

Pāhoehoe lava is characterized by a smooth, billowy, and folded or ropy surface. Sub-surface voids and channeling tubes are common in pāhoehoe lava. The roofs of lava tubes, which range from a few to several feet thick, develop fractures with cooling and aging, and are prone to eventual collapse. Construction projects in areas covered with pāhoehoe lava require extensive measures (softening) to fill in the voids and stabilize the surface to make it safe for vehicles. The composition of ‘a‘ā lava is similar to pāhoehoe, but is characterized by a rough, jagged, sharp, and uneven surface, and forms steep-sided, jumbled piles of sharp plates and boulders (Sato et al., 1973). ‘A‘ā lava tubes and voids are not commonly found. Lava tubes do not naturally occur in ‘a‘ā, they are a characteristic of pāhoehoe. Where lava tubes appear to be in 'a'a, it is generally because 'a'a has flowed over previously existing pāhoehoe (Howarth, 1972).

The prehistoric and historic Mauna Loa lava flows present at PTA consist of both pāhoehoe and ‘a‘ā lava types; lava from the Mauna Kea volcano is primarily ‘a‘ā lava. Small to large cinder cones also dot the landscape of PTA, especially in the northern portion of the installation. Cinder cone s are formed from large clots of lava and solid rock fragments that are thrown high into the air by explosions, and then fall back close to the vent. Cinder cones make up a small proportion of the landscape, but they provide unique habitat for several endangered plant species (USAG-HI, 2009a).

3.8.1.2 Volcanic and Earthquake Hazards

Hawai'i Island is geologically active, with many volcanic eruptions recorded in historic times. Hazards from volcanic activity include lava flows, tephra falls, volcanic gases, pyroclastic surges, ground fractures and subsidence, earthquakes, and tsunamis (Mullineaux et al., 1987). Mauna Loa is an active basaltic volcano southwest of PTA, and has erupted 33 times since its first documented historic eruption in 1843. Mauna Loa and Kīlauea are both considered active volcanoes. Mauna Kea last erupted about 3,500 years ago and is considered dormant. Hualālai last erupted in 1801. Lava from Mauna Loa's last eruption, in 1984, covered 16 sq. miles (41.4 sq. km) of land in three weeks. The lava erupted from the Northeast Rift Zone, which extends northeast from the Mauna Loa crater and skirts the southeast boundary of PTA. The lava flowed within 4 miles (6 km) of Hilo (USGS, 1997a), but did not cross the PTA boundary. Five Mauna Loa flows of known age traverse PTA (Macdonald 1949). Flows from Mauna Loa that have entered the PTA boundary last occurred in 1935 (USARHAW and 25th ID[L], 2001).

The U.S. Geological Survey (USGS) recognizes nine Lava Hazard Zones, based on historical records of eruptions and seismic events. (USGS, 1997b). Numbered from one to nine, in order of decreasing relative risk, these are shown in Figure 3.8-2. Zone 1 is the hazard zone with the highest volcanic risk and includes those areas where lava covers more than 25 percent of the land since 1800. Zone 1 areas occur adjacent to major rift zones of Mauna Loa and Kīlauea. Zone 2 represents lava flow inundations of 15 to 25 percent coverage since 1800, and 25-75% coverage in the last 750 years. Zone 3 represents inundations of areas with 1 to 5 percent lava cover since 1800, and 15-75% cover in the last 750 years. Zone 2 occurs adjacent to and downslope from active rift zones, whereas Zone 3 is slightly less hazardous because of its greater distance from recently active vents or topography for flows covering the area less likely. Zone 4 represents areas with about 5 percent lava cover since 1800, and less than 15% cover in the last 750 years, and includes all of Hualālai and Mauna Loa. Zones 5 to 9 are areas that have not been covered by lava since 1800 and are protected by topography or covered by very little lava in the last 750 years (Mullineaux et al., 1987). Most of PTA sits in Zone 3, with the eastern edge and some of the impact area lying within Zone 2 and areas on the upslope of Mauna Kea in Zone 8.

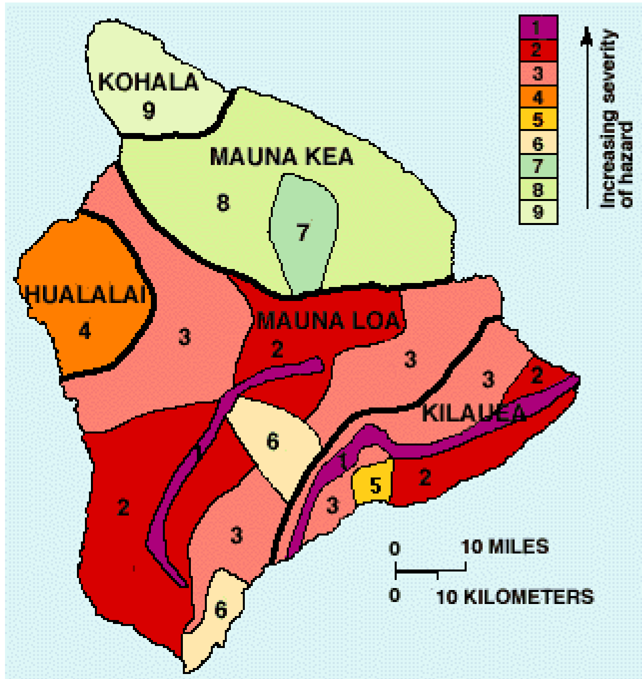

Figure 3.8-2. USGS Lava Hazard Zones at PTA

Most of Hawai‘i’s earthquakes are directly related to volcanic activity caused by magma moving beneath the earth’s surface, and often occur before and during volcanic eruptions. However, occasional strong earthquakes may originate from the Molokai fracture zone, which extends westward from North America (Mullineaux et al., 1987). An earthquake at a magnitude of 5.0 is potentially damaging, whereas a quake at a magnitude of 7.0 or greater typically causes widespread property damage. Ten destructive earthquakes with greater than a magnitude of 6.0 occurred from 1868 to 2006 near Hawai‘i. The two largest recent earthquakes in Hawai‘i with magnitudes greater than 7.0 occurred in 1868 and 1975, probably indirectly by movement of magma into the rift zones of Mauna Loa and Kīlauea. Two quakes (6.7 and 6.0 in magnitude) occurred at Kīholo Bay on 15 October 2006, causing more than $100 million of damage (EERI, 2006).

Hazards associated with earthquakes include ground shaking, fractures, liquefaction, landslides, and tsunamis. The 1868 and 1975 earthquakes generated destructive tsunamis along the coast (Mullineaux et al., 1987, USGS, 1997a); however, tsunamis would not be expected to reach PTA. The USGS has prepared maps showing the horizontal ground acceleration in firm rock, as a percentage of the acceleration of gravity, for a given probability of exceedance within a given number of years. Acceleration is the rate of change in speed or direction of an object, and it is what makes buildings come apart in a strong earthquake. A 10 percent probability of exceedance in the next 50 years means that there is a 10 percent chance that a larger event will occur in the next 50 years. PTA is in an area in which there is a 10 percent probability that an earthquake would cause a ground acceleration of more than 40 to 60 percent of gravity in the next 50 years, with the likely size of the earthquake increasing to the south, in the direction of Kīlauea and the south coast (USGS, 1997b).

3.8.1.3 Soils

PTA's high elevation[60], coupled with the area's relatively young geologic age, low precipitation, and rapid runoff, results in mostly thin and poorly developed soils. Much of the land surface of PTA is characterized by sparsely vegetated basaltic rock in the early stages of decomposition and soil formation. Pāhoehoe lava, ʻaʻā lava, and miscellaneous land types (e.g., puʻus) cover approximately 80 percent of the installation. Of the 53,750 ha (132,819 ac) at PTA, only about 4,047 ha (10,000 ac) are classified as soils formed on volcanic deposits, most of which lies within the KMA (U.S. Army Garrison-Pōhakuloa and CEMML, 2010). Twenty-four soil types were identified and broadly classified at PTA, with 14 soil types within the KMA. Deeper soils are found in the northern and western portion of the installation (i.e., KMA). Most of the central and southern portions of PTA are covered by lava flows, and small amounts of eolian sands. A map of soil types at PTA is shown in Figure 3.8-3.

[60] The elevation at PTA ranges from 1,228 m (4,030 ft) to 2,637 m (8,650 ft) AMSL.

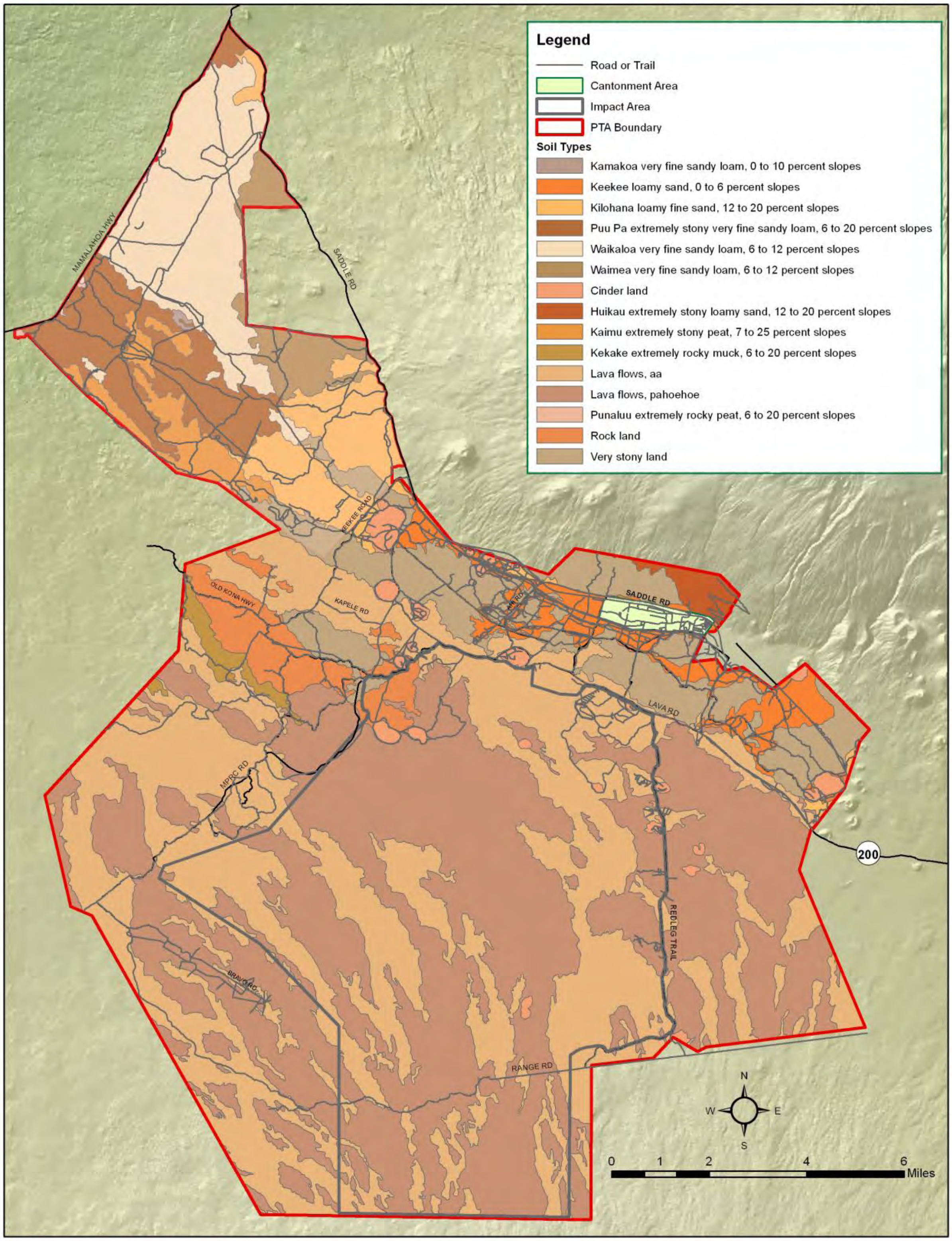

Figure 3.8-3. Land and soil types at PTA

3.8.1.4 Slope Failure

Slope failure occurs when the critical slope angle is exceeded. The angle depends on the frictional properties of the slope material and increases slightly with the size and angularity of the fragments. Dry, cohesionless material will come to rest on similar material when the angle of repose ranges generally between 33^{o} and 37^{o} (NPS, 2010). At PTA , areas with slopes greater than 30 percent are primarily limited to the slopes of Mauna Kea, north of Saddle Road, and to the southern portion of PTA, on the north-facing slope of Mauna Loa.

3.8.1.5 Soil Erosion

Overall, water erosion at PTA is low due to gentle slopes; low soil erosivity potential (e.g., extensive lava fields, stony rocklands, and cinderlands); and low intensity, gentle rainfalls (USAG-HI, 2010c). Soil erosion associated with water averages about 7 percent of tolerance as calculated from Range and Training Land Assessment (RTLA) data collected in 1989, 1990, 1993, and 2000 at PTA (USACE-HI, 2003).

3.8.1.6 Erosion Management

Mission Support Element - Hawaii (MSE-HI) manages and maintains the training lands on PTA through its Integrated Training Management (ITAM) Program, which integrates mission and training requirements with environmental requirements and environmental management practices. The ITAM goal is to achieve optimum, sustainable use of training lands by implementing an effective land management program. USAG-HI has developed a ITAM 5-year plan with specific goals and objectives, and annually develops an integrated ITAM work plan with individual projects and resource requirements.

The ITAM has four components, all supported by the SRP Geographic Information System (SRP GIS). The components are Training Requirements Integration (TRI), Land Rehabilitation and Maintenance (LRAM), RTLA and Sustainable Range Awareness (SRA)

TRI Provides a decision support capability based on the integration of training requirements, land conditions, range facilities, and land management requirements. TRI provides input to the USAG-HI and PTA INRMP and supports range project siting.

LRAM Repairs, maintains, and reconfigures Army lands to meet maneuver training requirements. It is the key enabler for sustaining realistic training conditions and supporting unit mission requirements. One example of an LRAM project includes erosion control and soil stabilization through use cost-effective technologies such as re-vegetation, erosion control structures, site hardening and dust palliatives. Site hardening includes the application of crushed lava on a range or training area in order to prevent degradation of the surrounding area.

RTLA acquires and assesses land condition data to provide information supporting decisions that maximize the capability and sustainability of Army land to support maneuver training. RTLA data is used to ensure biological considerations are part of the LRAM project planning process.

SRA develops and distributes educational materials to users of training lands to avoid unnecessary training damage. These educational materials identify and explain procedures that reduce the potential for inflicting avoidable impacts on range and training land assets, including local natural and cultural resources.

3.8.2 PTA Cantonment Area

The Cantonment Area lies at an elevation of 6,400 ft AMSL (1,950.7 m). The predominant soil in the Cantonment Area is Ke‘eke‘e loamy sand on 0 to 6 percent slopes with some cinder land to the west. This soil type is a mildly to strongly alkaline soil consisting of stratified sand developed in alluvium from volcanic ash and cinders. Permeability is rapid, and runoff is slow. The hazard of wind erosion is moderate to severe. The Cantonment Area is in lava hazard zone 8, and adjacent to hazard zone 2. The Cantonment Area is in an area in which there is a 10 percent probability that an earthquake would cause a ground acceleration of more than 40 to 60 percent of gravity in the next 50 years. The Cantonment Area is adjacent to steep slopes (>30%) at the base of Mauna Kea, as well as some cinder land.

3.8.3 PTA Range Area

3.8.3.1 General Range Area

The geology and soils of the general PTA area are described in Section 3.8.1, however, the KMA is substantially different from the other areas within the PTA. Instead of predominately lava and cinder substrates found elsewhere on PTA, a wide variety of soil types exist on the KMA. In the northern portion of the parcel, the soil is predominately Waikoloa very fine sandy loam with slopes of 6 to 12 percent. The southwestern portion is predominately Pu’u pa extremely stony very fine sandy loam (6 to 20 percent slopes) and kaimu extremely stony peat (7 to 25 percent slopes). The Southeastern portion is predominately Kilohana loamy fine sand (12 to 20 percent slopes), Waimea very fine sandy loam (6 to 12 percent slopes), and very stony land. All of these areas have small patches of other soil types present. Gullies and eroded trails in the KMA suggest water erosion potential may be greater there than in the rest of the installation due to inadequate drainage. Greater amounts and intensity of precipitation and a greater slope to the land would probably contribute to a greater rate of soil water potential in the KMA. Wind erosion is a more significant type of erosion than water at PTA in terms of impacts on military activities. Wind erosion in the KMA may be greater because of soil development. The KMA is in a lava hazard zone of 8, and in an area in which there is a 10 percent probability that an earthquake would cause a ground acceleration of more than 40 to 60 percent of gravity in the next 50 years.

Soil erosion is locally significant in areas where soils are well developed, principally in the training areas and on the northern portion of PTA (USAG-HI, 2010c).

Soil Contamination

Past and current activities at PTA have resulted in contamination of soil by explosives and other chemicals. The USACE Sacramento District conducted a surface soil and surface water investigation at PTA in 2002, in support of the Permanent Stationing of the 2/25th SBCT Final EIS (U.S. Army and USACE, 2008a). A total of 46 soil samples were collected from Range 5 (Grenade Range), Range 9 (Engineering Demolition Range); Range 10 (temporary Range 9, Engineering Demolition Range); Range 10 (temporary impact area); Range 11 (impact area); various firing points (309, 311, 420, 802, and 804); and Range Control (considered to be an ambient background site). No surface water was observed at any of the sites; therefore, no water samples were collected. Study objectives were to describe current conditions and to provide evidence of the effects of past training activities on surface soils and surface water. The investigation was not intended to be a comprehensive study of the distribution of contaminants on the existing ranges at PTA, as reported in the Final EIS for Military Training Activities at Mākua Military Reservation (MMR), HI (USAEC, 2009b), and summarized in the subsections below.

Chemical Residues from Past Activities

Explosives - From the surface soil investigation conducted by the USACE in 2002, 46 soil samples were conducted at PTA. The sampling detected six explosives included 2,4,6-trinitrotoluene (TNT); 2,4-dinitrotulene (DNT) (a precursor and degradation product of TNT); cyclotrimethylenetrinitramine (RDX), cyclotetramethylene-tetranitramine (HMX), nitroglycerin, and perchlorate. Four samples had detectable TNT concentrations (ranging from 0.8 to 1.5 mg/kg). None of the samples exceeded the industrial soil PRG of 57 mg/kg. The detections were in three samples from the Range 9 (Engineering Demolition Range) and in one sample from Range 5 (Grenade Range). Three samples contained 2,4-DNT, at concentrations ranging from 0.18 to 2.0 mg/kg. The industrial soil PRG for 2,4-DNT is 1,200 mg/kg. Perchlorate was detected in one sample from firing point (FP) 309 in the northwest corner of Training Area 8; the concentration was below the industrial soil PRG. Of the six explosives detected, five samples of RDX exceeded the RDX industrial PRG of 15.6 mg/kg.

Metals - Metals occur naturally in soils, varying at each location, and soils present on Hawai‘i Island are no exception. However, human activities may contribute to the background levels of metals in soils. On Hawai‘i, different lavas may have different compositions and concentrations of metals. Soils at PTA are relatively thin, poorly developed, with no mixing or redeposits. Metals concentrations in soils developed on different flows of different ages may vary. Frequency distribution plots can be used to help identify the normal ranges of metals in soils and to identify unusually high concentrations. High concentrations found in soils may be from natural sources, but if the concentrations are very different from the "typical" range of concentrations, then it is more likely that the metals are from human sources.

The most abundant metals found in the samples were tin basalt minerals, such as aluminum, barium, chromium, iron, nickel, and zinc. Other metals would generally be expected to be present at lower concentrations. Except for iron, none of these metals were detected at concentrations above the industrial soil PRGs. Chromium, nickel, and zinc were detected in one sample from Range 11 at much higher concentrations than in the other samples. However, these concentrations were less than the industrial soil PRGs. Iron did not exceed the industrial PRG in any of the samples. Zinc showed a clustered distribution in the range of 100 to 200 mg/kg. A few of the samples had higher detections, with the highest detected concentrations in samples from Range 5 and Range 11. Other less abundant metals were detected at concentrations below their respective industrial soil PRGs. The highest concentrations were generally detected in a single sample (R11TANK-01) and in samples from Ranges 9 or 10. Beryllium and selenium were exemptions with higher concentrations of which seem to be randomly distributed. The highest concentrations of these were found in the "background" samples near the Range Control office. The highest lead concentrations were detected in samples from Ranges 9, 10, and 11. Two samples (Ranges 10 and sample R11TANK-01) contained concentrations above the industrial soil PRG. Based on these results, both elevated metals concentrations and detectable explosives concentrations were generally found in the impact areas of Ranges 5, 9, 10, and 11. Few of the concentrations exceeded industrial soil

PRGs. Military training activities are the most likely source of the elevated concentrations, based on the training land use in these areas. Few of the concentrations exceeded industrial soil PRGs.

The combined non-cancer occupational health risk associated with exposure to the observed metals concentrations from the samples was just below the threshold of no further action. Excluding the calculated values for iron, aluminum, and manganese (i.e., known naturally occurring metals), the combined risk would be above the one in one million cancer risk threshold, mainly resulting from lead, but within the range of what is considered acceptable under some circumstances.

Semi-volatile Organics (SVOCs) - From samples collected at PTA, detections of metals, explosives, and several SVOCs (phthalate esters and polynuclear aromatic hydrocarbons [PAHs]) were present. The phthalate esters are plasticizers and are ubiquitous in the environment and may have been present from plastic parts in munitions. PAHs are also common in the environment at low concentrations as a product of combustion of heavy organic compounds, including wood, oils, and tars. None of the semi-volatile organics exceeded industrial soil PRGs.

Operational Range Assessment

As discussed in Section 3.8.1, the Army conducted an evaluation of PTA as a whole to determine whether a release or substantial threat of release of munitions constituents has occurred from an operational range (such as at PTA) to an off-range area that creates an unacceptable risk to human health or the environment. In the conduct of this study, the Army further reviewed the potential pathways that munitions constituents would use to migrate from the Range Area to reach off-range human and/or ecological receptors. The most common of these pathways are surface water and groundwater. After an assessment of 153 operational ranges (including firing points) at PTA, the Army found that migration pathways contaminants would use to leave the Range Area do not exist at PTA due to the lack of surface water and the great depth to groundwater, and are further hindered by low annual precipitation, highly permeable soils, and densely vegetated washes. The Army would conduct a follow-on review at five years after the latest assessment (scheduled for 2014) (USACE, 2009c).

3.8.3.2 IPBA at Western Range Area

The geology of the Western Range Area is covered by both pāhoehoe and ʻaʻā lava flows with little significant soil development. This area lies in lava hazard zone level 2, and is in an area in which there is a 10 percent probability that an earthquake would cause a ground acceleration of more than 60 to 80 percent of gravity in the next 50 years.

Soils here are likely to contain similar chemical residues (munitions constituents) as discussed in Section 3.8.3.1, but may be found in slightly less quantities as this portion of the impact area is currently underutilized and does not fall within the SDZs of other operational ranges located at the impact area.

3.8.3.3 IPBA at Charlie's Circle

Conditions at this alternative location would be similar in both geologic setting and soil slope hazards as the Western Range Area alternative. Levels of chemical residues would retain similar characteristics as the preferred alternative location.

3.8.3.4 IPBA at Southwest of Range 20

Similar to the Western Range Area and Charlie's Circle, the geology and soil composition at Southwest of Range 20 is covered by both pāhoehoe and ʻaʻā lava flows with little significant soil development. The terrain at this location is more rugged than the terrain present at the Western Range Area and Charlie's Circle. The area is in a lava hazard zone level 2, and in an area in which there is a 10 percent probability that an earthquake would cause a ground acceleration of more than 60 to 80 percent of gravity in the next 50 years.

The composition of soil contaminant at this location is likely similar to that of the Western Range Area and Charlie's Circle alternatives. Overall quantities of chemical residues here are likely to be less than what was found at ranges in the north and east part of the Range Area.

3.8.4 Geology and Soil Resources Surrounding PTA

PTA and much of the land surrounding it is designated a conservation district, overlapping both State and privately-owned land. The lands at low elevations are designated agricultural and are used for cattle grazing. Only a small amount of land, nearest the north coast and away from PTA, is being used for sugar cane. Lava flows and thin soils cover much of the surrounding land adjacent to PTA, with deeper soils in the north surrounding the KMA.

There is no information available on soil residues in the areas surrounding PTA.

3.9 BIOLOGICAL RESOURCES

3.9.1 Introduction and Region of Influence

This section describes the plant and animal species (biological resources) and habitats that occur in the terrestrial environments at PTA and surrounding areas. Biological resources include those that are limited in number or habitat or restricted in movement (e.g., plants and small mammals). These resources also include those that are more mobile and can range onto and off the property from surrounding habitat areas (e.g., birds and terrestrial mammals).

The Hawaiian Islands are located over 2,400 miles (4,000 km) from the nearest continental shore, isolating these islands from other land masses. Hawaiʻi is home to a large number of species only found in this geographic area (referred to as endemic species). Endemic species can be classified as found only on the Hawaiian islands (as an archipelago) or to a single Hawaiian island. For example, there are 71 known taxa of endemic Hawaiian birds, 23 are known to be extinct and 30 of the remaining 48 species (and subspecies) are federally protected as listed species by USFWS. There are 1,094 taxa of native flowering plants found in Hawaiʻi, 91 percent of which occur only in Hawaiʻi. Almost half of Hawaiʻi's native vascular plant taxa (flowering plants, ferns, and fern allies) are believed to be endemic and found nowhere else in the world (USAG-HI, 1997).

Terrestrial biological resources are divided into three categories: *vegetation communities*, *wildlife*, and *special-status species*. Vegetation consists of terrestrial plants and their habitat types (i.e., shrub land). Wildlife includes invertebrates, amphibians, reptiles, terrestrial mammals, birds, fish, and marine wildlife.

For the purposes of this document, protected species include those listed or candidate species under Federal and State of Hawaiʻi laws, locally regulated species, and migratory birds. All Army operations consider any published BOs, species and habitat listings or recommendations regarding any listed species to protect these species from impact appropriately.

The ROI for biological resources consists of the lands that support terrestrial biological resources (i.e., individual species and habitats) that may be directly or indirectly affected by the Proposed Actions. Vegetation, wildlife, critical habitats, and listed species that have been recorded in or that have the potential to be found within this ROI, based on the presence of suitable habitat, are discussed in this section. Biological resources have the potential to be impacted by construction, operations, and training-related activities.

3.9.1.1 Regulatory Framework

The analysis focuses on species and vegetation communities considered vital to the function of biological communities, of special public importance or that are protected under Federal, State or local laws and statutes. Biological resources are protected and managed through statutory and regulatory requirements including, but not limited to, the NEPA; ESA; Migratory Bird Treaty Act (MBTA); SAIA of 1997 (16 USC §670a et seq.), DoDI 4715.3; AR 200-1, ESA Section 7 consultations under the ESA with the USFWS; and/or Memorandum of Agreements (MOA)/Memorandum of Understandings (MOU) with cooperating agencies or groups.

Several management plans have been developed for PTA. Natural resources management plans used on PTA include the U.S. Army Garrison, Hawaiʻi (USAG-HI) Pōhakuloa INRMP for 2010-2014; Pōhakuloa Implementation Plan (2011); Pōhakuloa Ecosystem Management Plan (1998); and Pōhakuloa Endangered Species Management Plan (1997).

The ESA (16 U.S.C. §1531) is administered by the USFWS and requires Federal agencies to conserve terrestrial endangered species. The USFWS, and National Marine Fisheries Service (NMFS) are responsible for compiling the lists of threatened and endangered species of plants and animals and designating the critical habitat for animal species. The ESA defines an endangered species as any species in danger of extinction throughout all or a significant area of its range and a threatened species as any species likely to become endangered in the near future. Under Section 7 of the ESA, Federal agencies, in consultation with USFWS, must ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species (i.e., a listed species) or to result in the destruction or adverse modification of critical habitat, defined as a specific geographic area that is essential for the conservation of a threatened or endangered species and that may require special management and protection (USFWS, 2008).

If a Proposed Action may adversely affect a listed species or critical habitat, the Federal agency must prepare a BA and initiate a formal consultation with USFWS (or NMFS). After reviewing the BA, USFWS (or NMFS) prepares a BO stating whether the Proposed Action is likely to jeopardize the continued existence of a listed species or cause the destruction or adverse modification of critical habitat. The purpose of the consultation process is to ensure avoidance and minimization of potential adverse impacts on a listed species or critical habitats. Formal consultation is not required if the Federal agency determines, and USFWS (or NMFS) concurs in writing, that the Proposed Action is not likely to adversely affect listed species. In addition, the ESA prohibits all persons subject to U.S. jurisdiction, including Federal agencies, from, among other things, "take" endangered or threatened species. The "take" prohibition includes any harm or harassment and applies in the U.S. and on the high seas. Habitat considered essential to the conservation of a listed endangered or threatened species may be designated as critical and are protected under the ESA. These areas may require special management considerations or protection. Although critical habitat may be designated on private or government land, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife. Federal agencies are required to conduct a Section 7 consultation if a Proposed Action could affect designated critical habitat, even if the effects are expected to be beneficial. The Army, as a Federal agency, is prohibited from adversely modifying critical habitat without an incidental take statement or without concurrence form the USFWS that the take will not have an adverse effect on the species (U.S. Army and USACE, 2008a).

The Sikes Act of 1960 (16 U.S.C. §670a-670o) authorizes the Secretary of Defense to develop cooperative plans for conservation and rehabilitation programs on military reservations and to establish outdoor recreation facilities. The Sikes Act also provides for the Secretaries of the Department of Agriculture and the Department of Interior to develop cooperative plans for conservation and rehabilitation programs on public lands under their jurisdiction.

The MBTA (16 U.S.C. §703) prohibits the "take" of migratory and certain other birds, their eggs, nests, feathers, or young without an appropriate permit. EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) strengthens the protection of migratory birds and their habitats by directing Federal agencies to take certain actions that implement the MBTA. Unless permitted by regulation (i.e., waterfowl hunting, incidental take during DoD training and testing), it is illegal to "take" migratory birds, their eggs, feathers or nests. "Take" includes by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof. Under the MBTA, only the direct "take" of migratory birds requires authorization by USFWS. Actions that may adversely impact or indirectly "take" birds such as habitat destruction or manipulation are not a violation of the MBTA unless migratory birds are killed or wounded during the activity. However, the MOU between the DoD and the USFWS to promote the conservation of migratory birds that was developed pursuant to EO 13186 addresses both direct and indirect takes of migratory birds. The MOU identifies specific activities where cooperation between USFWS and DoD will contribute substantially to the conservation of migratory birds and their habitats. This MOU does not authorize the take of migratory birds (U.S. Army and USACE, 2008a).

To reduce impacts to migratory birds, on 28 February 2007, the USFWS published the final rule on the take of migratory birds by the Armed Forces (50 CFR Part 21). This rule authorizes and explains the conditions for which the Armed Forces, and contractors performing a military readiness activity in association with the Armed Forces, can unintentionally take migratory birds during military readiness activities. If the Armed Forces determine that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of a migratory bird species, then they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects. Under certain circumstances, such unintentional take authorization is subject to withdrawal to ensure consistency with the provisions of the migratory bird treaties (U.S. Army and USACE, 2008a).

Invasive species consist of non-indigenous species (e.g. plants, wildlife, and invertebrates) that adversely affect the habitats they invade economically, environmentally, or ecologically. EO 13112, *Invasive Species*, requires all Federal agencies to prevent the introduction of invasive species, provide control, and minimize the economic, ecologic, and human health impacts that invasive species may cause. The effects of invasive species is addressed in an Army Policy Guidance (*Management and Control of Invasive Species*) distributed in June 2001. The requirement to implement invasive species management is identified in the U.S. Army Environmental Program Requirements under the Sikes Act for natural resources stewardship requirements, the ESA when protecting or managing listed species and critical habitat, and the Clean Water Act when invasive species are involved in erosion control and wetlands. Installations are required to "monitor invasive species populations, and track the presence and status of invasive species over time to determine when control measures are necessary and to evaluate the effectiveness of prevention, control/eradication, and restoration measures." Invasive species are defined as non-native species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species include plants, animals, and other organisms (e.g., microbes). These species are typically introduced by human actions; however, they can be unconsciously carried to new locations by other organisms (e.g., seed in a bird's gullet), wind, and water. Invasive species can be a threat to natural resources, impact local economies, and adversely affect the military mission. An invasive species is further defined as any species part, including its seeds, eggs, spores, or other biological material, capable of propagating that species (USAG-HI, 2010c).

3.9.2 PTA Cantonment Area

3.9.2.1 Vegetation and Habitat Types

The Cantonment Area consists of four main vegetation community types: (1) *Sophora-Myoporum* Shrubland with grass understory; (2) *Eragrostis* Grassland; (3) Disturbed; and (4) *Chenopodium* Shrubland (Shaw and Castillo, 1997). It should be noted that Shaw and Castillo (1997) report on data from the late 1980s; current vegetation community types in the Cantonment Area will be surveyed and updated in the near future.

The *Sophora-Myoporum* Shrubland with grass understory is the common plant community found in the northeastern corner of the installation. The major overstory species include māmane (*Sophora chrysophylla*) and naio (*Myoporum sandwicense*). Grasses dominate the herbaceous understory. Characteristic grasses of this community are ripgut brome (*Bromus rigidus*), hairy wallaby grass (*Danthonia pilosa*), lovegrass (*Eragrostis leptophylla*), perennial veldtgrass (*Ehrharta calycina*), and nodding needlegrass (*Stipa cernua*). Common weedy species consist of telegraphweed (*Heterotheca grandiflora*), horehound (*Marrubium vulgare*), dwarf nettle (*Urtica urens*), and mullein (*Verbascum thapsus*) and constitute the herbaceous forbs. Feral ungulates have negatively impacted this community (Shaw and Castillo, 1997).

The *Eragrostis* Grassland community is found across the northern part of the installation and primarily occurs on Mauna Kea ash substrate but occasionally is found on broken pāhoehoe, ‘a‘ā, and cinder. The major shrub in this plant community is aweoweo (*Chenopodium oahuense*). Native grasses predominate, with the most common species of hardstem lovegrass (*Eragrostis atropioides*), nodding needlegrass, pili uka (*Trisetum glomeratum*), and panicgrass (*Pancium tenuifolium*). Weedy forbs consist of redstem stork’s bill (*Erodium cicutarium*), telegraphweed, hyssopleaf pepperweed (*Lepidium hyssopifolium*), muster John Henry (*Tagetes minuta*), puncturevine (*Tribulus terrestris*), mullein, and golden crownbeard (*Verbesina encelioides*) and have invaded much of the area (Shaw and Castillo, 1997).

The Disturbed and *Chenopodium* Shrubland vegetation communities are discussed below in Vegetation and Habitat Types.

Wildlife

Invertebrates

There are at least 90 species of arthropods and six other invertebrates found on PTA. A 1996 to 1998 survey found 485 taxa of arthropods on PTA. Most taxa were nonnative species. Other more recent invertebrate studies determined the presence and location of the Argentine ant (*Linepithema humile*) and other ant species (USAG-HI, 2010c).

The Cantonment Area is likely to contain invertebrate species similar to what is found in and around PTA.

Amphibians, Reptiles, and Fish

PTA does not contain water bodies to support aquatic fauna. Therefore, there are no native amphibians, reptiles, fish, or marine wildlife on PTA (USAG-HI, 2010c).

Terrestrial Mammals

The ‘ope‘ape‘a, or Hawaiian hoary bat (*Lasiurus cinereus semotus*), is the only native land mammal at PTA. All other mammals are non-native and individual perceptions can affect their designation as game or as an invasive/nuisance species. Common game mammals include feral goat (*Capra hircus*), sheep (*Ovis aries*), and pig (*Sus scrofa*), which, along with rat species (*Rattus rattus*), mongoose (*Herpestes auropunctatuts*), mouse (*Mus domesticus*), domestic cattle (*Bos Taurus*), domestic horse (*Equus caballus*), feral dogs (*Canis familiaris*), and feral cats (*Felis catus*) are considered nuisance species and harmful to the persistence of many native species (USAG-HI, 2010c).

The Cantonment Area is likely to contain terrestrial mammals similar to what is found in and around PTA.

Birds

Twelve endemic (native) bird species are present at PTA, along with 25 introduced (non-native) or visitor bird species. Many of the introduced (non-native) species are considered game birds. Seventeen of the bird species are protected by the MBTA, almost half of which are introduced (non-native) or visitor species, which must still be considered under the MBTA (USAG-HI, 2010c). Table 3.9-1 identifies the bird species present at PTA.

Table 3.9-1. PTA Bird Species

Common Name	Species	Origin Status	Status	Federal List
African Silverbill	*Lonchura malabarica*	Introduced	None	
‘Akiapōlā‘au+	*Hemignathus munroi*	Endemic	Protected/ Endangered	MBTA/ ESA
Apapane	*Himatione sanguinea*	Endemic	Protected	MBTA
Barn Owl	*Tyto alba*	Introduced	Protected	MBTA
Band-rumped Storm Petrel	*Oceanodroma castro*	Endemic	Protected/ Candidate	MBTA/ ESA
Black Francolin	*Francolinus francolinus*	Introduced	None	
California Quail	*Callipela californica*	Introduced	None	
Chukar	*Alectoris chukar*	Introduced	None	
Common Myna	*Acridotheres tristis*	Introduced	None	
Erckel’s Francolin	*Francolinus erckelli*	Introduced	None	
Gray Francolin	*Francolinus pondicerianus*	Introduced	None	
Hawai‘i ‘amakihi	*Hemignathus virens*	Endemic	Protected	MBTA
Hawai‘i ‘Elepaio	*Chasiempis sandwichensis*	Endemic	None	
Hawaiian Goose (nene)	*Branta sandvicensis*	Endemic	Protected/ Endangered	MBTA/ ESA
Hawaiian Hawk (‘Io)	*Buteo solitarius*	Endemic	Protected/ Endangered	MBTA/ ESA
Hawaiian Dark-Rumped Petrel (ua’u)	*Pterodroma sandwichensis*	Endemic	Protected/ Endangered	MBTA/ ESA
Hawaiian Short-eared Owl (Pueo)	*Asio flammeus sandwichensis*	Endemic	Protected	MBTA
Hawaiian Thrush (‘Oma‘o)	*Myadestes obscurus*	Endemic	Protected	MBTA
House Finch	*Carpodacus mexicanus*	Introduced	Protected	MBTA
House Sparrow	*Passer domesticus*	Introduced	None	
Japanese White-eye	*Zosterops japonicus*	Introduced	None	
Iiwi+	*Vestiaria coccinea*	Endemic	Protected	MBTA
Kalij Pheasant	*Lophura leucomelana*	Introduced	None	
Lavender Waxbill	*Estrilda caerulescens*	Introduced	None	
Melodious Laughing Thrush	*Garrulax canorus*	Introduced	None	
Northern Cardinal	*Cardinalis cardinalis*	Introduced	Protected	MBTA
Northern Mockingbird	*Mimus polyglottus*	Introduced	Protected	MBTA
Nutmeg Mannikin	*Lonchura Malacca*	Introduced	None	
Pacific Golden-Plover	*Pluvialis fulva*	Visitor	Protected	MBTA
Palila (honeycreeper)+	*Loxioides bailleui*	Endemic	Protected/ Endangered	MBTA/ ESA
Red-billed Leiothrix	*Leiothrix lutea*	Introduced	None	
Rock Pigeon	*Columbra livia*	Introduced	None	

Saffron Finch	*Sicalis flveola*	Introduced	None	
Sky Lark	*Alauda arvensis*	Introduced	Protected	MBTA
Spotted Dove	*Streptopelia chinensis*	Introduced	None	
Wild Turkey	*Meleagris gallopavo*	Introduced	None	
Yellow-fronted Canary	*Serinus mozambicus*	Introduced	None	
Zebra Dove	*Geopelia striata*	Introduced	None	

[+]Species historically recorded from PTA, but have not been recorded at PTA for 15 or more years
Source: USAG-HI, 2010c; Schnell, 2011

The most common bird on PTA is the Hawaiian ‘amakihi (*Hemignathus virens*; native), averaging 26 percent of the sightings from 2003 to 2005. The next common bird is the Japanese white-eye (*Zosterops japonicus*; non-game, non-native, 19 percent), followed by the Erckel’s Francolin (*Francolinus erckelli*, non-native, game bird, 11 percent), and the house finch (*Carpodacus mexicanus*; non-native, non-game, migratory bird, 10 percent) (USAG-HI, 2010c).

Appendix F provides descriptions of wildlife species present at PTA.

Listed Vegetation and Critical Habitat

Two listed plants have been previously identified in the Cantonment Area. The Hawaiian catchfly (*Silene hawaiiensis*), a federally listed threatened shrub, and ‘akoko (*Chamaesyce olowaluana*), a species of concern, have been observed north of the BAAF. The Hawaiian catchfly has not been recorded in this area for several years and no longer persists in the area which has been impacted by the construction of the new Saddle Road (Schnell, 2011). General information on these species is presented in Appendix F (Shaw, 1997 and USAG-HI, 1997).

The Cantonment Area has a Rare Plant Propagation Facility (type of greenhouse) that is used for listed plant species management at PTA. This shelter is used to raise dryland plants unable to propagate at lower elevations. Once these plants are ready for outplanting, the plants are moved to completely natural environments. Attempts are made to propagate all federally listed plant species found at PTA. The facility emphasizes federally listed species, but it is not necessarily limited to these species. The goal is to produce plants for outplanting to hasten species recovery and to provide hardened plants for revegetation projects. Outplantings include fencing to minimize grazing damage (Gene Stout and Associates et al., 2006).

Critical Habitat

No critical habitat is located in the Cantonment Area.

Listed Wildlife and Migratory Birds

The endangered Hawaiian hoary bat has been sighted in the Cantonment Area (Peshut, 2011). General information on this species is presented in Appendix A. Table 3.9-1 identifies the known protected species and migratory birds at PTA (USAG-HI, 2010c).

The following migratory birds may be present at the Cantonment Area of PTA: Apapane, barn owl, Hawaiian goose (nene, endangered), Hawaiian hawk (Io, endangered), Pueo, house finch, northern cardinal, northern mockingbird, Pacific golden plover, and sky lark (Schnell, 2011).

Invasive Species

Invasive Plant Species

The major invasive plant species known to occur on PTA include fountain grass (*Pennisetum setaceum*), fireweed (*Senecio madagascariensis*), Chandelier plant (*Kalanchöe tubiflora*), Banana poka (*Passiflora mollissima*), German Ivy *(Senecio mikanioides*), and Russian thistle (*Salsola kali*). Five additional species are not as widespread or have limited impacts on native species and/or the landscape; these include creeping gloxinia (*Lophospermum erubescens*), balloon plant (*Aesclepias physocarpa*), mullein, Jerusalem cherry (*Solanum pseudocapsicum*), and bull thistle (*Cersium vulgare*) (USAG-HI, 2010c).

Invasive plants, such as fountain grass, can produce substantial biomass and copious seed crops. Fountain grass can establish wherever substrate is sufficient for its needs, but prefers disturbed site such as sites that have had previous wildfires. The spread of invasive plants or noxious weeds increases the potential of wildfires occurring (U.S. Army and USACE, 2008a).

Invasive plant species are managed through PTA Natural Resources staff through invasive plant management guidance, a weed control program, and USFWS BO (2003). Weed control consists of hand pulling plants within one meter of a federally listed plant, herbicide application beyond the one-meter boundary during favorable weather conditions, and maintenance of a weed-free zone with a gas-powered line trimmer. Currently, PTA Natural Resources staff manages approximately 98 weed control buffers that range in size from 0.5 acres to 20 acres. The weed control program promotes native ecosystem restoration and conservation of listed species. Quarterly maintenance is necessary and may take two to three years to gain control, especially with fountain grass. Other species, such as fireweed, require long-term control measures. Fireweed is a growing problem and requires year-round management. Fireweed seeds are wind-blown, quick to germinate, and invade new habitats easily. Chandelier plant is an aggressive invasive species in some areas, forming dense mats on ‘a‘ā lava, an increasing problem at PTA. Banana poka is designated by the Hawai‘i Department of Agriculture as noxious and for eradication. A woody climber, the species both self-and cross-fertilizes and is increasing its spread in the Kīpuka ‘Alalā fence units (USAG-HI, 2010c).

Invasive plants are also controlled through the use of wash racks. Wash racks are provided at PTA for vehicles used for training activities; wash racks are used to clean off weed seeds before leaving PTA to reduce the risk of exporting invasive and noxious weeds to other areas of the installation or Island, as well as minimizing threats to federally listed species (USAG-HI, 2010c). Currently, there are two active washracks located near the BAAF, both temporary and self-contained that do not discharge wastewater. A permanent washrack facility for military vehicles is proposed as part of the BAX, scheduled for completion in 2012 (Arter, 2011).

Common weedy species found in the Cantonment Area consist of telegraphweed, horehound, dwarf nettle, mullein*,* redstem stork’s bill, hyssopleaf pepperweed, muster John Henry, puncturevine, golden crownbeard*,* yellow sweetclover (*Melilotus indica*), ripgut brome, and field mustard (*Brassica campestris*) (Shaw and Castillo, 1997). Non-native plants are managed by their ranking, which is based on invasiveness, extent, ability to outcompete native species, amount of fine fuel created, and the ability to be contained. Two species, fountain grass and fireweed, are ranked highest in need of control (USAG-HI, 2010c).

Invasive Wildlife Species

Ungulates and predatory mammals are the main invasive wildlife occurring on PTA. Ungulates present include feral pigs, feral sheep, feral goats, and mouflon (*Ovis musimon*). Predatory mammals include rodents, Indian mongooses, feral dogs, and feral cats (USAG-HI, 2010c). The Cantonment Area is likely to contain invasive wildlife species similar to that found on PTA. These mammals trample and remove native vegetation as well as disturb or kill native wildlife. Ungulate activity from freely ranging feral pigs, goats, and sheep also can spread weed seeds. Ungulate foraging, rooting, trampling, and weed transmission are responsible for altering, eroding, and degrading extensive tracts of native habitat. Disturbed native vegetation increases fire frequency and intensity and alters the composition and form of plant communities. Such changes affect native vegetation integrity and structure that could ultimately affect roosting sites for the endangered Hawaiian hoary bat, as well as native plant species (USAG-HI, 2010c).

Recreational hunting is allowed on and near PTA; however, public hunting has been limited due to military training and security concerns at the installation. Public hunting provides pressure to feral ungulate populations, but marginally reduces population numbers and environmental impacts resulting from these animals. Fencing projects are used to keep out feral ungulates and professional animal control contractors are used to remove nuisance sheep and goats from fenced conservation units. Recreational hunting reports are produced by the Hawai‘i Division of Forestry and Wildlife (Peshut, 2011 and US Army Garrison-HI and US Army Corps of Engineers, 1998). Currently, hunters are required to sign in at the Division of Forestry and Wildlife check-in stations at Pu‘uhulu or Kilohana.

Non-native invasive animal species control at PTA focuses on four principal areas: ungulate control, rodent control, other vertebrate animal control, and invertebrate control. Invasive wildlife species are managed through HQDA guidance developed in consultation with the Invasive Species Council and compliance with EO 13112, as well as the USFWS BO (2003) (USAG-HI, 2010c). Currently, animal control contractors trap for feral ungulates and feral cats/dogs within fence units (Peshut, 2011).

Invasive Invertebrate Species

Invasive invertebrates include wasps, ants, termites, and bees (USAG-HI, 1997; and USAG-HI, 2010c). The Cantonment Area is likely to contain invasive invertebrate species similar to that found on PTA. The Argentine ant is a proven threat to native species and has been implicated in native faunal declines. The rare wingless weevil (*Rhyncogonus stellaris*) is a native weevil that is vulnerable to alien predators such as Argentine ants. The Argentine ant affects a wide range of native arthropods, including important predator species and pollinators of native plants. Argentine ants are omnivorous and frequently feed on the honeydew produced by other invasive insects that are negatively impacting the health of the plants. In doing so, the Argentine ant may reduce the health of federally listed species that are host to insects that produce honeydew, including several federally listed plant species (USAG-HI, 2010c).

Yellow jackets (*Vespula pensylvanica*) are also widespread on PTA, particularly in ‘ōhi ‘a lehua (*Metrosideros polymorpha*) forests.

The remaining invasive invertebrates are managed through the Pōhakuloa Implementation Plan (PIP), which includes an Invasive Invertebrate Monitoring and Control Protocol. The plan recommends documenting all locations of invasive invertebrates; verifying locations that could provide access to the installation (e.g., Kawaihae Harbor, motor pool, Range Maintenance and DPW storage areas); using attractants to identify new locations; and eradicating new introductions before an extensive spread of the species (USAG-HI, 2010c).

3.9.3 PTA Range Area

3.9.3.1 General Range Area

Vegetation and Habitat Types

Approximately 38 percent of the plants found on PTA are indigenous (endemic, native) and the remaining are non-native species (USAG-HI, 2010c). There are numerous vegetation communities on PTA. Introduced plant species make up a significant portion of many of these habitats, and introduced plants are components in all habitats on PTA. Figure 3.9-2 illustrates the general vegetation types present at PTA including bare ground, grassland, lava, scrub, and sparse trees.

Barren lava covers 25 percent of the installation. Lichens, such as lava lichen (*Stereocaulon vulcani*), and ferns, such as cliffbrake (*Pelaea ternifolia*), are the first colonizers of these flows, although fountain grass is beginning to invade these barren areas (U.S. Army and USACE, 2008b). There are four types of *Metrosideros* treeland, ranging from sparse to mixed intermediate. The dominant canopy vegetation in these areas is generally ohia. There are three types of *Dodonaea* shrubland: open, dense, and mixed. The ‘a‘ali‘i (*Dodonaea viscosa*is) is the dominant plant in each community, along with other native species, including ilima (*Sida fallax*), aheahea, and naio. Pūkiawe (*Leptecophylla tameiameiae*) occurs either as a mixed shrubland community or as a component of *Leptecophylla-Dodonaea* shrubland. *Chamaesyce* treeland is generally found hosting native species ‘Akoko (a species of concern), ilima, aheahea, and 'a'ali'i. *Chenopodium* shrubland and hardstem lovegrass grassland are similar communities with different dominant species. The remainder of the native natural communities is a combination of *Chamaesyce, Myoporum,* and *Sophora* species, with divisions based on the densities of species (U.S. Army and USACE, 2008a).

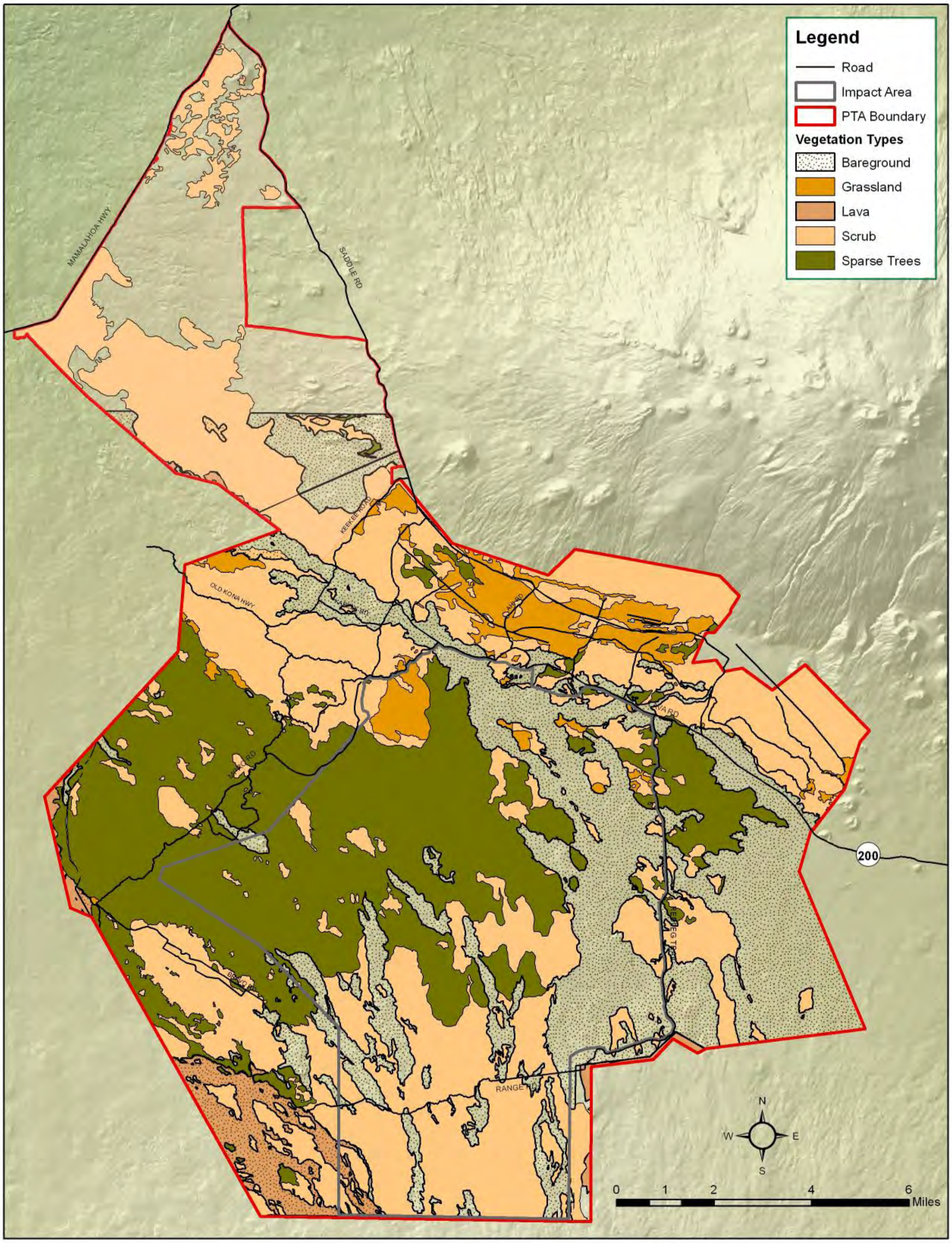

Figure 3.9-1. Vegetation types at PTA

A few vegetation community types prevalent in the range area are Disturbed and *Chenopodium* Shrubland. Impacts to vegetation primarily occur from ungulates and are compounded during dry periods. The Disturbed community type is restricted to heavily impacted areas used primarily for military training. This area is restricted mostly to the northern portion of the installation, around cinder cones (Puʻu), and along Red Leg Trail. Almost no perennial vegetation is present in this area with the exception of a few individuals of kikuyugrass (*Pennisetum clandestinum*) or Bermudagrass (*Cynodon dactylon*). With moisture and less disturbance, this area becomes abundant with weeds (Shaw and Castillo, 1997).

The *Chenopodium Shrubland* community occurs along portions of Saddle Road in the northern portion of the installation. It primarily is found on Mauna Kea ash substrate but can extend on to ʻaʻā and pāhoehoe. The only shrub encountered in this community is aheahea. A few scattered naio, māmane, and 'a'ali'i occur on the rougher substrates. Hardstem lovegrass is the dominant native grass species. Many weedy herbaceous species have invaded this community. Common weeds are redstem stork's bill, hyssopleaf pepperweed, yellow sweetclover, ripgut brome, and field mustard (Shaw and Castillo, 1997).

A total of 313 vascular plant taxa from 75 families[61] and 203 genera[62] have been identified on PTA (Shaw and Castillo, 1997). Most taxa are forbs (42 percent), followed by grasses and grass-like plants (18 percent), and shrubs (16 percent). Ferns comprise eight percent of the taxa, vines five percent, and trees four percent. Some taxa are present with both tree and shrub forms (six percent). Most species are perennials (69 percent), while annuals constitute 25 percent.

Plant communities present at the KMA include native and nonnative dominated shrublands and drainages of varying density and composition. Fountain grass is the dominant member of several grassland communities that can include a proportion of native shrubs, herbs, and trees. The highly disturbed communities are identified as *Eucalyptus* woodlots, nonnative forb lands, and pastureland, all of which contain native plants scattered sparsely throughout the area (U.S. Army and USACE, 2008a). KMA consists entirely of highly disturbed former cattle grazing land.

Appendix F provides descriptions of plant species present at PTA.

Wildlife

Invertebrates

The Range Area is likely to contain invertebrate species similar to that found on PTA. More information on invertebrates found on PTA is discussed in Section 3.9.2. Ant species are not uniformly distributed at PTA; the Range Area has some areas that are still ant-free (Schnell, 2011).

Amphibians, Reptiles, and Fish

[61] Family – a taxonomic rank. Other well-known ranks are life, domain, kingdom, phylum, class, order, genus, and species with family fitting between order and genus

[62] Genus, plural genera – A low-level taxonomic rank used in the classification of living and fossil organisms, which is an example of definition by genus and differentia

As previously mentioned, PTA does not contain water bodies to support aquatic fauna. Therefore, there are no native amphibians, reptiles, fish, or marine wildlife on PTA (USAG-HI, 2010c).

Terrestrial Mammals

The Range Area is likely to contain terrestrial mammals similar to what is present on PTA. More information on terrestrial mammals found on PTA is discussed in Section 3.9.2.

Birds

The Range Area is likely to contain bird species similar to what is found present on PTA. More information on birds present at PTA is discussed in Section 3.9.2. All bird species are not evenly distributed across PTA. Some bird species have highly restricted distributions such as the Apapane, ‘oma‘o, and Band-rumped Strom Petrel (Schnell, 2011).

Listed Species and Critical Habitat

Surveys and studies have been conducted for listed vegetation, habitat, and wildlife species at PTA since the 1970s. Surveys for special species of wildlife on PTA first occurred in 1976. Since 1980, annual surveys for palila (*Loxioides bailleui*) in the Mauna Kea region are administered by the Hawai‘i State DLNR, Division of Forestry and Wildlife, with assistance from USFWS (USAG-HI, 1997). In 1990, bird and mammal surveys were conducted at PTA. Plant and wildlife surveys have been conducted regularly between 1996 and 2010. Annual avian surveys, with a focus on listed species, have been conducted on PTA since 1997 (USAG-HI, 2009a).

Due in part to the presence of listed wildlife and critical habitat on PTA, the U.S. Army initiated formal ESA, Section 7 consultation with the USFWS for Routine Military Training and Transformation of the 2/25th SBCT. In 2003, a BO was provided, which required specific conservation measures and non-discretionary terms and conditions to be implemented by the U.S. Army. These measures were intended to ensure the continued existence of the federally listed species found at PTA. One of the main requirements is to construct large-scale fence units, and maintain these fence units ungulate-free. Fence units are completed on Western PTA, and currently encompass approximately 28,000 acres of conservation management areas. A large-scale fence unit on Eastern PTA (TA 21) is currently under construction, and will encompass approximately 12,000 acres.

In 2008, the U.S. Army reinitiated the Section 7 consultation with the USFWS because nenes were utilizing a live-fire range and attempted to nest in the KMA (USFWS, 2008). The 2008 BO mainly addresses impacts of new construction, training, and conservation actions that may affect the nene (USFWS, 2008).

Appendix F provides descriptions of listed wildlife species present at PTA.

Listed Plant Species and Critical Habitat

There are 15 federally-listed plant species at PTA. Table 3.9-2 identifies the listed plant species and their protected status. Three of the endangered plant species are located in the KMA. The Army considers Federal candidate species and State listed species as species at risk (USAG-HI, 1997 and 2006; U.S. Army and USACE, 2008b). No critical habitat is present for listed plant species present at PTA.

The majority of surveys for listed plant species have occurred outside of the impact area due to the presence of MEC/UXO. The locations of listed plants have been observed mostly in the KMA and the northern and westerns portion of PTA (Figure 3.9-2). The KMA contains individuals of aupaka (*Isodendrion hosakae*), nehe (*Melanthera venosa*), and *Vigna o-wahuensis* (no common name) (USFWS, 2003).

Endangered plants such as kioʻele (*Kadua coriacea*) and Mauna Kea pamakani (*Tetramolopium arenarium* var. *arenarium*), have been identified in the western portion of PTA. The Kīpuka Kālawamauna Endangered Plants Habitat (3,178 ha [7,853 ac]) is located in the northwest corner of PTA between the impact area and the historic boundary in portions of Training Areas 18, 19, 20, and 22 (Figure 3.9-2). This area was designated as endangered plants habitat by the U.S. Army following the discovery of honohono and creeping mint and their subsequent listing as federally endangered species. The area also contains other rare plants (USAG-HI, 1997).

Listed plant species are also located in Training Area 23, located at the southwestern portion of PTA within the Kīpuka ʻAlalā fence unit area. Kīpuka ʻAlalā includes Kīpuka ʻAlalā North Fence Unit (429 ha [1,059 ac]) and another where fencing was completed in April 2001 (Kīpuka ʻAlalā South Fence Unit, 1,597 ha [3,945 ac]) (Gene Stout and Associates et al., 2006). The area is currently ungulate free with increases in populations of listed plant species. The area is currently not used for training, and may be used in the future for benign training, such as steel targetry for laser aerial training (Peshut, 2011), or other training that can be conducted without placing listed plant species in jeopardy.

Other fence units on PTA include the Puʻu Ka Pele Fence Unit, *Silene hawaiiensis* Fence Unit, and emergency exclosures. The Puʻu Ka Pele Fence Unit is managed as a listed plant area and consists of 45 ha (111 ac) that was fenced in 1981 by the DLNR to protect a large population of honohono. This fenced unit is now government-owned land (Steve Evans, personal communications, 2011). The *Silene hawaiiensis* Fence Unit is a 14 ha (33 ac) fence unit in Training Area 3 that was completed in 1999 specifically to protect a large population of Hawaiian catchfly on PTA. Training Area 21 has known occurrences of Hawaiian catchfly, as well as cave habitat for the diamond spleenwort. The vicinity of Range 1 also has occurrences of Hawaiian catchfly and diamond spleenwort (USFWS, 2008).

Although listed plants are located in some concentrated areas on PTA, these plants are also widely dispersed throughout the installation (USAG-HI, 2009a). Recent vegetation studies of the KMA were conducted for the BA in 2003 and follow-up surveys by PTA Natural Resources staff in 2006 (USAG-HI, 2010c).

Emergency exclosures are used to fence critically endangered plants or groupings that require immediate fencing to minimize browsing damage. These temporary emergency exclosures include the use of hog wire, concertina wire, and/or plastic construction fencing. Plants protected by emergency exclosures include kioʻele, all maʻaloa (*Neraudia ovata*), ʻihi makole (*Portulaca sclerocarpa*), *Schiedea hawaiiensis*, lanceleaf catchfly (*Silene lanceolata*), popolu ku mai (*Solanum incompletum*), Mauna Kea pamakani, and Hawaiʻi pricklyash (*Zanthoxylum hawaiiense*).

Appendix F provides descriptions of the listed plant species present at PTA.

Table 3.9-2. Listed Plant Species at PTA

Scientific Name	Common Name	Status[1]
Federally Listed Threatened and Endangered Plants		
Asplenium peruvianum var. *insulare (Syn. Asplenium fragile)*	diamond spleenwort, fragile fern	LE
Haplostachys haplostachya	honohono	LE
Isodendrion hosakae	aupaka	LE
*Kadua coriacea (*Syn. *Hedyotis coriacea)*	kio‘ele	LE
*Lipochaeta venosa (*Syn. *Melanthera venosa)*	nehe	LE
Neraudia ovata	ma‘aloa	LE
Portulaca sclerocarpa	‘ihi makole	LE
Silene hawaiiensis	Hawaiian catchfly	LT
Silene lanceolata	lanceleaf catchfly	LE
Solanum incompletum	popolu ku mai	LE
Spermolepis hawaiiensis	Hawaiian parsley	LE
Stenogyne angustifolia var. angustifolia	creeping mint	LE
Tetramolopium arenarium var. arenarium	Mauna Kea pamakani	LE
Vigna o-wahuensis	no common name	LE
Zanthoxylum hawaiiense	Hawai‘i pricklyash, Hawaiian yellow wood, a`e	LE
Festuca hawaiiensis	Hawaiian fescue	C
Schiedea pubescens	Hairy schiedea	C

Sources: USAG-HI, 2010c; USAG-HI, 1997 and 2006; U.S. Army and USACE, 2008b; State of Hawai‘i Department of Fish and Wildlife, website accessed 1/03/2011, Hawai‘i State DLNR, website accessed 1/20/2011, and NatureServe, website accessed 1/20/2011.

[1]Key to Federal Status: LE – endangered; LT – threatened; C – candidate for listing

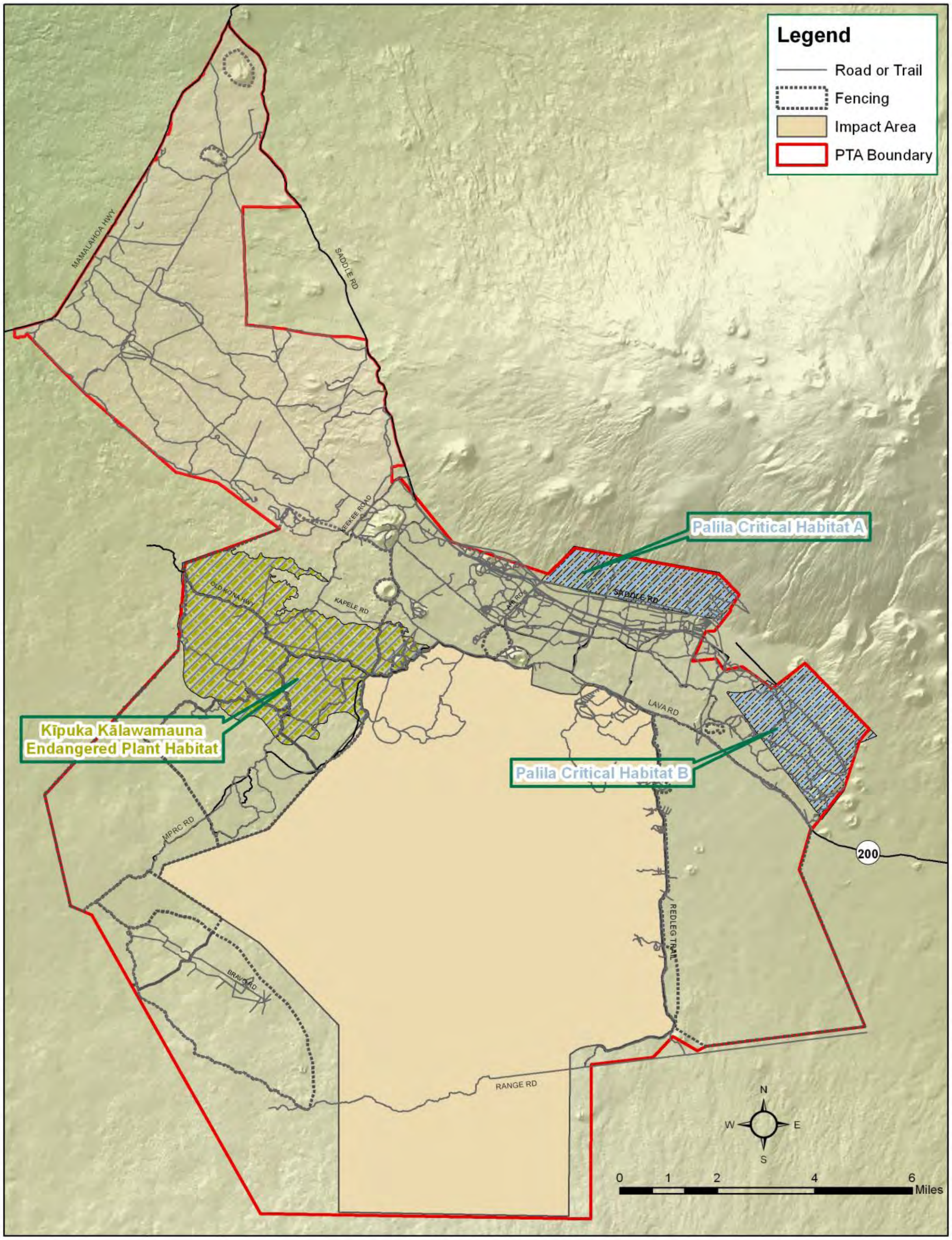

Figure 3.9-2. Protected Habitat at PTA

In 1977, USFWS designated critical habitat for the federally listed palila, which included areas at PTA. Critical habitat for the palila is located on two areas of PTA along the northeastern boundary of the installation (Figure 3-9-3). A total of 24,356 ha (60,185 ac) of palila critical habitat is designated on Hawai‘i Island; 1,707 ha (4,218 ac) of which is located on PTA. The primary constituent elements of the critical habitat are large and intermediate-sized māmane and naio trees, enough space for the population to expand, and the full range of altitudinal and geographical sites needed by the palila for normal life cycle movements and response to shifting seasonal and annual patterns of flowering, seed set, and ensuing pod development of māmane (U.S. Army and USACE, 2008b). On July 27, 1998, the USFWS issued a BO for the Saddle Road Realignment and Improvement Project (USFWS, 2008). The BO established a finding of “no jeopardy” to the palila and “no adverse modification” to palila critical habitat was “based in large part on the conservation measures built into the project…” To offset loss of palila critical habitat resulting from the planned Saddle Road realignment, the Army agreed that 4,045 ac (1,637 ha) of Kīpuka Alala would be palila habitat mitigation. In order to protect and enhance a large portion of māmane/naio forest as potential palila habitat in Kīpuka Alala, a large fence unit was constructed around the area and feral ungulates were removed. The fence was completed in January 2001. An MOU Regarding Implementation of the Saddle Road Palila Critical Habitat Impact Mitigation (1998) details the agreement between the Army, the Federal Highway Administration, and the USFWS regarding Kīpuka Alala (USAEC, 2009b).

Listed Wildlife and Migratory Birds

Several listed terrestrial wildlife species have been observed or have the potential to occur on PTA. Table 3.9-3 lists listed terrestrial wildlife species known to have occurred at PTA.

Table 3.9-3. Listed Wildlife Species at PTA

Scientific Name	Common Name	Federal Status[1]
Birds		
Hemignathus munroi	Akiapolaau[+]	LE
Branta sandvicensis	Nene, Hawaiian goose	LE
Buteo solitaries	‘Io, Hawaiian hawk	LE
Loxioides bailleui	Palila	LE
Pterodroma sandwichensis	ua‘u , Hawaiian dark-rumped petrel	LE
Mammals		
Lasiurus cinereus semotus	‘Ope‘ape‘a, Hawaiian hoary bat	LE

[+]Species historically recorded from PTA, but have not been recorded at PTA for 15 or more years
Sources: USAG-HI (2010) and USAG-HI (1997).
Key: Status: LE - endangered

Of the four federally listed endangered bird species, only the ‘Io and nene have been recorded at PTA in recent years. Figure 3.9-3 illustrates occurrences for these species at PTA over the years. The palila have not been observed for over 20 years at PTA; therefore, this species is no longer included in any specific management actions (USAG-HI, 2010c). As mentioned earlier, critical habitat was designated for the palila within PTA in 1977.

General information on the federally listed threatened and endangered wildlife species occurring at PTA is presented in Appendix F.

The Range Area would likely contain migratory birds similar to those species found on PTA (discussed above in Section 3.9.2).

Invasive Species

The General Range Area would likely to contain invasive plant, wildlife, and invertebrate species similar to those found on PTA (discussed above in Section 3.9.2).

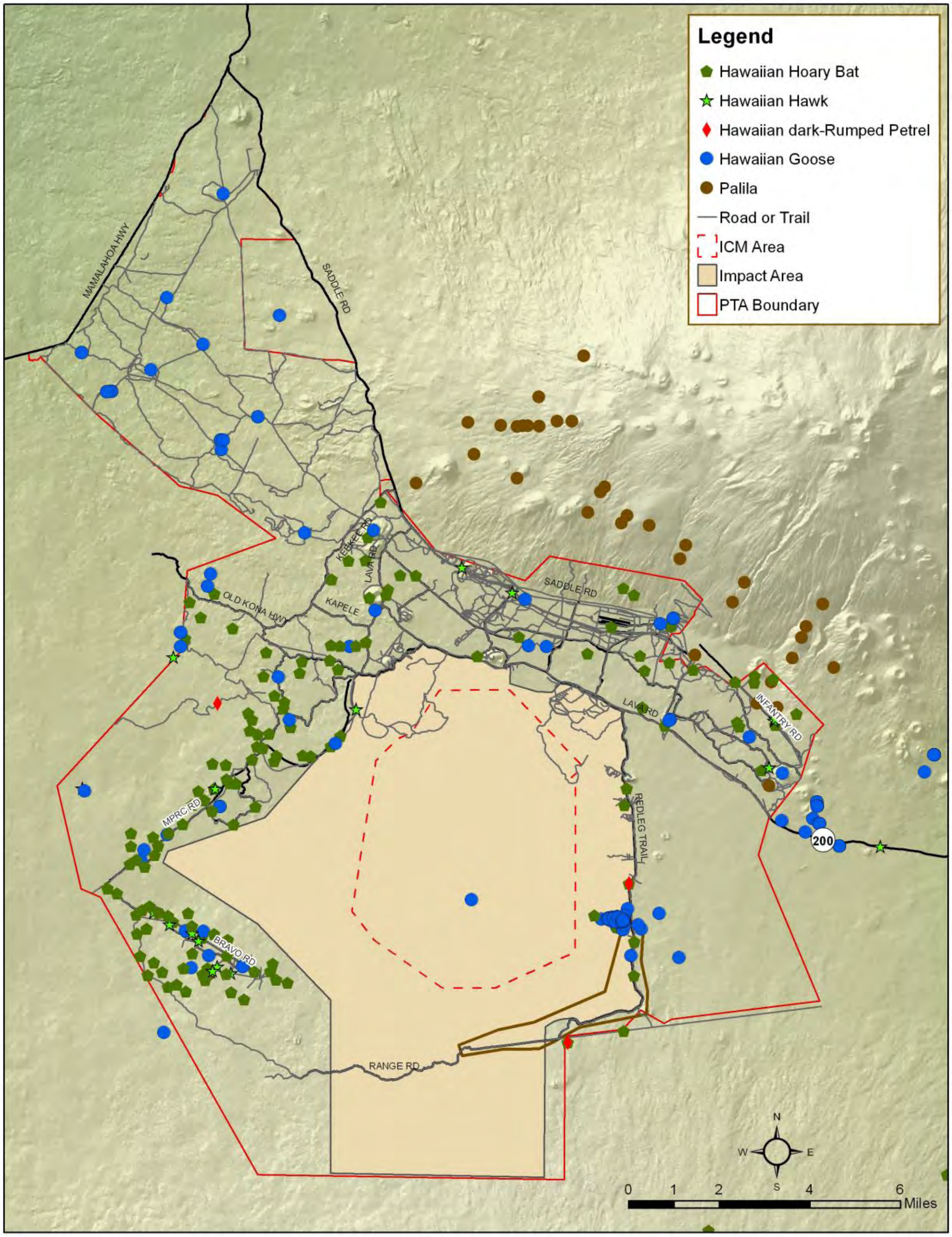

Figure 3.9-3. Occurrences for Federally-listed bird species and the Hawaiian hoary bat at PTA

3.9.3.2 IPBA at Western Range Area

Vegetation and Habitat Types

As reported in Shaw and Castillo (1997), the Western Range Area consists of seven main vegetation community types: (1) Barren Lava; (2) Sparse *Metrosideros* Treeland; (3) Open *Metrosideros* Treeland with sparse shrub understory; (4) Open *Metrosideros* Treeland with dense shrub understory; (5) Intermediate *Metrosideros* Mixed Treeland; (6) *Myoporum-Dodonaea* Shrubland; and (7) *Myoporum-Sophora* Shrubland with forb understory. The recent Listed Plant Species Survey confirmed these main vegetation types remain at PTA (U.S. Army, 2011).

Barren Lava is the largest cover type at PTA and occupies approximately one fourth of the installation. Lichen and ferns are some of the first plants to establish on the lava. The tree, ‘ōhi ‘a lehua, and shrubs, ‘a’ali’i, and pūkiawe, are some of the first flowering plants to colonize lava. Fountain grass is invading many of the barren lava flows and changing the natural primary successional pattern on these sites (Shaw and Castillo, 1997). Lava is most common cover type in the Western Range Area. Figures 2.2-3 and 2.2-4 in Chapter 2 show photos of the Western Range Area taken in 2010.

The Sparse *Metrosideros* Treeland occurs on relatively young lava flows and represents the first plant community to establish on barren lava. The overstory is dominated by ‘ōhi ‘a lehua, while the understory is characterized by ‘a’ali’i and pūkiawe. At higher elevations, ‘ohelo ’ai (*Vaccinium reticulatum*) becomes frequent. The herbaceous layer is very sparse consisting of carex (*Carex wahuensis*), meadow rice grass (*Ehrharta stipoides*), and fountain grass (Shaw and Castillo, 1997).

Open *Metrosideros* Treeland with sparse shrub understory are some of the most important communities based on biodiversity and number of endangered species. The dominant overstory species is the ‘ōhi ‘a lehua with ‘a’ali’i and pūkiawe are the most common understory shrub species. Shrubland dubautia (*Dubautia linearis*) is an important interstitial shrub species in this community. Invasion by fountain grass is most prevalent in this community (Shaw and Castillo, 1997).

Open Metrosideros Treeland with dense shrub understory is similar to the Open *Metrosideros* Treeland with sparse shrub understory, except for the larger abundance of shrubs. Overstory is dominated by ‘ōhi ‘a lehua in this community. ‘A’ali’i, pūkiawe, and Hawaiian hawthorn (*Osteomeles anthyllidifolia*) are the most common shrubs. Siberian pygmyweed (*Crassula sieberiana*) and fountain grass are the major herbaceous species (Shaw and Castillo, 1997).

Intermediate *Metrosideros* Mixed Treeland is unique to the upper montane dry forests found on the installation. Woody plants are pronounced within this community. Dominant species include ‘ōhi ‘a lehua and kolea (*Myrsine lanaiensis*), māmane, and naio form a mid-story canopy. ‘A’ali’i, Hawaiian hawthorn, and pūkiawe form a distinct shrub layer. Fountain grass is heavily abundant in this community (Shaw and Castillo, 1997).

Myoporum-Dodonaea Shrubland has similar distribution to the *Myoporum* Shrubland. The major difference between these two communities is shrub density. Shrubs are nearly three times as great in the *Myoporum* Shrubland. The overstory is predominantly naio with a few larger ‘a’ali’i. The understory shrub layer is characterized by small ‘a’ali’i and aheahea. The herbaceous layer is dominated by fountain grass. Other important herbaceous species include beggar’s-tick (*Bidens alba*), ripgut brome, smooth hawksbeard (*Crepis capillaries*), orchardgrass (*Dactylis glomerata*), black medick (*Medicago lupulina*), and German ivy (Shaw and Castillo, 1997).

Myoporum-Sophora Shrubland with forb understory only occurs in the Kīpuka ʻAlalā region of the installation. Naio and māmane are the dominant woody species. The shrub understory layer is very sparse. Weedy forbs dominate the herbaceous layer. Purple cudweed (*Gnaphalium purpureum*), telegraphweed, horehound, and Jerusalem cherry are the common herbaceous plants (Shaw and Castillo, 1997).

Wildlife

The Western Range Area is likely to contain invertebrate species, terrestrial mammals, and birds similar to what is found on PTA. Ant species are not uniformly distributed at PTA; the Western Range Area may have some areas that are ant-free (Schnell, 2011). More information on these species found on PTA is discussed above in Section 3.9.2.

As previously mentioned, PTA does not contain water bodies to support aquatic fauna. Therefore, there are no native amphibians, reptiles, fish, or marine wildlife on PTA

Listed Vegetation and Critical Habitats

The Western Range Area was preliminarily assessed for the potential presence of threatened and endangered plants species based on known vegetation community types and survey data from nearby conservation areas. As previously mentioned, the Western Range Area contains seven vegetation community types. These communities have been surveyed to various levels for listed plant species outside the impact area. It was assumed that similar densities of listed plant species (hundreds to thousands of individual plants) would be present across vegetation communities inside and outside of the project area. Recent survey efforts for listed plants present in the Western Range Area identified a much lower presence of listed plants. Table 3.9-4 lists the actual numbers of individual plants found (U.S. Army, 2011).

Table 3.9-4. Actual Number of Listed Plants in the proposed Western Range Area

Species	***Number of Individuals***
diamond spleenwort	1
Hawaiʻi pricklyash (aʻe)	15
kioʻele	10
Hawaiian catchfly	1
Source: USAG-HI, 2010c and 2011	

Actual field surveys for listed plants in the Western Range Area were completed in 2010 by trained biologists (Figure 3.9-5). Working with the MEC/UXO contractor team, surveys of the Western Range Area location identified the following federally listed plants as illustrated in Figure 3.9-4: diamond spleenwort (*Asplenium peruvianum)*, Hawaiʻi pricklyash (aʻe, *Zanthoxylum hawaiiense*), kioʻele (Figure 3.9-6; *Kadua coriacea*), and Hawaiian catchfly (*Silene hawaiiensis*). Complete coverage of the site was accomplished by surveyors walking transects spaced 10 m (33 ft) apart. Two survey teams of up to eight surveyors each accompanied by four explosive ordnance specialists per team, surveyed 692 transects. The sparse nature of the vegetation allowed surveyors to observe all plants present, searching for threatened and endangered plants thought to have a probability of occurring on the site (U.S. Army, 2011).

Additional surveys may be required for an alternative access road to the Western Range Area IPBA. The preferred access road runs begins at Charlie's Circle Road in the north and runs south to the IPBA. An alternative road begins at MPRC Road located west of the impact area and runs east to the preferred IPBA location. The Army intends to complete its survey of the selected access road by late 2011. The results of these surveys will be included in the Army's consultations with the USFWS.

The Army is currently completing a BA based on its survey findings of the Western Range Area alternative. Once complete, the Army will formally enter into Section 7 consultation with the USFWS under the ESA of 1973. The USFWS will issue a BO based upon that consultation.

The results of both regulatory consultations, and any recommended mitigation or conservation measures, will be included in the Final Programmatic EIS.

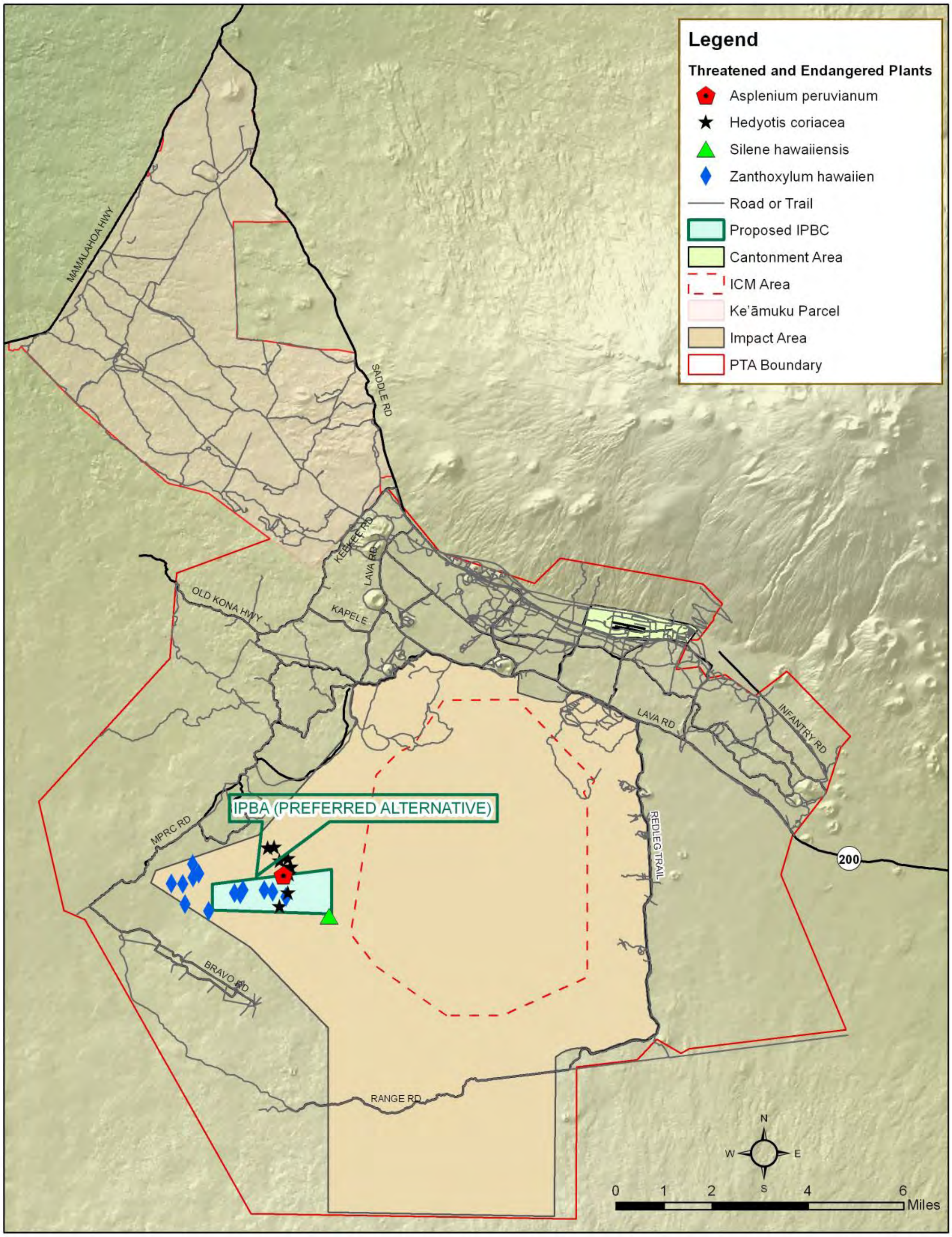

Figure 3.9-4. Listed Species identified in the Western Range Area

Figure 3.9-5. Biologists surveying the Western Range Area

Figure 3.9-6. Federally protected *Kadua coriacea*

No critical habitat is located in the Western Range Area.

Listed Wildlife and Migratory Birds

No evidence of listed wildlife has been identified in the Western Range Area during recent survey events for listed plants (U.S. Army, 2011). The Hawaiian hoary bat is ubiquitous at PTA and it is highly likely they are present in the area based on current and past Hawaiian hoary bat monitoring data at PTA (Schnell, 2011). The Western Range Area contains woodland habitats which may be potential roosting habitat for Hawaiian hoary bats, as defined under the 2003 USFWS BO. In addition, there has been one confirmed telemetry[63] data point of the nene by the national park near the Western Range Area. The nene has not been observed on the ground, but some preliminary data suggests that they may be touching down in the area south of the Western Range Area (Peshut, 2011).

The Western Range Area is likely to contain migratory birds similar to those present at other locations on PTA (discussed above in Section 3.9.2). No evidence of nesting areas or breeding grounds was found during recent survey events for listed plants (U.S. Army, 2011).

Invasive Species

Common weedy species found at the proposed Western Range Area may include fountain grass, purple cudweed, telegraphweed, horehound, Jerusalem cherry, Siberian pygmyweed, and meadow rice grass (Shaw and Castillo, 1997). None of the weedy species are federally listed as noxious weeds. However, fountain grass is considered a State noxious weed (USDA, 2011a, USAG-HI, 2010c).

The Western Range Area is likely to contain invasive wildlife and invertebrate species similar to those found on PTA (discussed above in Section 3.9.2).

3.9.3.3 IPBA at Charlie's Circle

Vegetation and Habitat Types

Based on surveys conducted in the 1980s (as reported in Shaw and Castillo, 1997), Charlie's Circle consists of seven main vegetation community types: (1) Barren Lava; (2) Sparse *Metrosideros* Treeland; (3) Open *Metrosideros* Treeland with sparse shrub understory; (4) *Styphelia-Dodonaea* Shrubland; (5) *Myoporum-Dodonaea* Shrubland; (6) *Myoporum Shrubland*; and (7) *Myoporum-Sophora* Shrubland with forb understory (Shaw and Castillo, 1997).

Vegetation community descriptions of Barren Lava, Sparse *Metrosideros* Treeland, Open *Metrosideros* Treeland with sparse shrub understory, *Myoporum-Dodonaea* Shrubland, and *Myoporum-Sophora* Shrubland with forb understory are discussed above in Section 3.9.3.2.

Myoporum Shrubland is scattered across the northern part of the installation, along the margins of Kīpuka Kālawamauna, and in isolated kīpuka along the western boundary of the installation. Naio shrubs are the characteristic overstory species. 'A'ali'i and aheahea form an obvious understory shrub layer. The predominant herbaceous vegetation is fountain grass. Other common herbaceous species include nodding

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[63] A technology that allows remote measurement and reporting of data, such as a radio transmitter

needlegrass, muster John Henry, prairie bromegrass (*Bromus willdenowii*), mullein, and telegraphweed (Shaw and Castillo, 1997).

Styphelia-Dodonaea Shrubland covers large areas in the southern and eastern part of the installation. It occurs on moderately aged Mauna Loa substrate. Pūkiawe and ‘a’ali’i are the dominant overstory shrubs. Ohelo 'ai forms a dense, shrubby understory in some areas. The herbaceous layer is poorly developed in this community (Shaw and Castillo, 1997).

Wildlife

Charlie’s Circle is likely to contain terrestrial mammals, invertebrate species, and bird species similar to those identified on PTA (see Section 3.9.2). Ant species are not uniformly distributed at PTA; Charlie’s Circle may have some areas that are ant-free (Schnell, 2011).

As previously mentioned, PTA does not contain water bodies to support aquatic fauna. Therefore, there are no native amphibians, reptiles, fish, or marine wildlife on PTA

Listed Vegetation and Critical Habitats

As previously mentioned, survey information for listed plant species has not been available for PTA’s impact area. Similar to the Western Range Area (Section 3.9.3.2), it was assumed that similar densities of listed plant species from the surrounding conservation areas would be present across vegetation communities inside and outside of the project area for Charlie’s Circle. Based on the recent survey for listed plant species in the Western Range Area, the Charlie’s Circle location contains, or is likely to contain, listed plant species similar to species found in the Western Range Area. The Charlie’s Circle location covers approximately 90 percent of the area surveyed for the Western Range location. Listed plant species present in Charlie’s Circle include diamond spleenwort, kio‘ele, Hawaiian catchfly, and Hawai‘i pricklyash (Shaw and Castillo, 1997; U.S. Army, 2011). More information on these plants is discussed in Appendix X.

No critical habitat is located in Charlie’s Circle.

<u>Listed Wildlife and Migratory Birds</u>

As mentioned in the Western Range Area, Section 3.9.3.2, no evidence of listed wildlife has been identified near Charlie’s Circle during recent survey events for listed plants (U.S. Army, 2011). The Hawaiian hoary bat are ubiquitous at PTA and it is highly likely they are present in the area based on current and past Hawaiian hoary bat monitoring data at PTA (Schnell, 2011). The Western Range Area contains woodland habitats which may be potential roosting habitat for Hawaiian hoary bats, as defined under the 2003 USFWS BO. In addition, there have been sparse sightings of nene from telemetry studies by the national park near Charlie’s Circle. The nene has not been observed on the ground, but some preliminary data suggests that they may be touching down in the area south of Charlie’s Circle (Peshut, 2011).

Charlie’s Circle is likely to contain migratory birds similar to those found at PTA (see Section 3.9.2). Furthermore, no evidence of nesting areas or breeding grounds was found during the recent survey events of listed plants (U.S. Army, 2011).

Invasive Species

Common weedy species found in the Western Range Area would also likely be found in Charlie's Circle (see Section 3.9.3.2). Charlie's Circle is likely to contain invasive wildlife and invertebrate species similar to those identified at PTA (see Section 3.9.2).

3.9.3.4 IPBA at Southwest of Range 20

Vegetation and Habitat Types

No biological surveys have been formally conducted in the area of Range 20. Range 20 and its surrounding area are situated at a higher elevation within an active impact area (in use for the past 50 years). Only flyover surveys have been conducted confirming the area is sparsely vegetated (Peshut verbal communications, 2011). Shaw and Castillo (1997) reported that the area Southwest of Range 20 consists of four main vegetation community types: (1) Barren Lava; (2) Sparse *Metrosideros* Treeland; (3) *Styphelia-Dodonaea* Shrubland; and (4) *Myoporum-Sophora* Shrubland with forb understory (Shaw and Castillo, 1997). Vegetation community descriptions of Barren Lava, Sparse *Metrosideros* Treeland, *Styphelia-Dodonaea* Shrubland, and *Myoporum-Sophora* Shrubland with forb understory were previously discussed in Section 3.9.3.2.

Wildlife

Southwest of Range 20 is likely to contain invertebrate, terrestrial mammals, and bird species similar to species commonly present at PTA. Ant species are not uniformly distributed at PTA; Charlie's Circle may have some areas that are ant-free (Schnell, 2011). More information on invertebrates found on PTA is discussed above in Section 3.9.2.

As previously mentioned, PTA does not contain water bodies to support aquatic fauna. Therefore, there are no native amphibians, reptiles, fish, or marine wildlife on PTA

Listed Vegetation and Critical Habitats

As previously mentioned, survey information for listed plant species is not available in the impact area. Listed plant species surveys have not been conducted in the impact area given the sparse vegetation, higher elevation, and location within the active impact area. Southwest of Range 20 likely contains vegetation community types that have the potential of having federally listed plant species, such as diamond spleenwort*, Portulaca sclerocarpa*, , and Hawaiian catchfly (Shaw and Castillo, 1997). More information on these plants is discussed in Appendix F.

No critical habitat is located in Southwest of Range 20.

<u>Listed Wildlife and Migratory Birds</u>

As described for the other two alternative locations, there have been sparse sightings of nene from telemetry studies by the national park near the Western Range Area and Charlie's Circle (Peshut, 2011).

Southwest of Range 20 is likely to contain migratory birds similar to those observed at PTA (discussed in Section 3.9.2).

Invasive Species

Common weedy species found at Southwest of Range 20 consists of fountain grass, purple cudweed, telegraphweed, horehound, Jerusalem cherry, and meadow rice grass (Shaw and Castillo, 1997). None of these common weedy species are federally listed as noxious weeds. However, fountain grass is considered a State noxious weed (USDA, 2011a).

Southwest of Range 20 is likely to contain invasive wildlife and invertebrate species similar to those found on PTA (discussed in Section 3.9.2).

3.9.4 Biological Resource Uses Surrounding PTA

Vegetation and Habitat Types

As discussed in Section 3.9, Hawaiʻi is home to many endemic and native species of flowering plants, birds, and wildlife. The vegetation surrounding PTA is similar to the community types on PTA, however, ungulates roam these areas trampling habitat for many plant species. Listed plant species and other endemic species are mostly prevalent in federally protected areas such as PTA and State lands (Peshut, 2011).

Wildlife

<u>Invertebrates</u>

An estimated census of invertebrates on Hawaiʻi consists of approximately 8,000 species of insects and over 1,000 species of endemic snails. Invertebrate species within the surrounding area of PTA are likely to be similar to the types of invertebrates found on PTA (USAG-HI, 1997).

<u>Amphibians and Reptiles</u>

No native amphibians or reptiles are located on any of the Hawaiian Islands (U.S. Army and USACE, 2008b).

<u>Terrestrial Mammals</u>

Mammals at PTA are non-native and include feral goat, sheep, and pig, which, along with rat species, mongoose, mouse, domestic cattle, domestic horses, and feral dogs and cats; all are generally considered nuisance species (USAG-HI, 2010c). Sheep and goats are the predominant ungulates that remain within PTA fence units. A large scale fencing project is mandated for construction in the future to prevent ungulates from trampling plants at PTA (Peshut, 2011).

<u>Birds</u>

Over 100 species of birds are found on Hawaiʻi. Sixty-nine of these birds species recorded from historical times are considered endemic. Bird species within the surrounding area of PTA are likely to be similar to the types of bird species found on PTA (USAG-HI, 1997).

Listed Vegetation and Critical Habitats

Hawai‘i has 279 listed federally threatened and endangered plant species. The majority of these plants are listed as endangered (USACE, 2005). As mentioned above, listed plant species are mostly prevalent in federally protected areas such as PTA and State lands. The area surrounding PTA has a limited distribution of listed plant species, which may only be found on State or private lands (Peshut, 2011).

The USFWS has established critical habitat for 46 plants on Hawai‘i Island. Critical habitat is mostly located in remote rugged locations of no real development value (U.S. Army and USACE, 2008a). Palila critical habitat is the only critical habitat located within and adjacent to PTA (extends to the northeast of PTA) (Figure 3-13) (USFWS, 2008). The Mauna Loa and Mauna Kea State forest reserves as well as the Kīpuka Ainahou Nene Sanctuary border PTA.

Listed Wildlife and Migratory Birds

Hawai‘i has two federally endangered mammals and 30 listed federally threatened and endangered birds. Listed mammals include the Hawaiian hoary bat and Hawaiian monk seal. The majority of birds are listed as endangered (USACE, 2005). There have been recent sightings of the endangered Hawaiian hoary bat feeding at night at elevations between 15 ft to-500 ft above ground level in the surrounding area (Peshut, 2011). Hawaiian monk seals are not in the area given the distance from the coastline and the lack of water.

There are approximately 24 birds State-wide that are protected under the MBTA (USFWS, 2010). Migratory bird species within the surrounding area of PTA would be similar to the types of migratory birds found on PTA (Table 4.9-1).

Listed Invertebrates

Hawai‘i has two federally listed endangered terrestrial invertebrate species, the Blackburn sphinx moth *(Manduca blackburni)* and the Hawaiian picture wing flies (*Drosophilidae spp*). Both of these invertebrates have restricted habitat and are prone to habitat loss (USFWS, 2011).

Invasive Species

There are approximately 95 State-listed noxious weeds in Hawai‘i (USDA, 2011b). Invasive plant species within the surrounding area of PTA are likely to be similar to the types of invasive plants found on PTA.

There are at least 19 invasive mammal species found on Hawai‘i. Other terrestrial invasive vertebrate species include birds (55 species), reptiles (24 species), and amphibians (six species) (State of Hawai‘i, 2008a). As mentioned above, sheep and goats are the predominant ungulates found along the PTA border (Peshut, 2011).

As previously mentioned, Hawai‘i has approximately 8,000 species of insects. More than 2,000 of these are introduced species that have become established in the wild in Hawai‘i (USAG-HI, 1997). It is estimated that 15 new species establish every year and a proportion of those are likely to be considered nuisance species. Hundreds and sometimes thousands of arthropod species are detected every year in goods shipped to Hawai‘i (State of Hawai‘i, 2008a).

3.10 CULTURAL RESOURCES

3.10.1 Introduction

There are multiple Federal regulations that protect historic and cultural resources. The NHPA (16 U.S.C. §470) directs the Federal Government to consider the effects of its actions on historic and cultural resources under Section 106 through a four-step compliance process (initiate, identify, assess, and resolve). The NHPA established the National Register of Historic Places (NRHP) (National Register) as the U.S. government's official list of districts, sites, buildings, structures, and objects deemed worthy of preservation (16 U.S.C. §470a[a]). It is noteworthy, however, that the law does not necessarily mandate preservation but does require a carefully considered decision making process.

Cultural resources are sites, structures, buildings, districts or objects, associated with important historic events or people, demonstrating design or construction associated with a historically significant movement, or with the potential to yield historic or prehistoric data, that are considered important to a culture, a subculture, or a community for scientific, traditional, religious, or any other reason (NPS, 2008). Typically, these resources are characterized as:

- **Historic Resources.** These include properties, structures, and districts that are listed in or have been determined to be eligible for listing on the National Register (administered by the NPS).
- **Archaeological resources**. This includes prehistoric or historic sites where human activity has left physical evidence of that activity but few above-ground structures remain standing.
- **Architectural resources**. This includes buildings or other structures or groups of structures that are of historic or aesthetic significance.
- **Native resources**. These include resources of traditional, cultural, or religious significance to a Native American Tribe, Native Hawaiian, or Native Alaskan organization. TCP, as defined in National Register Bulletin 38 (NPS, 1998), include archaeological resources, structures, neighborhoods, prominent topographic features, habitats, or areas where particular plants, animals, or minerals exist that any cultural group considers to be essential for the preservation of traditional cultural practices.

DoDI 4715.16 (2008) defines a cultural resource as any of the following:

- A building, structure, site, district, or object eligible for or included in the National Register established under Section 101(a) of the NHPA;
- Cultural items, as that term is defined in Section 2(3) of the Native American Graves Protection and Repatriation Act (NAGPRA, 25 U.S.C. §3001[3]). These include human remains, associated and unassociated funerary remains, sacred objects, and cultural patrimony objects;
- American Indian, Eskimo, Aleut, or Native Hawaiian sacred sites for which access is protected under the American Indian Religious Freedom Act (AIRFA, 42 U.S.C. §1996);

- Archaeological resources, as that term is defined in Section 3(1) of the Archaeological Resources Protection Act of 1979 (ARPA). These include any material remains of human activities that are of archaeological interest as determined under ARPA regulations; and,
- Archaeological artifact collections and associated records as defined under 36 CFR Part 79: Curation of Federally Owned and Administered Archaeological Collections. Under these guidelines, collections include material remains, such as artifacts, objects, specimens, and other physical evidence, that are excavated or removed during a survey, excavation, or other study of a prehistoric or historic resource. Associated records include original records (or copies thereof) that document efforts to locate, evaluate, record, study, preserve, or recover a prehistoric or historic resource.

Projects within Hawaiʻi must also consider the impacts to the culture of Native Hawaiians. Consideration must be given to Native Hawaiian concepts, culture, and landscapes. The Final Environmental Impact Statement, Permanent Stationing of the 2/25th Stryker Brigade Combat Team (SBCT) (U.S. Army and USACE, 2008) defines five cultural landscape types that "reflect the importance of culturally significant natural resources and man-made resources such as archaeological sites. They include the following:

- Areas of naturally occurring or cultivated resources used for food, shelter, or medicine;
- Areas that contain resources used for expression and perpetuation of Hawaiian culture, religion, or language;
- Places where known historical and contemporary religious beliefs or customs are practiced;
- Areas where natural or cultivated endangered terrestrial or marine flora and fauna used in Native Hawaiian ceremonies are located or where materials for ceremonial art and crafts are found; and,
- Areas that provide natural and cultural community resources for the perpetuation of language and culture, including place names and natural, cultural, and community resources for art, crafts, music, and dance

After determining if the proposed project meets the definition of a federal undertaking, per 36 CFR Part 800, the agency must take the effects of the proposed project on cultural resources into account, often referred to as Section 106 consultation. The Section 106 consultation is conducted in parallel with, and integrated into the NEPA process. An Area of Potential Effect (APE) must be identified to ensure that impacts to cultural resources within the APE can be fully evaluated. The APE is determined by the scope of the undertaking, topography, what known cultural resources are in the area (so as not to divide cultural resources), and landscape plantings surrounding the proposed project site. The APE, for example, in many cases may be larger than the actual proposed project site when these factors above are taken into consideration.

The identification of potential historic resources is accomplished through research and survey for cultural resources located within the APE. The cultural resources present within the APE are evaluated by qualified professionals to determine if they are eligible for nomination to the National Register. If the proposed project would impact identified historic resources that are eligible for listing on the National Register, the federal agency then determines the potential effect of the proposed action on such cultural resources. If it is determined that the proposed action will have an adverse effect on those resources, the agency determines appropriate mitigation measures to minimize the potential impacts from that action. Mitigation is enforced through a MOA. An MOA is between the federal agency, the Army in this instance, and the consulting parties such as the SHPD and other consulting parties such as Native Hawaiian groups and the Advisory Council on Historic Preservation (ACHP).

For this Programmatic EIS, the Section 106 consultation process is currently underway for the proposed IPBA in the Western Range Area. The Section 106 consultation is not being conducted for the overall PTA modernization proposal, however, cultural resources are being reviewed and considered under NEPA and the Army's implementing regulations for NEPA. When the other projects listed in Table 2.1-2 are more mature in the planning process and are being prepared for decision, the Army will conduct its regulatory consultations as required.

While alternatives to proposed actions can negate or lessen adverse effects to cultural resources, sometimes there are outside issues, such as funding or safety, that do not allow for an alternative that does not impact cultural resources.

Impacts to historic resources can include, but are not limited to, destruction of archaeological sites, significant changes to viewshed (see Section 3.3 Visual Resources), destruction of traditional sites, and changing or demolishing a historic building, structure, object or district. Mitigation is used to offset the effects of federal projects on cultural resources.

At PTA, over 40 archaeological investigations (Table 3.10-1) have been conducted, with most of these studies occurring during the mid-1980s and 1990s. Many previous studies covered large areas by helicopter survey, which only identifies very large sites. Site types identified at PTA include transportation features (trails and trail markers); occupation sites (lava tubes, blister caves, and overhang shelters); lithic resource sites (e.g., chill glass quarries and workshops); ritual/ceremonial sites (indicated by upright stones); excavated-pit features; historic features (walls, enclosures); and military modifications/impacts (CSH, 2011).

Table 3.10-1. Sample of Previous Archaeological Studies Conducted at PTA

Date	Type of Investigation	Reference	Training Area
1957	Inventory of SIHP # -5000* and -5001	Hansen 1964	Impact Area
1977	Reconnaissance Survey of 2.6% of PTA	Rosendahl 1977	4, 6, 14, and 22
1982	Reconnaissance of jeep trail and firebreak	Kam 1982a	22
1982	Reconnaissance of firebreak route at PTA	Kam 1982b	22
1982	Aerial survey of Pu‘u Pa and Humu‘ula	Hommon 1982	Outside PTA boundary
1983	Research design for archaeology at PTA	Hommon and Ahlo 1983	n/a
1983	Field check of SIHP # -5003 PTA (not relocated)	Cox 1983a	4
1983	Reconnaissance of firebreak route at PTA	Cox 1983b	18,19,22, and Impact Area
1983	Detailed surface survey of Bobcat Trail Cave	M. Rosendahl 1983	22

	(SIHP # -5004) at PTA		
1984	Reconnaissance of five land parcels at PTA	Streck 1984	5, 6 and 9
1985	Aerial reconnaissance of the MPRC at PTA	Streck 1985	23
1985	Reconnaissance of Bobcat Trail and MPRC Areas	Streck 1986b	23
1985	Intensive survey and testing of Bobcat Trail Cave (SIHP # -5004) at PTA	Haun 1986	22
1986	Aerial reconnaissance of revised MPRC at PTA	Streck 1986a	23
1986	Reconnaissance of Kaumana-Keamuku transmission line and Saddle Road powerline	Barrera 1986, 1987	n/a
1986	Reconnaissance of Saddle Road shoulder project	Rosendahl and Rosendahl 1986	n/a
1986	Aerial and ground reconnaissance of various land parcels	Watanabe 1986	22 and 23
1987	Inventory survey and testing of MPRC and Bobcat Trail Road at PTA 1989	Athens and Kaschko 1989	23
1990	Survey of new baseline of MPRC at PTA	Streck 1990	23
1991	Archaeological assessment and sensitivity map at PTA	Hammatt and Shideler 1991	n/a
1992	Aerial and ground reconnaissance of MPRC at PTA	Reinman and Schilz 1993	22 and 23
1992	Data recovery of MPRC at PTA	Reinman and Schilz 1994	22 and 23
1992	Analysis of radiocarbon dates and site types in the Saddle Region	Streck 1992	n/a
1993	Survey and testing for the Saddle Road improvement project at PTA	Welch 1993	n/a
1993	Aerial and ground survey of Red Leg Trail at PTA	Shapiro et al. 1998	21 and Impact Area
1994	Aerial and ground survey of two land parcels at PTA	Shapiro and Cleghorn 1998	5 and 22
1994	Regional synthesis of Hāmākua District	Cordy 1994	n/a
1996	Assessment of Bobcat Trail Cave (SIHP # -5004) at PTA	Cleghorn and Williams 1997	22
1996	Implementation of Bobcat Trail Cave assessment (SIHP # -5004) at PTA 1997	Cleghorn and Clark 1997	22
1996	Survey of Saddle Road	Langlas et al. 1997	n/a
1996	Reconnaissance of 4 areas Training Area 21	Williams 2002b	21
1997 -8	University of Hawaiʻi Field schools (Training Area 5)	Bayman et al. 2001	5
1998	Reconnaissance survey, inventory survey and selected testing in Training Area 21 east of Red Leg Trail	Williams 2002a	21
2002	Re-survey of 2900 acres south of Saddle Road and east of Red Leg Trail; and evaluation of chill glass quarry complex identified therein. Reconnaissance of portions of TA 5 and 21	Roberts et al. 2004	5 and 21

2002	Reconnaissance survey of 8,710 acres for BAX/AALFTR; 24,000 acres for Keamuku Land Purchase; and PTA Trail	Roberts et al. 2004	7, 21, and Impact Area
2003	Reconnaissance of Training Areas 1, 3, and 4	Roberts et al. 2004	1, 3, and 4
2003	Reconnaissance survey for SBCT Go/No Go Maneuver Areas at PTA	Desilets et al. 2005	6, 9, 12-16, and 19
2003	Phase II archaeological research of proposed BAX and AALFTR for SBCT	Robins et al. 2006	5, 7, and 21
2003	Phase II intensive survey and data collection at archaeological sites in the KMA	Robins et al. 2005	KMA
2006	Phase II Archaeological Survey for Significance Determination of Cultural Resources in SBCT Go/No Go Maneuver Areas and a 1,010-Acre Area Near Pu‘u Ke‘eke‘e	Brown et al. 2006	6, 9, 12-16, 19, and KMA
2006	Reconnaissance survey of trail SIHP # -19528 on lands of PTA	PTA DPW-CR, n.d.	22
2007	Phase II archaeological investigations of an excavated pit complex, SIHP # -23621, at PTA	Taomia 2007	11T
2010	Archaeological Survey of Training Area 22 and Trail SIHP # -19528	Wilkinson et al. 2010	22

* All SIHP #s begin with the prefix 50-10-30 unless otherwise noted.
Source: CSH, 2011

3.10.2 Region of Influence

The effects on cultural resources pertaining to proposed projects (See Chapter 2, Table 2-1) in a programmatic manner is to first identify those areas of PTA that could be affected by modernization in the future, and to compare what is known about those areas from past surveys, MOAs, and other NEPA documentation, and then determine the potential need for future studies or surveys. At a high level, this programmatic approach cannot identify specific impacts for projects that are still in the early planning process; rather, this Programmatic EIS presents a possible range of impacts (Section 4.10) from modernization. A future tiered NEPA document will examine the specific impacts to resources on an individual project basis using consultation as a cornerstone of verifying specific impacts.

As a site-specific approach, Section 3.10.6.2.2 provides a more detailed discussion of the resources found at the proposed IPBA, and through consultation will identify the impacts to those resources in Section 4.10 of the document, as well as consider mitigation measures to reduce the significance of potential impacts from the Proposed Action.

Given the discussion above, the ROI for cultural resources from a programmatic approach accounts for the outer perimeter or boundary of PTA itself, and includes the areas immediately adjacent to the installation.

The ROI for the programmatic action is all of PTA. The ROI for the IPBA is the APE, which is discussed later in this chapter at Section 3.10.6.2.2.

3.10.3 Native Hawaiian History and Tradition

The following information is from the 2004 *Final Environmental Impact Statement for the Stryker Brigade Combat Team (SBCT):*

3.10.3.1 Native Hawaiian History and Tradition

PTA is part of a larger cultural landscape that includes the sacred mountains Mauna Kea and Mauna Loa and the Saddle area between them. Research by Pualani and Kanahele, Edward (1999), Kepā and Onaona Maly (1997, 1999, 2005), Holly McEldowney (1982), Charles Langlas (Langlas et al., 1997), and Usha Prasad and Keone Nunes (SRP, 2002), among others, has helped to identify some of the factors that make the area spiritually and historically one of the most important places in Hawaiian tradition and history. Kepā and Onaona Maly have also provided context for the cultural landscape of the Waikiʻi area to the west including the Keʻāmuku Parcel (2002) and the Humuʻula and Piʻihon ua area to the east (2004).

The importance of Mauna Kea, Mauna Loa, and the surrounding landscape can be seen in the abundance of physical or archaeological remains and through the many oral histories that describe historical events and uses of the area (Maly, 1999; Maly & Maly, 2002, 2004, 2005). The region around PTA contained a rich resource zone that supported traditional activities that included bird hunting for feathers and meat, quarrying volcanic glass, and lithic workshop locations for manufacturing the adzes made from Mauna Kea basalt. The Saddle region has numerous trails and served as a much-used passage for travelers moving both cross-island and to the Mauna Kea and Mauna Loa summits.

Cave shelters are abundant due to the extensive natural lava tube systems in the area. These cave shelters provided refuge from the elements and, because there is relatively low rainfall within the region, served as a source of limited water. Archaeologists speculate that ancient Hawaiians practiced different economic activities in this uplands area. Radiocarbon dating of PTA sites (primarily caves) indicates occupation between the 12th and 18th centuries. Some reports indicate the presence of burials at PTA (Haun, 1986; Athens and Kaschko, 1989; Reinman et al., 1998; Robins, Desilets & Gonzalez, 2007). Past archaeological work has also suggested that Native Hawaiians planted sweet potato crops in stony areas (Reinman and Schilz, 1999), but more recent work supports the hypothesis that excavated pits were used for enhancing bird (petrel) habitat (Hu et al., 1996; Moniz-Nakamura, 1999; Williams, 2002a, 2002b). Experimental efforts to grow sweet potatoes at PTA have failed to produce tubers (Moniz-Nakamura, 1999; Cultural Surveys Hawaiʻi personal communication, 2010).

The Ahu a ʻUmi heiau on the slopes of Hualālai south of PTA is said to have been built by the legendary chief ʻUmi a Līloa around 1600. Both ʻUmi and his father, Līloa, are credited, in different accounts, with unifying Hawaiʻi island and with creating the system of land division that persisted through the end of the traditional era. In addition to Ahu a ʻUmi at the Kona boundary, ʻUmi is credited with building three other ahu at the boundaries of the other districts bordering Hāmākua, seat of his authority inherited from Līloa – at Puʻu Keʻekeʻe on the Kohala boundary, at Hale Pōhaku on the Hilo boundary, and at Pōhaku Hanalei on the Kaʻū boundary on the slopes of Mauna Loa. In a broad sense, the entirety of Mauna Kea is considered holy. From cultural practitioners to academic specialists to oral history informants, that sacredness has been expressed in a number of different ways that are briefly summarized here.

Attempts to translate the Hawaiian sense of Mauna Kea's spiritual meaning for a general audience often focuses on two concepts, hiapo (first-born, recipient of special privileges and responsibilities) and lōkahi (unity or harmony). The mountain is seen as the first-born child of Wākea and Papa, the original father and mother, and thus as a personal ancestor of living Hawaiians. Mauna Kea is also seen as the piko or navel through which Hawai'i island came into being. In addition, its proximity to the heavens provides a place to commune with the gods and therefore contributes to its sanctity.

This sense of Mauna Kea as a living elder and holder and transmitter of tradition complements a sense of lōkahi, in which the mountain participates in the larger cycle of life, where each element has a crucial part to play. For example, Mauna Kea's height attracts clouds, which bring precious rain. Through hiapo the mountain reaches up to the sacred realm, while through lōkahi it reaches out to the natural world——traditionally Hawaiians did not see those two realms as separate. There is a reciprocal relationship between those with the role of hiapo and other members of the family to care for each other, and this is expressed by Hawaiians in the need to care for Mauna Kea (University of Hawai'i, 2009).

Several deities are associated with Mauna Kea, perhaps most famously Poli'ahu, the snow goddess of the summit, and Lilinoe, embodying the mist and rain of the Pōhakuloa area. Both goddesses are embodied in cinder cones (pu'u) in the summit area, as is Kūkahau'ula. In legend, the region was also the scene of conflict between Poli'ahu and the fire goddess Pele. In geologic terms, this conflict can be seen in the ancient meeting of volcanic fire and mountain ice that produced exceptionally high-quality basalt prized by traditional adze makers.

Water is an important part of the mountain's sacred aspect. These sacred water sources include springs and their importance as part of cultural landscapes, rain clouds attracted by the peak, mist and snow representing its deities, and the icy water of Lake Waiau near the summit, prized for use in religious and medical practice. Water that had not touched the ground was considered especially precious, whether it was collected in the cupped part of a taro leaf, in high Lake Waiau, or in the top of a bamboo shoot. Interestingly, the ahupua'a[64] that stretches from the Hāmākua shore to include both Mauna Kea and Mauna Loa peaks and much of the land base for PTA is named Ka'ohe, or bamboo—a plant that was often used as a water carrier.

3.10.3.2 Traditional Activities

It is considered unlikely that the chilly heights of the Saddle area and above were ever the site of permanent homes, but many people passed through the region in pursuit of the numerous and unique natural resources available. These individuals included bird hunters, gatherers of various plants and other forest resources, and craftsmen in search of high quality wood and fine quality basalt for adze manufacturing. Lava that cooled quickly on the frigid mountaintop yielded an especially fine-grained form of basalt that could be turned into high quality adzes and other tools in the days before metal was available. Quarry sites were probably workshops, with associated shrines and temporary dwellings located in caves at lower warmer elevations, some of them within PTA.

[64] Narrow wedge-shaped land sections that run from the mountains to the sea

Craftsmen turned to the high forest when they needed particularly large trees from valuable upland hardwoods such as māmane. Koa and large 'ohia trees in particular were obtained from the mountain forests for canoes and temple images (Malo, 2006). According to Kanahele and Kanahele, the upper slopes were considered more sacred than the lower forests and were left alone as much as possible as conservation areas; when one of the larger and more valuable trees was taken, a major offering, often a human sacrifice, was given in return.

Perhaps the most valuable of the traditional forest resources were birds. Songbirds were hunted for their plumes, and seabirds that nest were hunted as food. Participants in early 20th century interviews remembered a variety of bird-catching techniques, from tethering a live ‘Io next to a trap, to setting tiny nooses alongside lehua blossoms, to snaking a gummed snare made of ‘ie‘ie vines into a shallow cave to catch ‘ua‘u chicks, a delicacy reserved for the ali‘i[65]. Most techniques required a great deal of finesse and patience and, in the case of the larger birds, strength and speed as well. Natural holes in the lava beds were improved to make them more attractive nesting places. Birds hunted for their feathers were, hunters recalled, released again in viable condition (Reinman et al., 1998; Moniz-Nakamura, 1999).

Cows, sheep, and other ungulates are a post-contact introduction, but as they were released into the uplands and multiplied, hunting them became a pastime and sometimes a living, pursued by Hawaiian and non-natives alike. For decades, hunting of the wild/feral creatures continued as more structured and privately owned ranching began to grow. Hawaiian participation, both in the wild hunts and in ranching, has become an island tradition in its own right.

People using the upland resources, as well as people traveling cross-island, developed a network of trails in the prehistoric and early historic eras. Some of those trails are now underneath lava flows, others lie under modern roads, and others may be of questionable location and antiquity, but it is clear that a number of trails crossed the Saddle region connecting the various coastal districts around the island with one another. The Ahu a ‘Umi heiau derives some of its importance from its location at the juncture of several of these trails.

The sacredness of the area and Native Hawaiian connection to the Mauna Kea landscape manifests itself in many ways. Oral testimony (Maly, 1997) has revealed a number of activities and traditional practices that have been less documented than the ones described above, possibly because they are not as readily reflected in the archaeological or archival record. Some of these practices involve secret family worship, a place of refuge from enemies, and a general sense of the magical deity-inspired restorative and healing power of the higher elevations of Mauna Kea. Prayer and worship are reported to continue to this day (Maly, 1997; Maly & Maly, 2005).

Water from Lake Waiau, a small lake on the summit platform of Mauna Kea, is considered sacred and is associated with the god Kåne. Healing power and a spiritual connection is associated with the water, and it is still used by Native Hawaiians. Many generations are reported to have deposited their children’s umbilical cords (piko) into the lake, as well as on the summit peak of Pu‘u o Kūkahau‘ula; this tradition is

[65] In ancient Hawaiian society, ali‘i was a hereditary chiefly or noble rank consisting of the high and lesser chiefs of the various realms in the islands. The ali‘i governed with divine power called mana. The ali‘i were the highest class, ranking above both kahuna (priests) and maka‘āinana (commoners).

still practiced by some families (Maly, 1997; Maly & Maly, 2005). In addition to reported historic burials, some use Mauna Kea as a place to spread the cremated remains of their deceased loved ones (Maly, 1997; Maly & Maly, 2005).

It is likely that in historic times, the landscape and forms of Mauna Kea and Mauna Loa were used as navigation aids both at sea and on land. Mountains to this day are used as physical and emotional benchmarks that help people regain their sense of place. Astronomy, although an important Native Hawaiian traditional component, has not been directly tied to Mauna Kea in the archival record. Because of the "significant association of gods and deity whose forms are seen in the heavens and whose names are also commemorated at locations on Mauna Kea…it is very likely that practices of the native *kilo hoku* [those who studied the stars] occurred on Mauna Kea" (Maly, 1999, 20).

As reported in the SBCT Final EIS (U.S. Army and USACE, 2004), the area of the cloud line is considered wao akua (inhabited by gods and spirits, the creators of life), and as such, the kama ʻaina[66] (children of the land) have an even greater respect for these higher elevations. Most of the population were commoners, or makaʻāinana, whose daily activities did not involve lands in the wao akua region and were not likely to have visited. However, an elite few, the akua (gods), aliʻi (royalty), or kahuna (priests) of high rank, and the class of specialized practitioners who gathered resources or worshipped in the wao akua and mountain region areas in which they practiced cultural activities made use of natural resources and cared for both natural and cultural resources in the area.

It is difficult to describe the emotional and spiritual link that exists between Native Hawaiians and the natural setting. Hawaiians generally believe that all things in nature have mana, or a certain spiritual power and life force. A custodial responsibility to preserve the natural setting is passed from generation to generation, and personal strength and spiritual well being are derived from this relationship. Because of this belief, Mauna Kea may be the most powerful and sacred natural formation in all Hawaiʻi.

3.10.3.3 Native Hawaiian Sovereignty

Hawaiʻi became a territory of the U.S. in 1898, and it became the 50th state of the U.S. in 1959. The overthrow of the Kingdom of Hawaiʻi and subsequent loss of Native Hawaiian Sovereignty continues to be an issue of great concern, and the source of many comments during the scoping period of this Programmatic EIS. The 103d Congress issued a joint resolution in 1993 that "acknowledge[d] the 100th anniversary of the January 17, 1893 overthrow of the Kingdom of Hawaiʻi, and [offered] an apology to Native Hawaiians on behalf of the U.S. for the overthrow of the Kingdom of Hawaiʻi." The resolution was signed into law (PL 103-150) by President Clinton.

3.10.4 Historic Overview – Pōhakuloa Training Area

In the late 1800s, owners of two large ranches competed for the rights to raise cattle and sheep and to hunt feral animals in the Saddle Region. John Parker II held a lease to the Kaʻohe lands of PTA from sometime before 1876 through 1891. The Waimea Grazing and Agricultural Company leased Humuʻula

[66] "kama 'aina" is a term used for people born in Hawaiʻi, however, Native Hawaiians refer to themselves as maoli, or kanaka maoli (native people). Maoli means native or indigenous, whereas kama 'aina can include other nationalities who were born in Hawaiʻi, or whose families have been in Hawaiʻi for generations as the term is not specific to Native Hawaiians.

to the east of PTA from Kamehameha III around 1860 and raised sheep and also killed wild cattle for their hides. The company built a wagon road from its remote sheep station along the current Saddle Road in Humuʻula to Waimea, through PTA, to transport wool to the harbor at Kawaihae. A portion of this road still remains within and to the east of PTA. The company also raised sheep in the portion of Waikōloa that forms the KMA, establishing the Keʻāmuku Sheep Station.

By 1891 the Humuʻula lease was held by the Hackfields' Humuula Sheep Station Company, which in that year obtained the lease for the east side of Kaʻohe, while Parker continued to lease the west side. The company built a number of stone walls in the 1890s, some of which may be the stone walls still standing in the northeastern part of PTA. These stone walls were the foundations for fence lines; ranching era fence lines, including the stone foundations where needed, extend across PTA's northern training areas and into the KMA. After 1900, Parker Ranch was expanded to include the Humuula Sheep Station Company and most of the lands in the Saddle (Langlas et al., 1997).

PTA's use as a military installation began in 1942 with the building of the Kaūmana Road for military access between Hilo and Waimea. Kaūmana Road is now known as Saddle Road (SH200), which served as the forerunner to the development of the Saddle Training Area, which primarily consisted of BAAF and the PTA cantonment area. Many members of the local community have, or have had, relatives who worked or trained at PTA. Most of the cantonment area is composed of Quonset huts dating from 1955 to 1958, after authority was given for a permanent training area (Eidsness et al. 1998, 31).

3.10.4.1 Previous consultations and reports

As reported in the SBCT 2004 EIS, Social Research Pacific (SRP) (2002) has completed a draft report of an oral history survey of PTA, focusing on place names, trail systems, and known Native Hawaiian built structures. The report includes information gleaned from previous works, including McEldowney (1982), which contains oral accounts and written evidence about the Mauna Kea summit area; other various early accounts from western visitors passing through the area (e.g., Maly, 1997, 21); and myth and legend material found in Elbert (1959) and Kamakau (1992).

Additionally, SRP (2002) conducted interviews with 29 individuals, both Native Hawaiians and other long-time residents of Hawaiʻi island familiar with the area. A field visit with eight of the informants was made to Ahu a ʻUmi heiau, located west of PTA on the slopes of Hualālai, in the Saddle area. Extensive information was gathered about the heiau, which served during the historic period as a resting place along the trails that traversed the central part of the island. The report includes a description of the heiau recorded by Jacques Remy in 1853, based on an interview with Kanuha, an extremely elderly chief at the time of the interview (SRP, 2002).

Informants reported the presence of burials both from observation and from oral traditions, but no exact burial locations could be recalled. Informants did know of the continued use of old trails that crossed PTA and of the persistence of bird hunting, one of the major traditional uses of the area from prehistoric times into the early part of the 20th century.

Informants described the use of catching birds for feathers (using gummed sticks or branches extended up into the canopy). A list of 20 potentially significant place names within and around the vicinity of PTA was prepared; however, little or no oral historical information could be collected concerning these places (SRP, 2002).

Maly (1997; Maly & Maly, 2005) conducted a series of interviews that considered not only Mauna Kea itself, but the landscape and view planes of the area. Many of the respondents had knowledge of several of the traditional practices described above. In the 1997 study, and in follow-up interviews, the researchers surmised that the Hawaiian people feel a "deep cultural attachment to the broad spectrum of natural and cultural resources" found in and around Mauna Kea (Maly, 1999, 3). Maly recommended that the traditions, sites, practices, and continuing significance of Mauna Kea, both historically and today, make it "eligible for nomination as a traditional cultural property under federal law and policies" (Maly, 1999, 3).

3.10.4.2Identifying and managing resources at PTA through surveys

The Army has dedicated personnel and a robust cultural resources management program that, through ongoing surveys, Section 106 consultation with Native Hawaiian advisors, public input, and consultation with the SHPD and other consulting parties, has and will continue to identify cultural resources representatives for the history of the area. Through these surveys and Section 106 consultations, and taking into consideration oral tradition and developmental history, the Army determines the potential impacts from military actions at PTA and works with planners and the public (through consultation and through the NEPA process) to identify alternatives that will lessen potential impacts.

PTA's Cultural Resources Management professionals conduct the following activities regularly in order to manage known sites at the installation (and throughout USAG-HI):

- Consult Native Hawaiian organizations and other interested parties to facilitate site identification and interpretation, determine appropriate methods of site protection as needed, and gather recommendations on proper protocols, rehabilitation, landscaping, and preservation;
- Maintain and update a comprehensive database of site discoveries and status;
- Monitor condition of archaeological sites on ranges for damage;
- Determine, implement, and monitor site protection measures of sites;
- Verify the locations of sites and map new sites with GPS technology;
- Evaluate sites to determine eligibility for the National Register;
- Survey and map lava tube systems through partnerships with the Hawaiʻi Island caving community;
- Follow the process defined in NAGPRA to complete all repatriations of human remains, including burial crypts for the repatriated remains;
- Manage historic buildings and structures;
- Care and conservation of artifacts and historical documents to ensure long-term preservation at a small curation facility at PTA;

- Develop and maintain database to track projects, technical reports, photographs, artifacts, and other archived materials;
- Oversee the recovery and curation of artifacts collected during earlier surveys and held temporarily by permitted archaeological consultants prior to the completion of an adequate Army curation facility outreach;
- Promote Soldier and public awareness of the unique cultural resources;
- Provide hands-on educational activities and tours for schools and community organizations; and,
- Facilitate access to archaeological resources within Army installations;

This Programmatic EIS cites several surveys from numerous sources in the sections below. Because there are proposed projects throughout the installation, the surveys cited are related to the portion of PTA where, in a future tiered analysis, the individual projects identified in Table 2-1 (Chapter 2) will consider the known resources identified in surveys and work to avoid impacting them. The Proposed Action(s) take place in the Cantonment Area and throughout the Range Area.

3.10.5 PTA Cantonment Area

The main historic resource at PTA's Cantonment Area is Quonset Huts that are used for temporary housing, dining, and maintenance facilities, and the administrative and environmental management of the installation's assets by the staff working at PTA. Due to their age, and because they were originally built to be temporary structures, Quonset Huts throughout the Cantonment Area are dilapidated, costly to maintain, and energy inefficient.

The remainder of the Cantonment Area has been highly disturbed and does not contain archeological sites. Located just northeast of the PTA Cantonment on the lower slopes of Mauna Kea (on Hawaiʻi State land) below the main adze quarry are Hopukani, Waihu, and Liloe springs. There are sites along these springs that exhibit evidence of basalt tool manufacturing activities and subsistence items (McCoy, 1986; Cultural Resources Management Projects Performed at PTA, Annual Report, December 2008).

In late 2003, the Garrison established a 350 sf curation facility at PTA that hosts artifacts found throughout PTA in a humidity-controlled room. The facility meets federal curation standards established in 36 CFR 79 *Curation of Federally Owned and Administered Archaeological Collections*.

The DPW Building List includes 138 structures at PTA that are more than 50 years of age, including Quonset huts that date from 1955 to 1958. The condition of all structures has been assessed, and they appear to be National Register eligible. Kenneth Hays of the USAG-HI DPW Environmental staff has conducted a survey and condition assessment of these structures; the Quonset huts have lost their integrity and therefore are not eligible for the NRHP (Hays, 2002). Although no structures have been determined as eligible, the Army has agreed to preserve four Quonsets huts located next to Puʻu Pōhakuloa as mitigation for the Saddle Road construction that removed a number of buildings.

3.10.6 PTA Range Area

PTA is rich with archaeological resources, with 482 reported archaeological sites, 338 of which have State site numbers. These include both prehistoric and historic sites (Table 3-10.2). The only site listed on the National Register is the Bobcat Trail Habitation Cave (Site 5010-30-5004). Figure 3-10.1 shows archaeological sensitivity areas at PTA. When the Army proposes new projects in the range area, the Cultural Resources Management staff at PTA conducts surveys of project areas and, as new sites are found, adds those to their managed inventory.

Table 3.10-2. Historic Property Types and Count at PTA

Site Type	Count
Lava tubes	154
Ahu/Cairns	71
Ranching Features	71
Overhangs/Rock shelters	47
Volcanic Glass Quarries	30
Excavated pits	28
C-shapes	19
Trails	12
Other	49

The SBCT 2004 EIS indicates that archaeological inventory surveys of PTA began in the 1960s and 1970s, supported by the Bishop Museum[67] (Bishop Museum, 2011; Rosendahl, 1977). Since the 1980s, many archaeological studies have been conducted at PTA, mostly for regulatory compliance (e.g., Cox, 1983; Haun, 1986; Hommon and Ahlo, 1983). Other studies at PTA include Athens and Kaschko (1989), Reinman and Schilz (1993, 1994, 1999), and Streck (1985, 1986, 1990). Surveys in the northern section of PTA include those of Barrera (1987), Kalima and Rosendahl (1991), and Welch (1993), among others. A complete list of identified archaeological sites at PTA is found in Appendix C. A biological inventory of cave and lava tube systems within PTA recorded cultural resources at the cave entrances and within the underground system (Pearthree, Stone, and Howarth, 1994). Subsequently, PTA Cultural Resources has employed a cave team seasonally to document the lava tubes in detail, including the cultural resources found within them. GANDA has completed additional survey work, including surveying the northern portion of the range are, KMA,, training areas 1, 3, 4, 5, and 21, and areas north of the cantonment area (GANDA, 2002a; Roberts, Roberts & Desilets, 2004; Roberts, Robins, & Buffum, 2004; Desilets & Roberts, 2005; Desilets, Roberts, & Buffum, 2005; Brown, Desilets, DeBaker & Peterson, 2006; Roberts, Brown & Buffum, 2004; Robins & Gonzalez, 2006; Robins, Desilets & Gonzalez, 2007). PTA Cultural Resources staff conduct surveys for small scale projects as they arise, and have conducted field work for some larger projects as well (i.e., Escott, 2006a, b). Additional research has been conducted on the Keʻāmuku Sheep Station (Escott, 2004).

[67] http://www.bishopmuseum/research/natsci/geology/geochem.html

3.10.6.1General Range Area

Most of the early archaeological surveys at PTA took place in the west and southwest portions of the training area along or off Bobcat Trail. In 1985, PHRI conducted a survey of the Bobcat Trail Habitation Cave Site and the surrounding kīpuka (Haun, 1986), and, in 1987, Athens and Kaschko (1989) surveyed the heavily forested and (at the time) undeveloped region of the MPRC. In 1992, Ogden revisited the MPRC and conducted data recovery excavations of sites to be affected, as well as a survey of an additional 20,000 ac (8,094 ha) (Reinman and Schilz, 1999). This resulted in the discovery of 48 new sites.

On the east side of PTA, surveys were not initiated until 1993, when BioSystems Analysis conducted an aerial and pedestrian inventory survey of 6,700 acres along both sides of Red Leg Trail (Reinman and Pantaleo, 1998). Following this work, Ogden surveyed four areas east of Red Leg Trail totaling about 970 ac (393 ha) (Williams et al., 2002). Later, an additional area of 2,640 ac (1,068 ha) to the east of the trail was surveyed and Phase II surface collection and testing conducted of sites in areas previously surveyed (Williams, 2002a, b). In an area with an expected low density of sites, 67 sites and over 1,800 excavated pits were recorded. Surveys conducted for SBCT projects at PTA identified many new sites.

Archaeological sites identified during surveys along Red Leg Trail and areas to the east for the SBCT EIS (U.S. Army and USACE, 2004) were related to the BAX and AALFTR projects. Several sites were identified within the boundaries for the BAX, including site 19490, a trail site, portions of a historic ranching fence line, an excavated pit site, a lava tube shelter with ti leaf sandals, and a mound. The BAX footprint was shifted to the west to avoid site 19490. The other sites could be avoided by placing components of the BAX around the sites, rather than over the sites (GANDA, 2002).

Figure 3.10-1 shows recorded archaeological sites throughout PTA. Surveys in the last ten years have significantly diversified the types of potential historic properties that have been identified at PTA. In general, archaeological resources at PTA consist of modified natural features, such as lava tubes, lava shelters, and lava blisters. There are more than 30 lava tube systems that have been identified at PTA by cavers, and these contain 154 archaeological sites, making up 32% of the sites at PTA. Other site types include cairn sites, cairn or ahu complexes, trails, volcanic glass quarries, excavated pits, and lithic workshops. The historic period is also represented by historic camp sites, walls and fences of the ranching era, the ranching features in the KMA, a historic road and features associated with its construction, and one clearly historic petroglyph. Within the archaeological sites at PTA, material remains include grinding tools, charred wooden torches, gourds, cordage and matting, woven ti leaf sandals, kukui nuts, ‘opihi shells, and other faunal remains. Surface features include stone-lined hearths, cupboards, rock-paved areas, low walls and platforms, rock-filled crevices, ramps, cairns, shrines, open-air shelters, and trails. The region has much value for archaeological research and has produced important information concerning bird hunting, trail systems, and short-term living conditions at higher elevations.

As reported in the SBCT 2004 EIS, Reinman et al. (1998) claim the cultural resources at PTA are important for addressing issues about Hawaiian prehistory and history in the uplands region, as well as the development of Native Hawaiian society.

The existence of approximately seven stone shrines attest to the likely ritual activity that went on at PTA. With prayers and ritual permeating traditional Hawaiian life, some of the structures at PTA may be occupational shrines (Buck, 1957, 259, cited in McEldowney, 1982, 1.10). Cairns (ahu) have been recorded at various terrains, either associated with trail systems or boundary markers, or as just isolated features. There appears to be no pattern to the distribution of cairns across the PTA landscape, and they have been quantified as representing about 15 percent of known sites.. There are seven ahu complexes at PTA, where the ahu are arranged in a circular manner. The purpose of these sites is unknown, but these are presumed to be pre-Contact sites. Even at these sites, the form of ahu varies considerably.

Survey and evaluation of sites in the vicinity of the Red Leg Trail identified over 40 sites including habitations and chill glass quarry complexes.

A Phase I reconnaissance survey of approximately 9,000 acres was conducted between May 19 and July 11, 2003 for the SBCT Go-Areas at PTA for the SBCT EIS (U.S. Army and USACE, 2004). The PTA Go-Areas included a portion or all of training areas 1, 2, 4, 6, 9, 12 to 16, 18, and 19. Twenty-two sites or site complexes were identified, including traditional Hawaiian sites: habitation complexes, rock shelters, pāhoehoe pits, ‘a‘ā pit complexes, and a lithic scatter. One of the habitation complexes had a pictograph panel with six anthropomorphic figures, one Lono figure, one dog figure, and six linear figures. These were the first pictographs identified at PTA. With the exception of the pictograph panel, all features and site types identified within the Go-Area were common to PTA and represented short-term occupation, resource exploitation, and lithic workshop.

The WPAA (now known as KMA) located west and north of PTA proper was acquired (approximately 23,000 ac [9,308 ha]) from the Richard Smart Trust (Parker Ranch) under the SBCT EIS (2004). The proposed land acquisition area surrounded the Waiki‘i Ranch development on its north, west, and south sides is used for force-on-force training. Prior to 2002, two archaeological surveys had been conducted of small portions of the KMA. During survey of the Waikoloa Maneuver Area, Ogden conducted a limited survey within the KMA and identified two sites, a rock shelter (Site 22929) near one crater and a dryland agricultural complex (Site 22933) within another crater (Robins et al., 2001). PHRI conducted a survey of several proposed corridors for the Saddle Road through the area and identified five sites, although two historic sites adjacent to Saddle Road were considered not eligible for the NRHP and not described or given State site numbers. The other sites included a portion of the historic Old Waimea-Kona Belt road (Site 20855), the Ke‘āmuku Sheep Station (Site 23529), and two enclosures (Site 20852) that were reported by an informant to be associated with a burial (Langlas et al., 1997). The exact location of the last site has not been disclosed, and it is not known if it is included among the sites later recorded in the area.

In 2002, GANDA surveyed the entire KMA for archaeological resources identifying 90 new sites and relocated four of the seven previously known sites; thus, a total of 97 sites were identified in the area (Appendix C). The sites include ahu, C-shaped stone mounds (one with bone fragments), an enclosed excavated pit, mounds, a mound complex (with over 20 mounds), rock piles, enclosures, an enclosed platform, wall sections, a wall-mound-terrace complex, and a petroglyph (Roberts et al., 2004 and Robins et al., 2007). Military features were not recorded as sites. An ancient trail, the Hualālai-Waiki‘i Trail, would have crossed the parcel, but no evidence of the trail was found during the surveys.

Most of the sites in the KMA are associated with historic era agriculture and ranching activities. Only 10 sites are clearly or possibly of traditional Native Hawaiian origin, and mainly consist of a few agricultural terraces and enclosures and habitation shelters. A few sites may be of special importance to Native Hawaiians: a basalt ledge with a petroglyph, and a boulder face with an anthropomorphic red pigment pictograph.

High probability areas of archaeological sensitivity are located in discrete land parcels on the western and eastern sides of the training area. Figure 3.10-1 shows general areas of sensitivity, however, the entire area within each red-shaded parcel on the map is not sensitive. Rather, the map is designed to protect the location of individual sites. The red-shaded parcels on the map may contain one or more clusters of cultural sites and therefore, the shaded area is skewed because it appears to show more sensitive sites than are actually present.

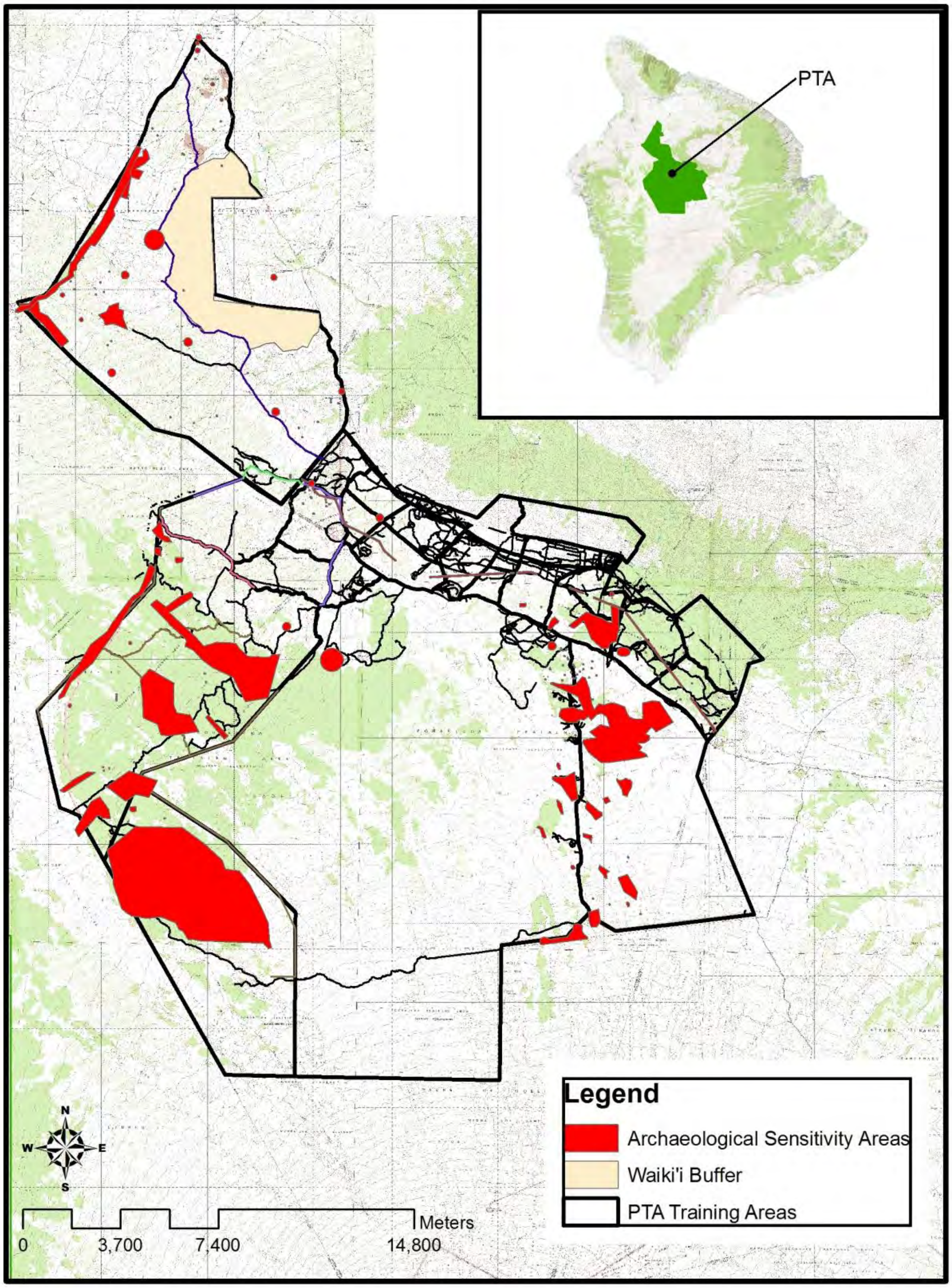

Figure 3.10-1. Recorded Archaeological Sensitivity Areas at PTA

3.10.6.1.1 IPBA at Western Range Area

The information contained in this section, unless otherwise noted, is from the *Draft Archaeological Reconnaissance Survey Report of Infantry Platoon Battle Course, U.S. Army Pōhakuloa Training Area*, Island of Hawai'i, Hawai'i.

The APE for the Western Range Area (Preferred Alternative) is the footprint of the proposed IPBC with an approximately 754 -acre trapezoidal-shaped section (Figure 2.2-1). The APE was established to take into account the proposed development of the IPBA in the Western Range Area.

A small portion of the far western side of the IPBC APE was included in surveys conducted near the MPRC Road access road alternative, and two sites (sites 17148 and 17149) were identified in this area. Most of the IPBA area was not previously surveyed (Reinman & Schilz, 1999). Additional surveys will need to be conducted in this area if the Army determines it will use the MPRC Road access road alternative over the Charlie's Circle Road access road alternative.

A Phase I survey was conducted in 2010 to determine the extent of resources within the proposed APE. As a result, the surveyors identified 102 possible lava tube openings, 24 possible surface archaeological sites, and more than 600 pāhoehoe excavated pit features. Sites and features are scattered throughout the APE, some in clusters. There is no uniform pattern of the sites found.

The lava tubes range in size from 18 inch openings to openings large enough to accommodate a full sized compact vehicle. These lava tubes were partially explored by experienced cavers between 12 January 2011 and 10 February 2011[68]. A cave found within the Western Range Area is shown in Figure 3.10-2.

The PTA Cave Team evaluated 44 lava tube openings, of which 15 were not lava tubes (a cavity that one can enter and that extends for more than five meters), and eight of the remaining lava tubes did not contain any cultural materials. Therefore, 21 of the identified lava tube entrances contained cultural resources. Twenty-three lava tube entrances were quickly checked over the span of two days, only one of which was determined not to be a lava tube; these openings require additional survey work to determine if they contain cultural materials. Thirty-five possible lava tube openings remain to be evaluated, primarily along the southern portion of the IPBC footprint and in the western trapezoid. The 21 openings containing cultural materials were confirmed as part of seven lava tube systems.

[68] These are proficient cavers with many years of experience between them. One qualifies for the Secretary of the Interior's Standards for Archaeology and works for the U.S. Forest Service as an archaeologist.

The use of the excavated pits is unknown. There is conjecture that they were used for water collection, growing sweet potatoes, and/or trapping birds. Studies are underway to determine how the pits were possibly used pre-contact; a draft report is expected in June 2011.

The Phase I survey did not locate any human skeletal remains, burial objects and associated artifacts, or other potential burial features.

Several of these sites (including the surface archaeological sites) are the subject of additional investigations in a Phase II archaeological survey. A report detailing the results of the Phase II survey is expected to be available in Spring 2012.

In addition, an archaeological survey will need to be conducted for a small parcel of land at the northeast portion of the proposed IPBC to provide improved access to the range in that area. The Army anticipates that that survey will be completed in late 2011, and a report will be made available in Spring 2012.

Figure 3.10-2. Cave observed during surveys of the Western Range Area

3.10.6.1.2 IPBA at Charlie's Circle

The APE for the IPBA at Charlie's Circle has not been fully identified. The Army fully evaluated only the APE of the preferred alternative. Figure 2-9 in Chapter 2 illustrates that the Charlie's Circle alternative shares some of the same footprint as the preferred alternative; therefore, the APE will be somewhat similar. The resources within the overlap area would include excavated pits, lava tubes, and approximately half of the surface archaeological sites identified in the Phase I survey of the preferred alternative.

If the Army selects the Charlie's Circle alternative over the preferred alternative, the Army would fully identify the APE, conduct supplemental surveys of the IPBA portion that does not overlap with the Preferred Alternative, and amend the consultation under Section 106. Any required mitigation for adverse effects would be developed in consultation with the SHPD and other consulting parties.

3.10.6.1.3 IPBA Southwest of Range 20

The Army has not identified the APE for the IPBA at Southwest Range 20. Cultural sites were previously recorded within the footprint of Training Area 23, located west of the impact area from this location (see Figure 2-9 in Chapter 2). This portion of the impact area has not been surveyed because of MEC/UXO hazards in this area, and because until now the Army has not considered this site for a new range.

If the Army selects this alternative over the preferred alternative, then it will conduct surveys and supplemental NEPA documentation and the Army would initiate consultation under Section 106. Any required mitigation would be developed in consultation with the SHPD and other consulting parties.

3.10.7 Cultural Resources Surrounding PTA

The cultural resources surrounding PTA must be considered for the proposed action. Although the Army does not own or control the land that contains these resources, it is important to note their present condition and analyze the impacts of the proposed projects on these resources. The importance of the surrounding area (Mauna Kea and Mauna Loa) is described in Section 3.10.3, Native Hawaiian Traditions and History. Cultural resources in the vicinity of PTA include Ahu a ʻUmi, the Humuʻula Sheep Station, Waikiʻi, and the walls and trails associated with the ranching era (Maly & Maly, 2002, 2004).

The University of Hawaiʻi Mauna Kea Comprehensive Management Plan (CMP) (2009) describes that between 1975 and 2006, 223 historic properties were identified in the University of Hawaiʻi Management Area within 11 distinct site types. Site types include archaeological sites, TCPs, shrines, burials, possible burials, stone tool quarry/workshop complexes, an adze quarry ritual center, isolated adze manufacturing workshops, isolated artifacts, stone marker/memorials, temporary shelters, historic campsites, and those of unknown function.

To date, three TCPs have been designated on Mauna Kea and include the summit (Kukahauʻula) and Puʻu Lilinoe in the Mauna Kea Science Reserve and Lake Waiau in the Mauna Kea Ice Age Natural Area Reserve (NAR). In addition, a vast area on the summit is eligible for listing on the NRHP as a historic district. The Keanakakoʻi adze quarry is listed as a National Historic Landmark (University of Hawaiʻi, 2009), and has been recommended that "the traditions, sites, practices, and continuing significance of

Mauna Kea, both historically and today, make it eligible for nomination as a traditional cultural property under federal law and policies" (USACE and COE, 2009).

The HAMET EA (USAG-HI, 2010a) identified field surveys undertaken at LZs proposed for use by the Army. Field surveys found a potential historic property within 0.5 miles of one LZ, and five (5) mounds believed to be prehistoric Hawaiian features near another LZ.

The Saddle Region, home to PTA, connects Mauna Kea to Mauna Loa. Various trails connecting population and resource centers run through the area. There are small rock structures associated with the trails, including rest shelters and cairns to mark the trails. As described earlier, the oral history interviews reported the continuation of bird hunting for feathers continued into the post-Contact period using existing trails. Several major trails also linked population centers, and others likely led to procurement areas. A 2005 historic sites review and feasibility study conducted for a proposed Mauna Loa trail system revealed resources that are similar in association and nature to those found on Mauna Kea and within the Saddle Region. They include those related to canoe building and bird catching (such as caves, lava blisters, and overhangs), human burials, possible human burials, a vast network of trails, and several sites and structures associated with historic settlement, ranching, and other agricultural activities (Dye, 2005, pp. 4–8). As with Mauna Kea, Mauna Loa's elevation and location made it an important spot for atmospheric and other scientific observations. The Mauna Loa Solar Observatory has long been prominent in observations of the sun, and the nearby NOAA Mauna Loa Observatory monitors the global atmosphere.

3.11 Hazardous Material/ Hazardous Waste

3.11.1 Introduction and Region of Influence

The following section is an overview of the Hazardous Material and Hazardous Waste that may be present within the project ROI. The PTA ROI includes the boundaries of PTA. Some operations in the cantonment area may generate hazardous materials/hazardous wastes, however, these areas are highly controlled. Waste generated on the ranges generally stays within that area as there is no surface water and the depth to groundwater is too deep. Because fences or mountain ranges cannot always confine or reduce impacts from spills or releases of hazardous materials or wastes, areas immediately adjacent to the PTA boundaries are considered part of the ROI.

3.11.1.1 Regulations

The DA PAM 200–1 governs the use, transport, and disposal of all hazardous materials and regulated waste by military or civilian personnel and on-post tenants and contractors at all Army facilities. In addition to these procedures USAG-HI follows its own Installation Hazardous Waste Management Plan (IHWMP). This regulation provides plans and procedures for handling, storing, and disposal of hazardous materials (HM) and hazardous waste (HW) on USAG-HI (USAG-HI, 2010f)).

The Comprehensive Environmental Responsibility, Compliance, and Liability Act (CERCLA) (42 USC 9601) defines a hazardous substance as any substance that, due to its quantity, concentration, or physical and chemical characteristics, poses a potential hazard to human health and safety or to the environment. CERCLA has created national policies and procedures to identify and remediate sites contaminated by hazardous substances. This section addresses the following specific hazardous materials and wastes:

- Ammunition, Live-Fire, and MEC/UXO
- Petroleum, Oils, and Lubricants (POLs) and Storage Tanks
- Oil-Water Separators (OWS), Wash Racks, and Grease Traps
- Lead
- Asbestos
- PCBs
- Pesticides/Herbicides
- Radon
- Biomedical Wastes

Ammunition

Live-fire training exercises occur within the Range Area, and various types of ordnance are used. The general public is not allowed into areas where ammunition is stored or used.

Ammunition would be brought [by units deploying to PTA for training] from WAAF or Lualualei to PTA via boat (LSV or barge) or helicopter. If boats were used, the ammunition would be driven from Kawaihae Harbor to PTA. Per state regulation, military convoys are not authorized to operate on state highways during “rush hour” between the hours of 6:00 AM and 8:30 AM or between 3:00 PM and 6:00 PM, Monday through Friday. Movements on Saturday, Sunday, and holidays are by special request only. Military convoys are also normally restricted from operating on state highways between 6:00 AM and 8:30 AM and between 3:00 PM to 6:00 PM during the normal work week. This is to avoid peak traffic hours and to reduce the risk of accidents. In addition, convoys and ammunition movements normally are not authorized to pass through a school zone when students are in transit; that is, when school zone lights are flashing. There are no school zones along the route the military takes between Kawaihae Harbor and PTA.

There are no published or established flight routes between Oahu and PTA. Helicopters, barges, and ground transport vehicles responsible for delivering ammunition to PTA would follow safe handling and transportation procedures discussed in AR 385-64 Ammunition and Explosives Safety Standards.

Any unused ammunition must be returned to the original storage facility at the end of each exercise. There are no permanent ammunition storage facilities at PTA; therefore any unused ammunition at the end of a deployment must be safely transported back to Oahu. The Army carefully plans every deployment to minimize a requirement to deliver ammunition away from PTA.

MEC/UXO

The DoD Ammunition and Explosives Safety Standards defines MEC/UXO as "explosive ordnance that has been primed, fused, armed, or otherwise prepared for action, and that has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material and remains unexploded either by malfunction or design or for any other cause."(DODD 6055.9, 2004) Grenades, mortars, and artillery weapons used in live-fire training can produce MEC/UXO; all other ammunition is inert. When training activity on a live-fire training ceases or a range is closed, all MEC/UXO is normally destroyed where it is found. No known dud rounds are left in place at the conclusion of a training exercise. Guidance and Procedures for the Remediation of Formerly Used Defense Sites (FUDS) can also be found in the DoD Ammunition and Explosives Safety Standards (DODD 6055.9, 2004).

The public surrounding military sites in Hawaiʻi has voiced great concern over the presence of MEC/UXO sometimes found off military installations there.

MEC/UXO comes in many shapes and sizes. Some will look new and others will look old and rusty. Some will look like bullets or bombs. Some will look like pointed metal pipes, soda cans, small balls, or even an old car muffler. MEC/UXO may be clearly visible, or it may be partially or completely hidden; and it may be easy or virtually impossible to recognize as a military munitions. If disturbed, (touched, picked up, played with, kicked, thrown, etc.) MEC/UXO may explode without warning.

DoD offers a MEC/UXO Safety Education Program available as a public service program run under the control of DoD dealing with explosive safety. The program was designed by the Army for DoD as a toolkit from which installations and the public could use individual tools to enhance or supplement local safety programs. The toolkit is available on the following DoD web site (wwww.denix.osd.mil - search Environment, then UXO Safety Education Program) and consists of ready-to-use products and materials for home, community or classroom use. The following items are available in the toolkit:

- UXO educational material[69]
- Glossary of terminology
- Posters
- Activity books for children
- Tailorable, ready to use briefings and presentations
- Frequently asked questions about UXO
- Videos
- A gallery of UXO photographs

[69] While MEC is the preferred terminology, many products and informational materials throughout DoD Web sites still reference the term UXO.

Public information regarding MEC/UXO is also found at the U.S. Army Environmental Command (USAEC) Web site for UXO [70], and it also includes information on how to identify a UXO hazard.

If you have found something that could be MEC/UXO, report what you saw immediately and where you saw it to the police or call 911.

POLs and Storage Tanks

POLs include engine fuels (gasoline, diesel, and jet fuel); motor oils and lubricants; and diesel and kerosene heating fuels. Vehicle and heating fuels include a mixture of aliphatic hydrocarbons and aromatic organic compounds such as benzene, toluene, ethylbenzene, and xylene (BTEX). CERCLA's hazardous substances and pollutants definitions exclude petroleum unless specifically listed. The USEPA defines petroleum to include hazardous substances found naturally in crude oil and crude oil fractions, such as benzene, and hazardous substances normally added to crude oil during the refinement process. Petroleum additives or contaminants that increase in concentration in petroleum during use are not excluded from CERCLA regulations. Motorpools may be designated as recyclable materials shop storage points, with primary and secondary containment for wastes generated by vehicle servicing and shop areas. Wastes are temporarily collected and stored in areas of the motorpools with secondary containment and separated out. Recycling of used POLs is accomplished in accordance with AR 200-1 and USAG-HI Regulation 200-4. In addition, guidance and procedures on storage of POLs, spill prevention, and spill plans at USAG-HI are regulated by the USAG-HI Spill Prevention, Control, and Countermeasures (SPCC) Plan (USAG-HI, 2009b). PTA has its own guidance and procedures regarding a spill plan, storage and usage of POLs, refueling procedures, and the usage of spill kits. This information can be found in the USAG-HI PTA External Standard Operating Procedures (SOPs) (USAG-HI, 2008).

OWS, Wash Racks, and Grease Traps

OWSs that are used on many Army installations, separate oil, fuel, and grease from water using gravity because these substances have a specific gravity that is lower than that of water (i.e., gasoline floats on water). OWSs can create environmental issues similar to those associated with USTs.

Lead

Lead sources can include lead-based paints, and ordnance and ammunition. Lead was a major ingredient in house paints used throughout the country for many years. Lead-based paint (LBP) is defined as any paint or surface coating that contains more than 0.5 percent lead by weight. Buildings constructed before 1978 are considered a risk for LBP.

"Exposure to lead can occur from breathing contaminated workplace air or house dust or eating lead-based paint chips or contaminated dirt. Lead is a very toxic element, causing a variety of effects at low dose levels. Brain damage, kidney damage, and gastrointestinal distress are seen from acute (short-term) exposure to high levels of lead in humans. Chronic (long-term) exposure to lead in humans results in effects on the blood, central nervous system (CNS), blood pressure, kidneys, and Vitamin D metabolism. Reproductive effects, such as decreased sperm count in men and spontaneous abortions in women, have

[70] http://aec.army.mil/usaec/technology/uxo00.html

been associated with high lead exposure. The developing fetus is at particular risk from maternal lead exposure, with low birth weight and slowed postnatal neurobehavioral development noted. Human studies are inconclusive regarding lead exposure and cancer." (EPA, 2010b)[71]

Lead is also used in manufacturing ordnance/ammunition, such as that used for small arms training. The Army documents "Prevention of Lead Migration and Erosion from Small Arms Ranges" and "Army Small Arms Training Range Environmental Best Management Practices (BMPs) Manual" provides management practices to minimize adverse impacts on human health and the environment from small arms ranges (USAEC, 1998, Aberdeen Test Center (ATC) and USAEC, 2005). The Army implements general cleanup procedures following training events to remove shell casings and other munitions residue from the ranges, and EOD specialists destroy all MEC/UXO. In addition the Army has a brass recycling program in which collected shell casings can be reused.

Asbestos

The USEPA and OSHA regulate asbestos-containing material removal and clean-up. The Toxic Substances Control Act (TSCA), the Asbestos Hazardous Emergency Response Act (AHERA), and OSHA regulations provide protection for employees who encounter or remove and clean up asbestos-containing material. The National Emission Standard for HAPs (NESHAP) regulates the renovation, demolition, and disposal of asbestos-containing material.

Buildings constructed prior to 1980 are considered to be at risk for asbestos-containing materials. Asbestos is commonly used in a variety of building construction materials for insulation and as a fire-retardant. These items include roofing shingles, ceiling and floor tiles, paper products, and asbestos cement products, heat-resistant fabrics, packaging, gaskets, and coatings. Building surveys to identify asbestos materials are conducted prior to the start of any renovation and demolition work.

PCBs

PCBs are mixtures of synthetic organic chemicals with the same basic chemical structure and similar physical properties, ranging from oily liquids to waxy solids. Due to their nonflammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications, including electrical, heat transfer and hydraulic equipment (EPA, 2010d). PCBs may be found in the cooling fluid of electrical equipment, including transformers and capacitors, particularly if such equipment was manufactured before the early 1970s. PCBs may also found in fire retardants and other solid materials.

Pesticides/Herbicides

The USEPA defines a pesticide as any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest (EPA, 2010c). Pests can be insects, mice, and other animals, or unwanted plants (weeds), fungi, or microorganisms, such as bacteria and viruses. Though often misunderstood to refer only to insecticides, the term pesticide also applies to herbicides, fungicides, avicides (bird agents), rodenticides, and various other substances used to control pests. A pesticide can

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[71] http://www.epa.gov/ttnatw01/hlthef/lead.html

also be any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant (EPA, 2010c). Pesticides and herbicides are stored at PTA in approved containers at the Natural Resources Office (NRO) facilities.

Radon

Radon is a naturally occurring, slightly radioactive gas that is produced by the decay of rock containing uranium. The EPA believes that the principal source of radon within a structure is due to soil contact with basement floors and walls (EPA, 2010a). Radon occurs in low concentrations in the Hawaiian Islands and is not considered a specific risk to this area.

Biomedical Waste

The medical clinics on PTA produce small amounts of regulated chemical and medical waste. The medical waste is combined and temporarily stored before being disposed of at a regulated off-base disposal site.

3.11.2 PTA Cantonment Area

Ammunition

No live-fire is conducted in the PTA Cantonment Area. All ammunition, links, and casings must be returned to the ammunition supply point (ASP) at the completion of any training exercise. Ammunition storage facilities consist of 6 igloos located in the Range Area. Ammunition storage is temporarily used by the battalion during training activities at PTA. There are no permanent ammunition storage facilities at PTA.

POLs and Storage Tanks

The bulk storage facility was constructed in 1982 and is located at Building 343 with eight underground storage tanks (USTs). POL containers belonging to the bulk fuel facility are stored on a concrete pad with secondary containment.

One UST at PTA is included on the Leaking UST list maintained by DPW. This tank was located at the dining facility in Building T-186 and was removed in May 1994. This site has been remediated, and the USEPA issued a clean closure status in December 2001.

In addition, two Installation Restoration Program (IRP) sites exist at PTA. Both sites are landfills located in the southern portion of the main post. In an installation assessment report created in 1984, the first site was identified as a concern due to the fact that small quantities of oils, solvents, and battery wastes were disposed of at this location. The second landfill was closed in 1993 and both sites are currently being tracked together using the Army Environmental Database-Restoration (AEDB-R). The Decision Document (DD) was signed for both sites in 2010, and quarterly methane monitoring will be conducted at the second site, followed by a five-year review of both sites.

OWS, Wash Racks, and Grease Traps

There are no OWS or grease traps located at PTA. No wash racks exist in the cantonment area.

Lead

USAG-HI established a lead hazard management program out of concern for the safety and health of Soldiers and civilians.

The cantonment area of PTA was constructed in 1955 and BAAF in 1956. Because construction took place before 1978, the Army deemed it necessary to conduct surveys for lead paint throughout the Cantonment Area. The surveys are accessible in a DPW database, and are reviewed when building demolitions are proposed to determine the presence of LBP, and to ensure that any demolition is compliant with State and Federal regulation.

Asbestos

USAG-HI established an installation asbestos management program to protect the health and safety of Soldiers and civilians. Under this program, Army personnel commissioned the survey of asbestos-containing material throughout the Cantonment Area at PTA. Asbestos was long suspected as being used in Quonset Huts, such as in floor tiles. The use of Asbestos is not expected in any of the training areas.

The asbestos surveys are accessible in a DPW database, and are reviewed when building demolitions are proposed to determine the presence of asbestos, and to ensure that any demolition is compliant with State and Federal regulation.

PCBs

A preliminary assessment/site inspection of four potential contaminant sources (a former pesticide storage area, a fire training area, and two landfills) within the boundaries of PTA was conducted in March and April 1993. The analytical results for soil sampling in these areas indicated that PCB concentrations were all below the listed PRG. Devices that were found to contain regulated levels of PCBs have been either removed and upgraded with non-PCB devices, or were retrofilled or removed, drained, packaged, and disposed of in accordance with 40CFR Part 761. No PCB-containing transformers remain at PTA.

Pesticides/Herbicides

Pest control in the Cantonment Area is managed by U.S. Department of Agriculture (USDA)/Wildlife Services. Weed control and feral animal control on BAAF and in the training areas are conducted by professional weed and animal control contractors. At this time, animal control is contracted to Keepers of the Land, Inc.

There is one primary pesticide storage location on PTA, the DPW Natural Resources Department (Building T-93). Small volumes of pesticides are stored in plastic lockers, with closed plastic containers as secondary containment. Larger volumes are stored in plastic containers on secondary containment pallets. Pest management of the cantonment area is completed under contract. Contractors are not allowed to store hazardous materials, including pesticides, on site. (US Army and USACE, 2004)

3.11.3 PTA Range Area

3.11.3.1 General Range Area

The PTA Range Area consists of 163 direct and indirect-fire ranges which make up a majority of the land area at PTA.

Ammunition

Live-fire training exercises occur at the training and impact areas of PTA. These areas have designated SDZs associated with live ammunition firing at range training facilities. SDZs at PTA are configured toward the ordnance impact area. The impact area, comprised of 51,000 acres (20,640 hectares), is off limits to unauthorized personnel due to the hazards from MEC/UXO and from live-fire exercises. In addition, although ICMs are no longer used on Army training lands, PTA has a 16,800-acre ICM impact area within the designated impact area (see Figure 2-8 in Chapter 2). Safe operations and regulations concerning ICM areas are provided in AR 385-63.

The types of ammunition fired at PTA include small arms ammunition up to .50 caliber rounds, as well as medium to large munitions which includes 40mm High Explosive (HE) grenades, mortars, artillery rounds, rockets, and missiles.

Live-fire activities include artillery and mortar (A&M) training, which requires the use of bags filled with explosive propellant for artillery and similar explosive propellant charges for mortars. Charges that are not used during training are burned in an approximately 50 sf (5 sq. m) metal burn pan with a 33 inch (84-cm) containment wall at the designated PTA burn site (USAEC, 2009b). Residues from burned propellant are the only hazardous wastes temporarily stored at the range burn site in a designated hazardous waste satellite accumulation area which is a storage area prior to off-site disposal. The burn site for PTA was selected and constructed in accordance with Section 17-5, DA PAM 385-64, Ammunition and Explosive Safety Standards.

No live-fire is conducted on the KMA. Live-fire ranges are currently located surrounding the impact area to the northeast, north, northwest, east, southeast, and one range is located in the south portion of the impact area. No operational live-fire ranges are found in the west or southwestern portion of PTA's impact area. One inactive range, Training Area 23, is located southwest of the impact area.

MEC/UXO

MEC/UXO is suspected, and has been found in various training areas and the impact area of PTA which presents a potential threat to Army personnel. Please refer to the discussion of MEC/UXO in sections 3.11.3.2, 3.11.3.3, and 3.11.3.3 for MEC/UXO specific to the alternative action locations for the IPBA modernization project.

MEC/UXO is not cleared before maneuvers commence because there is a low level of suspected MEC/UXO in the KMA and other areas where Soldiers maneuver. In addition, Soldiers are taught how to identify MEC/UXO and are trained on proper procedures for notification when MEC/UXO is identified in a training area.

POLs and Storage Tanks

A preliminary assessment and site inspection at PTA was conducted in March and April 1993 (PRC, 1997). Soil samples were obtained across the installation and analyzed for various constituents, including petroleum products. Gross petroleum contamination was not apparent based on field observations and screening. Analytical results indicated that Volatile Organic Compounds (VOCs) and SVOCs were below EPA Region 9 PRGs. Site inspection data for soils in the fire training area indicated the presence of some contaminants of concern, but at concentrations that if left in place, would pose minimal, if any, threat to human health and the environment (PRC, 1997) (US Army and USACE, 2004).

OWS, Wash Racks, and Grease Traps

There are no known OWS or grease traps located at PTA. There are two wash racks located within the Range Area of PTA. Both wash racks are temporary, self-contained, systems with no wastewater discharge.

Lead

Though intact lead ammunition does not readily migrate, lead particles found outside of intact spent lead ammunition may undergo corrosion and may exist in the soil as lead salts. Many of these lead salts differ from the metal in that they are more soluble in water, more easily absorbed by plants and animals, and therefore more toxic than the lead found in intact ammunition. Due to the low precipitation and relatively arid climate at PTA, lead corrosion is not as prevalent.

The Army conducted an ORAP assessment of PTA in 2010 (discussed in detail in Section 3.8). The conclusions of that study found that migration pathways contaminants would use to leave the Range Area do not exist at PTA; therefore, contaminants are generally confined to the range area and within the impact area at PTA.

PBCs

Please refer to the discussion of PCBs and within Section 3.11.1.

Pesticides/Herbicides

The use and storage of pesticides and herbicides at PTA is discussed in section 3.11.1. There are no records of gross pesticide contamination at PTA.

3.11.3.2 IPBA at Western Range Area

No live-fire ranges are currently situated in the Western Range Area. The proposed site for the IPBA is located entirely within the existing PTA impact area. The only hazardous waste identified within the Western Range Area was introduced from firing live-ordnance into the impact area from another part of the range.

In 2010, EOD technicians accompanied personnel that conducted the archaeological resources inventory survey, and the rare plant species survey. EOD technicians identified more than 40 MEC/UXO in the Western Range Area. Separately, USACE-contracted EOD technicians in 2010 conducted a MEC/UXO survey within only the proposed IPBC footprint. The USACE survey was accomplished in 10m transects, and documented several dozen occurrences.[72] All surveys were limited to surface MEC/UXO and ordnance that was partially covered by soil due to ground penetration. The identified MEC/UXO includes 40mm HE grenades, 81mm Mortars, 2.75” Rockets, MK81 250lb and MK82 500lb bombs, 75mm rounds, 105mm rounds, and 155mm rounds (USACE Baltimore District, 2010).[73]

No UXO was found at the proposed location of the Live-fire Shoothouse and MOUT sites, which would be sited to the west of the proposed IPBC footprint. No surveys were taken within the ICM Area, located east of the survey area within the impact area. If the proposed Western Range Area alternative was selected, UXO posing safety hazards to workers constructing the IPBA would be cleared of the range.

3.11.3.3 IPBA at Charlie’s Circle

No live-fire ranges are currently situated in the location of the Charlie’s Circle alternative. The Charlie’s Circle alternative is located entirely within the existing PTA impact area. Similar hazards exist in this area as discussed in Section 3.11.3.2 for the preferred IPBA alternative in the Western Range Area.

The survey area for the Western Range Area alternative overlaps approximately 90 percent of the area that is proposed for the Charlie’s Circle alternative. During the Western Range Area surveys conducted in 2010, MEC/UXO were discovered inside and around the proposed Charlie’s Circle IPBC footprint, and possibly within the footprint of the proposed Live-fire Shoothouse or MOUT. No surveys were taken within the ICM Area, which is located east of the survey area within the impact area. If the Charlie’s Circle alternative was selected, MEC/UXO posing safety hazards to workers constructing the IPBA would be cleared of the range.

3.11.3.4 IPBA at Southwest of Range 20

No surveys for UXO were conducted of the proposed IPBA at Southwest of Range 20. Range 20, a helicopter gunnery range used for helicopter gunnery qualification, is the nearest range to this alternative. The only hazardous waste expected near southwest of Range 20 would have been introduced from live-fire training, including UXO, munitions constituents, lead from expended ammunition, and range scrap containing munitions constituents residue.

3.11.4 Hazardous Waste and Hazardous Material Surrounding PTA

Military Munitions Response Program Sites

There are currently four Military Munitions Response Program (MMRP) sites associated with PTA which are located outside of the current PTA boundary (USAG-HI, 2010d).

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[72] It is assumed that the IPBC would be the first range of the IPBA to be constructed. As discussed in Chapter 2, the Live-fire Shoothouse and MOUT would be constructed using separate funding mechanisms.

[73] USACE-contracted EOD technicians are also trained to identify munitions items that contained depleted uranium. No munitions items suspected of containing depleted uranium were found during this survey. Section 3.12 addresses depleted uranium at PTA.

The Humuula Sheep Station-West was identified during the Army CTT Range and Site Inventory in 2002. The site is located near the intersection of Saddle Road and Mauna Kea access road and was used for bivouac, tactical maneuvers, and air assault operations. The SI resulted in the discovery of both complete and expended blank small arms cartages and a ground burst simulator. This site is currently in the Remedial Investigation/Feasibility Study (RI/FS) Phase.

The Kulani Boys' Home Site, located 10 miles southeast of PTA, was also used for unit bivouac, tactical maneuvers, air assault operations and urban assault training. A two-story building on the site was intended to be a youth correctional facility; however, a fire prevented its intended use and it was subsequently equipped with bullet traps for live small arms ammunition training. This site is currently in the RI phase with a recommendation to further evaluate for MEC/UXO and removal of a contaminated burn pit.

The Pu'u Pa'a Site was acquired by the Navy as an artillery firing range and troop maneuver area and USAG-HI held a lease for 13,272 acres of the Pu'u Pa'a area until the early part of the last decade. This area is located outside of the PTA boundary, west of the intersection of Mamalahoa Highway and Saddle Road. The site is currently in the RI phase.

The Former Waikoloa Maneuver Area is about 91,000 acres in size and located on the western side of Hawaiʻi Island, near Kamuela. The Navy acquired the land in 1943 through a licensing agreement with Richard Smart of the Parker Ranch. Portions of the maneuver area were used as an artillery firing range, and others for troop movements. The entire Waikoloa Maneuver Area was in constant use, as the Marine infantry conducted every phase of training from individual fighting to combat team exercises. Intensive live-fire training was also conducted in forested areas, cane fields, and around the cinder hills, in particular Puʻu Pa, and Holoholoku. The current KMA at PTA is part of the former Waikoloa Maneuver Area.

3.12 DEPLETED URANIUM

3.12.1 Introduction and Region of Influence

This section addresses the presence and hazards associated with depleted uranium (DU) as they relate to modernization activities proposed at PTA. Uranium is a weakly radioactive heavy metal that occurs naturally in the environment. Rocks, soil, surface, water, air, plants, and animals all contain varying amounts of Uranium. Because Uranium is found everywhere on earth, we eat, drink and breathe a small amount every day. However, Uranium is also used as a fuel for nuclear reactors and nuclear weapons. DU is created during the processing of natural Uranium into a fuel source for nuclear power plants or nuclear weapons. DU is used in the manufacturing of ammunitions used to pierce armor plating.[74] It is also used in missile nose cones. Armor made of DU is much more resistant to penetration by conventional anti-armor ammunitions than conventional hard rolled steel armor plate. DU was also used in the body of

[74] Armor piercing ammunitions are generally referred to as "kinetic energy penetrators"

the M101 spotting round for the Davy Crockett weapons system; due to its high density DU replicates the weight of the actual warhead.[75]

Due to the potential hazards AR 385-63 *Range Safety* prohibits the use of DU ammunition for training worldwide. It should be noted that this policy has been in effect for over 20 years.

The Army, based upon considerable concern raised by the public, and based upon the reactive properties of DU, determined that the ROI for DU includes PTA and the areas immediately surrounding the installation.

3.12.2 Health Risks of DU

Depleted uranium, or DU, is a byproduct of the enrichment process. After the enrichment process, DU consists of Uranium-238 (99.28%) (^{238}U), Uranium-235 (0.71%) (^{235}U), and Uranium-234 (0.0058%) (^{234}U), and is 40% less radioactive than naturally occurring Uranium's radioactivity (Office of the Secretary of Defense, 2002).

Military specifications mandated by DoD require that the percentage of ^{235}U be less than 0.3%. However, DoD generally uses DU with a ^{235}U content of approximately 0.2% (USAEPI, 1995)[76].

The Nuclear Regulatory Commission (NRC) conducted extensive studies on the pathways that unique waste streams such as DU may enter the human body and published these study results of online. Unless otherwise noted, the following information is provided at the NRC Web page for unique waste streams (Background Information on Depleted Uranium[77]) (February 2011). Primary exposure pathways where DU may enter the human body is through the inhalation of air and from the ingestion of food and water. The size of Uranium aerosols and the solubility of the Uranium compounds in the lungs and intestinal tract influence the transport of Uranium inside the body. "Coarse [inhalable] particles are caught in the upper part of the respiratory system (nose, sinuses, and upper part of the lungs) from where they are exhaled or transferred to the throat and then swallowed. Fine particles [respirable] reach the lower part of the lungs (alveolar region). If the Uranium compounds are not easily soluble, the Uranium aerosols will tend to remain in the lungs for a longer period of time (up to 16 years), and deliver most of the radiation dose to the lungs. They will gradually dissolve and be transported into the blood stream. For more soluble compounds, Uranium is absorbed more quickly from the lungs into the blood stream. About 10% of it will initially concentrate in the kidneys."

A majority of ingested Uranium compounds never reach the blood stream and are instead excreted through feces; whereas, of the fraction of Uranium that does reach the blood stream, a high percentage of it is excreted through urine over the course of a few days. A small fraction may persist in the kidneys, bones, and in other soft tissue. In high quantities ingested or inhaled Uranium may cause health effects such as kidney damage and renal failure. More commonly, in cases where high quantities of Uranium are ingested or inhaled, the receptor may experience chemical toxicity effects before radiological effects

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[75] The utility of this is to allow the trajectory of the practice round to be similar to the warhead to allow for accurate weapons training.

[76] US Army Environmental Policy Institute, Health and Environmental Consequences of Depleted Uranium Use in the US Army: Technical Report, Atlanta, GA: Georgia Institute of Technology, June 1995

[77] http://www.nrc.gov/about-nrc/regulatory/rulemaking/potential-rulemaking/uw-streams/bg-info-du.html

would occur. Also, due to the mildly radioactive nature of Uranium compounds, once inside the body they may irradiate organs; however the primary health effect is associated with the chemical action on body functions.

In many countries, current occupational exposure limits for soluble Uranium compounds are related to a maximum concentration of 3 micrograms (µg) of Uranium per gram of kidney tissue. Any effects caused by exposure of the kidneys at these levels are considered to be minor and transient or temporary. Current practices, based on these limits, appear to protect workers in the Uranium industry adequately. In order to ensure that this kidney concentration is not exceeded, legislation restricts long term (8 hour) workplace air concentrations of soluble Uranium to 0.2 milligram (mg) per cubic meter and short term (15 minute) to 0.6 mg per cubic meter. Like any radioactive material, there is a risk of developing cancer from exposure to radiation emitted by natural and Depleted Uranium. The annual dose limit set by the NRC for a member of the public is 1 millisievert (mSv) (or 100 millirem (mrem)), while the corresponding limit for a radiation worker is 50 mSv (5,000 mrem). The additional risk of fatal cancer associated with a dose of 1 mSv (100 mrem) is assumed to be about 1 in 20,000. This small increase in lifetime risk should be considered in light of the risk of 1 in 5 that everyone has of developing a fatal cancer. It must also be noted that cancer may not become apparent until many years after exposure to a radioactive material.

3.12.3 Army Use of DU

The Army continues to review and characterize DU on Hawaiʻi. The Army established a public Web site that contains several reports on how DU-containing munitions were used and to what potential extent; a variety of studies based upon samples the Army has taken at several ranges, and some off range areas; human health and risk assessments conducted to characterize the potential risks of DU contact for workers, Soldiers, and off-post receptors that may be exposed to DU; independent studies, and media releases (USAG-HI[78], 2011).

Between 1960 and 1968, the military used the M101 spotting round in training. The M101 was a small (about 8 inches in length and 1-inch diameter) low speed projectile weighing about one pound and containing about 6.7 ounces of DU alloy. The M101 was used primarily to identify the flight path of the Davy Crockett warhead. In August 2005, while conducting range clearance activities to establish ranges at Schofield Barracks, an Army contractor discovered 15 tail assemblies from the M101 spotting round, a component of the Davy Crockett weapon system. In 2006, a scoping survey confirmed the presence of DU fragments from the M101 on a portion of Schofield Barracks' impact area. After confirming the presence of DU, the Army disclosed that information to the public. In 2007, the Army published an *Archive Search Report on the Use of Cartridge, 20mm Spotting M101 for Davy Crockett Light Weapon M28, Schofield Barracks and Associated Training Areas, Islands of Oʻahu and Hawaiʻi* (USACE, May 2007). Limited records exist on the known usage of DU-containing munitions with regard to the Davy Crockett weapons system. The Army, in order to assess an approximation of DU-containing rounds used at Hawaiʻi ranges, conducted an extensive literature search of records from where these munitions were

[78] http://www.garrison.hawaii.army.mil/du/default.htm

manufactured and shipped. The 2007 report details the Army's methodology for determining the use of DU-containing munitions in Hawai'i.[79]

The Army further searched historic records, garrison-wide, where the Davy Crockett may have been used on Hawai'i ranges. The Army used parameters including considering the maximum distance DU-containing munitions may have traveled (this relates to which ranges it may have been fired from), historical range regulations, and map analysis.

3.12.3.1 Use at PTA

Surveys and Studies

Initial Site Reconnaissance

The archives record search for PTA resulted in 12 possible ranges at PTA that could have been capable of using the Davy Crockett; however, based on criteria known to have been regulated for Davy Crockett munitions, the Army identified four potential ranges where the Davy Crockett weapons system may have been used at PTA. These are presently known as Ranges 10, 11T, 14 and 17.

The Army conducted site reconnaissance at PTA to try and better characterize the extent to which DU items or fragments are present in the Range Area. Site reconnaissance combined aerial surveillance of the firing ranges with ground investigations of accessible areas to obtain visual confirmation of the use of the Davy Crockett weapons system. The archives report indicated that potential visual indicators for the Davy Crockett weapons system use include:

- Aluminum shrapnel from the rear body assembly and plastic fiberglass from the fins and windshield of the Projectile, Atomic Supercaliber 279 millimeter (mm) Practice M390;
- Aluminum fin assemblies and projectile body pieces from the Cartridge, 20mm Spotting M101;
- Pistons from either the light or heavy Davy Crockett weapon; or,
- Bright yellow (oxidized) fragments from Uranium alloy components.

Given what was found on Hawai'i based on historical records (use of the M101 spotting round only), the Army's air reconnaissance consisted of helicopters searching for Davy Crockett pistons. Once pistons were located, the Army then could calculate potential firing points and points of impact for the weapons system. Where terrain and safety concerns allowed access, radiological surveys were conducted to measure levels of alpha, beta, and gamma radiation using a Ludlum Model 43-93 alpha-beta probe, Ludlum 44-9 Geiger-Mueller (GM) Pancake Probe, or Field Instrument for the Detection of Low Energy Radiation (FIDLER) (Cabrera Services, 2008). Surveyors additionally collected soil samples of areas at PTA common to both visual and radiological indicators of use of the Davy Crockett. Soil samples were analyzed by the National Environmental Laboratory Accreditation Program (NELAP) for analysis of

[79] The Army is currently finalizing a complete set of reports on the use of the M101 Spotting Round that will update and replace the 2007 report. The Army expects to publish these reports in July 2011.

Uranium nuclide activity concentrations, and specifically for ^{234}U, ^{235}U and ^{238}U. Ten (10) soil samples were collected around the perimeter of the suspect impact areas at the PTA during the scoping survey. Soil samples were collected at areas where sediment had accumulated from past runoff/erosion events.

The study reported that all of the results were consistent with naturally occurring concentrations of Uranium; there was no indication of Uranium depletion. Uranium depletion would show up as concentrations of ^{234}U activity being significantly lower than the ^{238}U concentration.

In 2010, the Army surveyed portions of the western impact area, which correlates to the proposed footprint of the IPBA. Three surveys were conducted in all. Two of the surveys were for threatened and endangered plant species and archaeological resources. The surveyors for these efforts were accompanied by personnel trained and certified in MEC/UXO identification. The third survey was specifically to identify MEC/UXO, and was performed by personnel further trained to identify evidence of use of munitions that contain DU material. In all three surveys, the Army found no evidence of use of DU-containing material.

Airborne DU

The public has raised several concerns over DU migrating outside PTA boundaries in an airborne form. Chief among these concerns is that DU is either aerosolized from the impact of other munitions exploding on top of DU fragments, and is subsequently carried off-post. There is also the fear that dust containing DU particles is carried off-post by wind action. The Army, in response to public concern, conducted a study of airborne DU that began in February 2009 and ended in March 2010; these reports are found at the USAG-HI DU Web site[80]. A final airborne DU report summarizing the study will be released for public review in summer 2011.

The Army placed portable air samplers along the installation boundary at three (3) locations near Saddle Road. Two (2) of the sampling locations were adjacent to the Cantonment Area, and one (1) sampling location was positioned near Waikii Ranch, where the nearest community receptors reside. Each air sample collected PM from midnight to midnight during sample days. The Army followed the USEPA's recommended sampling schedule of every six days during a month. The sampling device's Teflon collection filters were regularly collected and sent to an independent laboratory for analysis. The lab analysis tested for TSP of Uranium (U), ^{234}U, and ^{235}U. The air collection schedule ensured that sampling was conducted when heavy weapons fire occurred at PTA, and also when no heavy training occurred at PTA. Each report on the DU Web site provides a discussion of the type of weapons firing that occurred during sample periods when such events occurred.

The results of each sampling report provides the high-to-low range of the total month's sampling events in terms of TSP ($\mu g/m^3$) collected, the range of Uranium concentrations found during sampling events ($\mu g/m^3$), and the mean concentration of Uranium found during the sampling period (also reported in [$\mu g/m^3$]). The results of Uranium concentrations were plotted on a graph in each report to allow the

[80] http://www.garrison.hawaii.army.mil/du/reports.htm

reader to visually compare sampling results with published guidelines on Uranium exposure from the WHO and U.S. Agency for Toxic Substances and Disease Registry (ATSDR)[81].

In every case, the sampling results at PTA were well below WHO and ATSDR exposure guidelines. During the third sampling month (April 2009), the Army noticed low Uranium content in the TSP samples and increased the sampling run-time from 12 hours (midnight to midnight) to 72 hours, every six days. This was done in an effort to raise the collected Uranium mass to above the practical reporting level (PRL)[82] to demonstrate the Army's commitment to public safety by determining if increasing the sampling event timing would provide significantly elevated results. Six of the sampling months reported that some sample events did exceed the PRL, but noted that in each case these levels were well below WHO and ATSDR exposure guidelines. The July 2009 report could only demonstrate results for a portion of the sampling period as some of the samples recovered became compromised and were subsequently invalidated.

In almost every trial ^{234}U and ^{235}U isotopes were virtually undetectable. One trial demonstrated higher (detectable) Uranium mass, but not reportable levels for ^{235}U. The sum of these reports shows that DU is not migrating off the installation via airborne pathways near any levels that would pose a human health risk.

Health Risk Assessment

The Army published a Baseline Health Risk Assessment (Cabrera Services, 2010) based upon the results of prior studies and what is known from EPA on exposure and potential health impacts from Uranium radionuclides. The report, which is found on the USAG-HI DU Web site, evaluated the potential risks of exposure by first identifying land use practices of the range (to determine who is likeliest to have been exposed to DU), and it also identified potential exposure pathways of DU. An exposure pathway is the channel a chemical may take to reach potential receptors (humans in this case). To determine reasonable pathways, a receptor must have been exposed to a complete exposure pathway that includes a source of contamination (e.g., PTA Range where the Davy Crockett weapons system was used); a primary contaminant release mechanism (e.g., detonation of the M101 spotting round); a secondary source or secondary release mechanism (e.g., degradation of a substance to make it's toxic components available for transport); a transport contact medium (e.g., soil or air[83]); and, an exposure route (e.g., ingestion or inhalation, contact with the skin/dermal or external gamma[84] exposure). The absence of any one of the above elements results in an incomplete exposure pathway; in other words, if there is no exposure, there is no risk.

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[81] The WHO guidelines are based on an annual average of uranium exposure while the ATSDR guideline is based upon chronic exposure (365 days or longer)

[82] The PRL is the minimum reporting activity used when reporting sampling data. In this case, the PRL is 0.00025 $\mu g/m^3$

[83] The lack of surface or shallow groundwater at PTA eliminated exposure of DU through consumption of water. Prior efforts to drill for potable water sources beneath PTA failed to demonstrate that groundwater would be shallow enough to facilitate migration of any chemical materials. Freshwater sources at the installation boundary may be as deep as 300 m (nearly 1,000 ft) below ground surface.

[84] This external exposure pathway accounts for radionuclides that may produce a risk without any physical contact.

Five reasonable maximum exposure receptor scenarios were determined. Off-post receptors were not considered because the results of airborne DU studies showed that there is no complete pathway for humans residing or working near PTA. The five scenarios are current and future range maintenance workers; future construction or remediation workers; adult cultural monitors, visitors, and trespassers; future site workers; and Soldiers training at PTA. Completed exposure pathways include direct contact via ingestion or through contact with the skin, external gamma exposure, and inhalation.

In order to calculate a cancer risk or a non-cancer hazard, the chemical concentration in the environmental medium (e.g., soil) to which an individual may be exposed to DU was estimated; this information is found in the Exposure Duration columns of Table 3.12-1. Exposure pathways were found to be through ingestion (such as consuming soil media that may contain DU residues), inhaling air particulates that may contain trace amounts of DU, and contact through gamma exposure as discussed earlier. Table 3.12-1 demonstrates in conservative values, the duration that any of the five receptor types may be exposed to soil, air, and gamma during the course of their work at PTA and coming into potential contact with DU. The Army subsequently developed a risk assessment to determine the potential cancer risk for these receptors.

Table 3.12-1. Exposure variables for receptors at PTA

Receptor	Exposure Duration			Soil Ingestion Rate	Inhalation Rate
	Years	Days/Yr	Hrs/Day	(mg/d)	(m3/hr)
Current/Future Maintenance Worker	6.6	10	8	100	1.4
Future Construction/ Remediation Worker	3	250	8	330	3
Future Adult Cultural Monitor/Trespasser/ Visitor	30	26	8	100	0.83
Future Site Worker	25	250	8	50	0.83
Current/Future Soldier	25	254	8	100	1.4

Source: CABRERA, 2010

The study concedes to limitations such as an unknown quantity of DU at the Range Area of PTA; therefore, exposure cannot be accurately calculated[85]. The study provided an approximation of DU at PTA based upon known parameters such as DU mass and an understanding of Uranium activity.

Human health risks from radioactivity in soils and structures (referred earlier as gamma exposure) were calculated using computer modeling, in coordination with the Department of Energy (DOE), EPA, and

[85] Based upon a historical records search it is thought that 714 rounds containing DU were fired at PTA, but records are incomplete.

the NRC. Exposure times for each receptor would be similar as shown in Table 3.12-1, but are reported as doses in quantities of millirems. The study went on to integrate a toxicity assessment for Uranium based upon reported EPA risk factors. Table 3.12-2 shows the maximum risk (based upon exposure duration and estimated amounts of DU to which the receptor could have been exposed); and the table shows the maximum risk that receptors' have from potential DU exposure to experiencing adverse health effects.

Table 3.12-2. Estimates of Radiological Dose and Risk Assessments (based upon estimated 714 rounds of DU-containing munitions items at PTA)

Receptor Scenarios	Maximum Dose (millirems/yr)	Maximum Risk
Current/Future Maintenance Worker	$1. \times 10^{-5}$	$5. \times 10^{-11}$
Future Construction/ Remediation Worker	$4. \times 10^{-4}$	$6. \times 10^{-10}$
Future Adult Cultural Monitor/ Trespasser/ Visitor	$3. \times 10^{-5}$	$6. \times 10^{-10}$
Future Site Worker	$2. \times 10^{-4}$	$3. \times 10^{-9}$
Current/Future Soldier	$3. \times 10^{-4}$	$4. \times 10^{-9}$

Source: CABRERA, 2010

The USEPA considers safe, or acceptable, a range of 10^{-6} to 10^{-4}. Table 3.12-2 shows that Current or Future Soldiers, among all receptors, have a maximum risk of 4E-9, which is well below the USEPA acceptable risk range. In other words, based on what is currently known of DU at PTA, no adverse human health impacts are likely to occur as a result of exposure to the uranium present in the soils at the installation.

3.12.3.2 Army/NRC License

During scoping, the public raised concerns that the Army should clean-up DU contamination on its ranges. As a policy, the Army does not close operational ranges for cleanup, but in accordance with DODI 4715.11 *Environmental and Explosives Safety Management on Operational Ranges with the United States* (May 2004), it provides for safe operation of ranges, including limiting hazards on ranges to the extent practicable (e.g., UXO), and to resolve conflicts between explosive safety and other [training] requirements, and to determine whether there is a substantial threat of release of munitions constituents from an operational range.

At PTA, due to the lack of "off-post" exposure pathways, and the very low health risks associated with DU, the Army has decided not to close operational ranges containing DU, but rather restricts the use of HE in areas where DU is known to be present (DODI 4715.11, Section 5.4.9.2).

The Army has applied to the NRC for a source material license to possess Davy Crockett M101 spotting round DU on ranges at PTA. Once issued, this license would not permit "clean-up" of this DU, only possession. If and when the Army decides to "clean- up" this DU, the Army would apply to the NRC for an amendment to the license to allow for this activity (personal communication with the IMCOM Radiation Health Safety Officer, February 2011).

3.13 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Socioeconomics comprise the basic attributes and resources associated with the human environment, including demographic, economic, and social assets of a community. Demographics focus on population trends. Additional demographic data, including race and ethnicity, age, and poverty status, assist with the evaluation of potential environmental justice and protection of children issues. Economic metrics provide information on employment trends, income, and industry earnings. Income information is provided as an annual total by county and per capita. Housing, infrastructure, and services are also influenced by socioeconomic factors.

The baseline year for socioeconomic data is 2009, which is the most recent year that data for most of the socioeconomic indicators are available. The 2010 Census data are not available at the time of writing. Wherever possible, the most recent statistical data are used to characterize current conditions.

3.13.1 Introduction / Region of Influence

The main data points used to describe the prevailing socioeconomic conditions in the area that comprise the ROI include population demographics, economic data such as employment, housing, and income, and other factors such as access to services including schools and emergency services.

PTA is located in Hawai‘i County, which serves as the socioeconomic ROI for this EIS. The ROI is the geographic area in which social and economic impacts are most likely to be felt; Hawai‘i County covers the entire island. Although there are no permanent military personnel residing at PTA, sectors such as housing and services may be indirectly impacted by the expenditures associated with the Proposed Action.

The Hawai‘i County covers the entire island; 12 Census County Divisions (CCDs) comprise the County. A CCD represents a relatively permanent statistical area established cooperatively by the U.S. Census Bureau (USCB) and State and local government authorities that is used for presenting decennial Census statistics in those States for which counties are generally the smallest level of government. Examining the CCDs provides a finer level of analysis in which to examine trends in the local economy. The CCDs are Hilo, Honoka‘a-Kukuihaele, Kau, Kea‘au-Mountain View, North Hilo, North Kohala, South Kohala, North Kona, South Kona, Pā‘auhau-Pa‘auilo, Pāhoa-Kalapana, and Papaikou-Wailea. PTA is primarily contained within the Pā‘auhau-Pa‘auilo CCD, as well as small portions of the North Kona, South Kohala, and North Hilo CCDs

EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) directs agencies to address environmental and human health conditions in minority and low-income communities. Environmental justice addresses the disproportionate and adverse effects of a Federal action on low-income or minority populations. The intent of EO 12898 and related directives and regulations is to ensure that low-income and minority populations do not bear a disproportionate burden of negative effects resulting from Federal actions. In order to provide context for the evaluation of environmental justice, general category descriptions may help to quantify and better illustrate those populations covered by the EO. These categories include economic characteristics such as low-income areas, housing characteristics such as medium- to high-density residential areas and rural areas, and demographic characteristics such as areas with a high percentage of minorities.

The USCB typically defines rural areas as towns outside of an urbanized area with a population of less than 2,500. Definitions of medium- and high-density residential development are typically promulgated at a local level through zoning ordinances and can be addressed on a site-specific level. Typically, however, medium density residential development is characterized by between three and five units, often specifically single-family detached units, per acre. High-density residential development, therefore, may be generally characterized by more than six units per acre (CPED, 2008; Dublin LULRP, 2008).

Finally, as defined by the Environmental Justice Guidance under NEPA (CEQ, 1997), minority populations include persons who identify themselves as Asian, Native Hawaiian or other Pacific Islander, Native American or Alaskan Native, black (not of Hispanic origin), or Hispanic. Race refers to census respondents' self-identification of racial background. Hispanic origin refers to ethnicity and language, not race, and may include persons whose heritage is Puerto Rican, Cuban, Mexican, and Central and South American. A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent (%) or is meaningfully greater than in the general population. In addition, a minority population also exists if there is more than one minority group present and the minority percentage, when calculated by aggregating all minority persons, meets one of the above thresholds.

3.13.2 Population Characteristics

PTA is located in Hawaiʻi County, an area which has undergone significant growth in recent years. The population has grown from 120,317 in 1990 to 172,370 in 2009, with a growth rate more than twice the average growth rate for the State of Hawaiʻi. Table 3.13-1 shows the population counts and percentage changes in the ROI over time, as compared with the State of Hawaiʻi and the U.S. as a whole. The CCDs in which PTA is physically located are denoted in bold text.

Table 3.13-1. Total Population for the ROI and Percent Change

	1990	2000	Percent Change 1990 - 2000	2009*	Percent Change 2000-2009
Hilo CCD	39,574	42,425	7.2%	50,066	18.0%
Honokaʻa-Kukuihaele CCD	3,758	3,895	3.6%	4,211	8.1%
Kau CCD	4,517	5,827	29.0%	6,650	14.1%
Keaʻau-Mountain View CCD	13,993	22,738	62.5%	25,012	10.0%
North Kohala CCD	4,328	6,038	39.5%	5,161	-14.5%
Pāʻauhau-Pa'auilo CCD	**1,849**	**2,213**	**19.7%**	**2,220**	**0.3%**
Pāhoa-Kalapana CCD	6,745	8,597	27.5%	8,963	4.3%
Papaikou-Wailea CCD	5,067	4,961	-2.1%	5,371	8.3%
North Kona CCD	**22,196**	**28,543**	**28.6%**	**37,703**	**32.1%**
South Kona CCD	7,708	8,589	11.4%	8,565	-0.3%
South Kohala CCD	**9,052**	**13,131**	**45.1%**	**16,693**	**27.1%**
North Hilo CCD	**1,620**	**1,720**	**6.2%**	**1,755**	**2.0%**

	1990	2000	Percent Change 1990 - 2000	2009*	Percent Change 2000-2009
Hawai‘i County	120,317	148,677	23.6%	172,370	15.9%
State of Hawai‘i	1,108,229	1,211,537	9.3%	1,280,241	5.7%
US	248,709,873	281,421,906	13.2%	301,461,533	7.1%

Source: US Census Bureau, Decennial Census, 2011a

*2009 data from 2005-2009 American Community Survey 5 yr survey estimates

In 2009, Hawai‘i County accounted for approximately 13.5% of the total state population, a slight increase over 2000. With a population of 172,370, the county is the second largest in the state.

PTA primarily occupies the Pā‘auhau-Pa'auilo CCD, which has the second-smallest population in the county, and in which growth slowed significantly between 2000 and 2009. The North Kona and South Kohala CCDs showed some of the highest growth percentages in the county during that same time. Although PTA is adjacent to some of the larger population centers on the island, such as the North Kona CCD, and there are civilian and military personnel who work there, no military or civilian personnel permanently reside at PTA.

Low-income or poverty areas are defined using the statistical poverty threshold from the USCB, which is based on income and family size. The USCB defines a poverty area as a census tract in which 20 percent or more of its residents are below the poverty threshold and an extreme poverty area as one in which 40 percent or more are below the poverty level. The 2007 poverty threshold for a family of four with two children under the age of 18 was $21,027 (USCB, 2008). Tables 3.13-2and 3.13-3 show poverty levels and racial distribution in the CCDs that contain or surround PTA. The percentage of individuals living below the poverty line in Hawai‘i County decreased between 2000 and 2009; however, it is still significantly higher than that of the State. Within the CCDs surrounding PTA, Pā‘auhau-Pa'auilo has demonstrated a higher poverty level than the others, although poverty levels have come down throughout the county, most dramatically in the North Hilo and South Kohala CCDs.

Table 3.13-2. Percentage of the Population Below the Poverty Line

	2000	2009
Pā‘auhau-Pa'auilo CCD	11.30%	9.50%
North Kona CCD	9.70%	7.70%
South Kohala CCD	8.50%	4.90%
North Hilo CCD	9.20%	3.40%
Hawai‘i County	15.7%	13.5%
State of Hawai‘i	10.7%	9.4%

Source: US Census Bureau, 2011a

Table 3.13-3. Racial Distribution of Population Surrounding PTA

	White	Black or African American	American Indian or Native Alaskan	Asian	Native Hawaiian or Pacific Islander	Other race	Two or more races
Pāʻauhau-Pa'auilo CCD	32.30%	<0.01%	0.00%	27.80%	5.50%	<0.01%	34.00%
North Kona CCD	44.70%	<0.01%	<0.01%	17.10%	10.20%	5.50%	21.50%
South Kohala CCD	47.50%	1.40%	<0.01%	20.80%	9.10%	1.40%	19.10%
North Hilo CCD	31.60%	1.10%	0.00%	31.80%	11.00%	0.01%	23.90%
State of Hawai'i	26.90%	2.40%	0.30%	38.50%	8.80%	1.30%	21.70%
US	74.50%	12.40%	0.80%	4.40%	0.10%	5.60%	2.20%

Source: US Census Bureau, 2011a

As shown in Table 3.13-3, the demographics of Hawaiʻi differ considerably from those of the rest of the U.S. For the nation as a whole, the Asian population comprises 4.4% of the total population, with white being the majority race by a considerable margin. However, in Hawaiʻi, not only is the Asian population 38.5% of the total, compared with 26.9% white, but the Native Hawaiian or other Pacific Islander population is 8.8%, as compared with 0.1% for the U.S. Within the CCDs surrounding PTA, the North Hilo CCD had the highest percentage of non-white populations (67.81%) (USCB, 2011a).

3.13.3 Economic Characteristics

Table 3.13-4demonstrates that the economy of Hawaiʻi County continued to grow from 1990 to 2009, with growth in per capita income outpacing that of the State and the nation.

Table 3.13-4. Per Capita Income in the ROI

Location	1990	2000	Percent Change 1990-2000	2009	Percent Change 2000-2009
Hawai'i County (ROI)	$13,169	$18,971	44.1%	$25,960	36.8%
State of Hawai'i	$15,770	$21,525	36.5%	$28,662	33.2%
US	$14,420	$21,587	49.7%	$27,401	26.9%

Source: US Census Bureau, Decennial Census and American Community Survey

According to the Hawaiʻi County Comprehensive Annual Financial Report (County of Hawaiʻi, 2010), the largest employers in the County are the State, County, and Federal governments. While individual hotels and resorts rank lower on the list of principal employers in the county, the combined total employees from these hotels and resorts, 3,295 individuals in 2009, exceeds the total employment associated with County and Federal employment. Table 3.13-5 shows the top employers in Hawai‘i County for 2009.

Table 3.13-5. Principal Employers, County of Hawai‘i (2009)

Rank	Employer	# of Employees
1	State of Hawai‘i	8,115
2	Hawai‘i County	2,745
3	U.S. Government	1,364
4	Hilton Waikoloa Village	984
5	Wal-Mart	852
6	KTA Super Stores	800
7	Mauna Loa Resort	685
8	The Fairmont Orchid	577
9	Four Seasons Resort Hualalai	562
10	Hapuna Beach Prince Hotel	487

Source: County of Hawai‘i, 2010

Federal government expenditures in Hawai‘i totaled approximately $24.6 billion in 2009. Defense expenditures accounted for 36 percent of federal spending in 2009, down from approximately 39 percent in 2000.Nonetheless, defense spending in Hawai‘i more than doubled between 2000 and 2009 to $8.8 billion (Hawai‘i Department of Business, Economic Development, and Tourism [HDBEDT], 2009). In 2009, per capita defense spending in Hawai‘i reached $5,826.09, fourth in the 50 U.S. behind Alaska, Virginia, and the District of Columbia (USCB, 2009). The economic impacts of defense spending have a ripple effect throughout the Hawaiian economy due to additional demand for goods and services from personnel associated with the installation and the increased demand for goods and services generated by vendors and contractors associated with the military installations.

Unemployment in the county was 9.7% in 2009, up from 4.7% in 2000, and is above both the national and State averages. Table 3.13-6 shows average annual unemployment for the ROI in comparison with the State and the nation.

Table 3.13-6. Annual Average Unemployment

	1990	2000	2009
Hawai‘i County	3.5%	4.7%	9.7%
State of Hawai‘i	3.2%	4.0%	6.8%
US	5.6%	4.0%	9.3%

Source: Bureau of Labor Statistics, 2011

Overall unemployment has remained consistently higher in the ROI when compared to its larger context. Furthermore, poverty in Hawai‘i County has consistently been significantly higher than for the State, and on par with or higher than the national average. Table 3.13-7 shows the percentage of the population below the poverty line over time.

Table 3.13-7. Percentage of Population below the Poverty Line

	1990	2000	2010
Hawai‘i County	14.2%	15.7%	13.5%
State of Hawai‘i	8.3%	10.7%	9.4%
US	13.1%	12.4%	13.5%

Source: US Census Bureau, 2011a

Employment growth figures for Hawai‘i County contrast substantially with State and national averages. The construction sector grew by 87.5% from 2000 to 2009, further underscoring the growth seen in the area. The national average for growth in the construction industry for that same time period was 19.5%. Other areas of strong employment growth in Hawai‘i County were in the manufacturing and retail trade sectors. Although construction sector growth was relatively high at the State and national levels at 54.3% and 20.5%, respectively, from 2000 to 2009, other top-growth sectors differed. Table 3.13-8 shows employment by industry sector for the nation, State, and Hawai‘i County from 2000 to 2009.

Table 3.13-8. Employment by Industry Sector (Nation)

US	2000*	2009**	Percent Change 2000-2009
Agriculture, forestry, fishing and hunting, and mining	2,426,053	2,576,402	6.2%
Construction	8,801,507	10,520,876	19.5%
Manufacturing	18,286,005	15,887,145	-13.1%
Wholesale trade	4,666,757	4,516,754	-3.2%
Retail trade	15,221,716	16,277,681	6.9%
Transportation and warehousing, and utilities	6,740,102	7,173,048	6.4%
Information	3,996,564	3,450,324	-13.7%
Finance, insurance, real estate, and rental and leasing	8,934,972	10,033,714	12.3%
Professional, scientific, management, administrative, and waste management services	12,061,865	14,540,450	20.5%
Education, health, and social services	25,843,029	30,390,213	17.6%
Arts, entertainment, recreation, accommodation, and food services	10,210,295	12,395,164	21.4%
Other services (except public administration)	6,320,632	6,842,841	8.3%
Public administration	6,212,015	6,698,533	7.8%
Total Population	**129,721,512**	**141,303,145**	**8.9%**

[redacted]

State of Hawai‘i Sector	**2000***	**2009****	**Percent Change 2000-2009**
Agriculture, forestry, fishing and hunting, and mining	12,119	9,200	-24.1%
Construction	32,180	49,665	54.3%
Manufacturing	18,979	19,913	4.9%
Wholesale trade	17,188	17,111	-0.4%
Retail trade	65,693	70,255	6.9%
Transportation and warehousing, and utilities	33,559	33,144	-1.2%
Information	13,278	12,071	-9.1%
Finance, insurance, real estate, and rental and leasing	37,867	41,992	10.9%
Professional, scientific, management, administrative, and waste management services	51,039	60,213	18.0%
Education, health, and social services	102,254	120,162	17.5%
Arts, entertainment, recreation, accommodation, and food services	86,189	94,412	9.5%
Other services (except public administration)	23,853	26,845	12.5%
Public administration	43,711	50,176	14.8%
Total Population	**537,909**	**605,159**	**12.5%**
Hawai‘i County Sector	**2000***	**2009****	**Percent Change 2000-2009**
Agriculture, forestry, fishing and hunting, and mining	4,600	3,535	-23.2%
Construction	5,057	9,480	87.5%
Manufacturing	1,685	2,364	40.3%
Wholesale trade	1,786	2,260	26.5%
Retail trade	7,826	10,591	35.3%
Transportation and warehousing, and utilities	3,546	3,420	-3.6%
Information	1,159	1,038	-10.4%
Finance, insurance, real estate, and rental and leasing	3,346	5,024	50.1%
Professional, scientific, management, administrative, and waste management services	5,596	7,172	28.2%

Education, health, and social services	12,287	15,368	25.1%
Arts, entertainment, recreation, accommodation, and food services	11,462	14,635	27.7%
Other services (except public administration)	2,911	3,714	27.6%
Public administration	3,718	4,366	17.4%
Total Population	**64,979**	**82,967**	**27.7%**

Source:
*2000 data from US Census Bureau 2000 Census
**2009 data from 2005-2009 American Community Survey 5 yr survey estimates

3.13.4 Housing and Community Services

3.13.4.1 Housing

Soldiers training at PTA are stationed at SBMR, located on O‘ahu, which has family housing units, bachelor quarters, and housing for visitors; there are no housing facilities at PTA.

Housing stock in the ROI has grown rapidly since 2000, with an estimated growth in housing units of more than 45% (USCB, 2011a). This rate of growth is more than four times the State and national averages, and corresponds to the significant growth seen in the construction sector as noted earlier. Table 3.13-9 shows growth in the housing sector from 2000 to 2009

Table 3.13-9. Total Housing Units within the ROI

	Total Units 2000*	Total Units 2009**	Percent Change 2000-2009
Pā‘auhau-Pa'auilo CCD	767	925	20.6%
North Kona CCD	13,960	19,216	37.7%
South Kohala CCD	5,794	8,431	45.5%
North Hilo CCD	661	687	3.9%
Hawai‘i County	52,985	76,893	45.1%
State of Hawai‘i	460,542	505,087	9.7%
US	115,904,641	127,699,712	10.2%

Sources:
*2000 data from US Census Bureau 2000 Census
**2009 data from 2005-2009 American Community Survey 5 yr survey estimates

In 2009, 65.7% of all housing units in the ROI were owner-occupied, significantly below the national average of 88.2%, although higher than the State average of 58.1% (USCB, 2011a).

3.13.4.2 Public Safety

Public safety services on the island are typically divided into two main service areas, East and West. The Hawai‘i County Police Department (HCPD) has eight (8) district stations throughout the county, in addition to the HQ located in Hilo. The County Police Department had a total annual budget in 2008 – 2009 of $49,222,966 (HCPD, 2009).

Army staff provides all police services on PTA. Units that come to PTA for training may bring MP of their own, depending on the size of the unit and other circumstances. The PTA police facility is located in the Cantonment Area and is open 24 hours a day, seven days a week.

The Hawai‘i County Fire Department (FD) has 20 full-time fire/medic stations, and 20 volunteer fire stations, with more than 60 pieces of apparatus available for emergency response activities. The County FD had a total annual budget of $37,187,821 in 2009 (County of Hawai‘i, 2010).

Fire response services are provided by Army staff based at PTA. There is one fire station, located at BAAF, with a staff of six (including two emergency medical technicians sharing duty round the clock). Available equipment includes two brush trucks (wildland rigs), a tanker, a crash rig, and an ambulance.

3.13.4.3 Medical Facilities

There are several major medical facilities in Hawai‘i County, as well as many others on neighboring islands. These include North Hawaiian Community Hospital, a 39-bed hospital located in Waimea; Hilo Medical Center, the largest facility in the Hawaiian Health Systems Corporation with 264 beds; Kona Community Hospital, a 94-bed primary health care facility Ka‘u Hospital, a 21-bed rural health clinic and critical access hospital; and Hale Ho’ola Hāmākua, a 50-bed critical access hospital providing long-term care. These facilities offer a wide range of services to meet the needs of the rural and urban populations in Hawai‘i County.

3.13.4.4 Education

The Hawai‘i County School District, headquartered in Hilo, operates a total of 77 public schools in the county, including public charter schools. In addition, there are another 41 private and Catholic high schools in the county. There are 37 public elementary schools in the county, nine of which are charter schools. Sixteen private and Catholic schools round out the elementary education offerings in the county. There are 24 middle schools comprised of seven charter schools and 14 private schools. There are 16 public high schools, four of which are charter schools and 11 private schools. The public school system serves 27,068 students in Hawai‘i County.

3.13.5 Protection of Children

EO 13045, Protection of Children from Environmental Health and Safety Risks, requires Federal agencies to identify and assess environmental health and safety risks that might disproportionately affect children. Environmental health and safety risks primarily include risks attributable to products or substances that a child is likely to come into contact with or to ingest. In 2009, approximately 22.6% of the State’s population was made up of children (under 18 years old), which is a decrease of 3% from 2000.

In 2009, 23.5% of the population of Hawaiʻi County was under the age of 18. Within Hawaiʻi County, the Kau, North Kohala, and Pāhoa-Kalapana, CCDs had the highest population percentages below the age of 18 (29.65%, 28.6%, and 27.55%, respectively), and the Hilo, North Kona, and Keaʻau-Mountain View CCDs had the largest total populations of children (10,241, 8,526, and 6,627, respectively). PTA mainly occupies the Pāʻauhau-Paʻauilo CCD and small portions of the North Kona, South Kohala, and North Hilo CCDs. The percentages of the populations of North Hilo, North Kona, Pāʻauhau-Paʻauilo, and South Kohala CCDs under the age of 18 were 19.5%, 22.6%, 24.8%, and 25.6%, respectively (US Census Bureau 2000, 2009).

3.14 PUBLIC SERVICES AND UTILITIES

3.14.1 Introduction and Region of Influence

Public services and utilities constitutes the infrastructure available to the public that together, preserves a community's ability to support living and working conditions, enhance economic growth, and respond to emergencies. The ROI for this resource area is the extent to which these services are used by PTA, on- and off- the installation.

3.14.1.1 Public Services

Police

PTA has a MP station at the installation that is open 24 hours per day, seven days per week, and is staffed by Army personnel. MPs at PTA have the responsibility to respond to emergencies at the installation, but may also be available to support County Police if needed, and coordinate with County Police on a regular basis (US Army and USACE, 2004; USAEC, 2009b). MPs at PTA do not patrol Saddle Road, rather, that is accomplished by county Police. In addition, when battalions deploy to PTA for training they may also bring with them MPs.

Fire

Army staff at PTA provides fire response services to the installation. The fire station is located at BAAF and is operated by 29 firefighters, which has access to three fire trucks, one military helicopter (one UH-60, CH-46/7, or CH-53), and one backup helicopter. Fire personnel respond to fires, regularly inspect facilities throughout the Cantonment Area, and may also inspect firebreaks around Range Areas and supporting infrastructure such as dip tanks throughout the installation. The full capability of the PTA FD is discussed in Section 3.15 Wildfires (Moller, 2011).

Emergency Medical

Emergency medical services at PTA are via Army staff based at the installation. Services at PTA are limited as there is no hospital on-site, so Soldiers or civilians that are inflicted with serious medical emergencies must be flown by helicopter to Hilo Medical Center, which is 10 minutes away by air. PTA emergency staff does respond to accidents along approximately 25 miles (40.2 km) of Saddle Road (US Army and USACE, 2004; USAEC, 2009b).

3.14.1.2 Utilities

Utilities are the systems that are essential to support PTA's daily operations. They include a broad array of services (e.g., water, wastewater, electricity, solid waste management, telecommunications, etc.), and can either facilitate or limit development. Changes in land use, population density, and development usually generate changes in the demand for and supply of utilities. The Hawaiian Public Utilities Commission (PUC), an office of the Department of Budget and Finance, regulates all franchised or certificated public service companies operating in the State.

An essential component of in an area is the availability of utilities and their capacity to support growth. The utilities to be discussed in this section include water, wastewater, electricity, solid waste management, and telecommunications.

Water

The Army pays for potable water to be trucked to PTA from county wells, primarily from the Waimea well, to the Cantonment Area using tankers with a 5,000-gallon capacity. Once at the Cantonment Area water is transported to two pump stations that in turn distribute water to two 670,000-gallon distribution reservoirs where the water is chemically treated using powdered chlorine and then distributed to three 10,000-gallon reservoirs on the installation. Water from these reservoirs supplies PTA, BAAF, and fire reserves (C. H. Guernsey & Company 2001, USAEC, 2009b). Water consumption at PTA may be at 10,000 gallons per day (gpd) corresponding to minimal Troop presence; to up to approximately 70,000 gpd when PTA is near full training capacity. During heavy water usage days the installation may contract up to 14 tanker trucks of potable water. If demand cannot be met by the Waimea well, excess demand can be supplied by the City of Hilo (USAEC, 2009b).

Wastewater

In 2004, EPA Region IX required the conversion or removal or all LCCs. The Army complied with Federal and State cesspool regulations by converting its LCCs to septic systems and utilizing UIC wells. Permits for UICs are issued by the HDOH-SDWB. All wastewater at PTA is handled through septic tanks and/or underground injection wells in accordance HDOH-SDWB, UIC permit UH-2609. Injectant from permit UH-2609 is limited to septic tank-treated domestic wastewater from five separate septic tank wastewater treatment systems. Under this permit, the State requires the Army to conduct daily monitoring, quarterly sampling, periodic inspections, and annual status reporting. On-site staff at PTA completes these regulatory requirements for submittal to HDOH-SDWB (personal communication with USAG-HI DPW Environmental Storm water and wastewater Program Manager, 2011).

Electricity

PTA's electrical energy is provided by the HELCO from a HELCO-owned substation located outside the northeast fence of the Cantonment Area to the main base substation. At the substation, the 69-kV transmission voltage is transformed down to the 12.47-kV primary distribution voltage through a radial distribution system[86] feeding the remainder of the installation, using a 2,500-kVA transformer. The base owns, operates, and maintains the distribution network beyond the substation; the components of this system include metering equipment, 29 transformers, 20 miles (32.2 kilometers) of overhead lines, and 755 poles. PTA's current electricity usage is approximately 1,718,400 kWh per year, and electricity consumption has increased steadily in recent years (DOE, 2010).

The total 2010 capital expenditure budget forecasted for HELCO is approximately $59 million, with several individual Capital Improvement Projects (CIPs) in excess of $1 million. One such project is to install a substation at Hokukano, which is located to the west of PTA. According to the PUC, the five-year capital expenditures forecast for HELCO is expected to remain relatively stable, with no major increases expected (PUC, 2010).

Although alternative sources of energy, such as using photo-voltaic (PV) cells to power the lights on the BAAF airstrip, have been tried at PTA to reduce overall energy usage, these systems have not yet been successful at PTA. PTA was nominated by Army officials in 2010 to be a prototype installation for a net zero energy assessment and planning. As part of this process, a study was conducted by the National Renewable Energy Laboratory (NREL) to evaluate the potential for increasing energy efficiency and increasing the use of renewable sources of energy. While not ultimately selected as the prototype installation, the Army is using the information gained by conducting the NREL study to seek energy and environmental sustainability opportunities at PTA for both range and cantonment areas, including waste to energy projects, renewable energy, water conservation, waste minimization and management.

PTA was also recently awarded funding under the American Recovery and Reinvestment Act (ARRA) for the installation of two additional solar systems. The likely locations for the systems are on the HQ building and the fire station.

Solid Waste Management

As with other utility usage numbers at PTA, the amount of waste generated is highly dependent on the number of troops currently using the installation, as well as the number of troop days in a given year. In 2010, average waste generated was estimated at 3 tons per day, or approximately 1,100 tons per year (DOE, 2010). This is more than a threefold increase over a 2002 study that concluded with an annual estimate of 296 tons of industrial solid waste based on the waste and recycling streams generated during the third quarter of 2002 (USARHAW and 25th ID(L), 2001; USAEC, 2009b).

PTA has been nominated by the Army as a test site for a waste to energy demonstration project. This project will support the installation's net zero installation goals as defined in NREL (DOE, 2010).

2010 annual waste disposal costs for the base were estimated at approximately $166,250. The landfill on the island is nearing capacity, but there are plans in place to open new cells to create additional capacity in the future.

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[86] A radial system has only one power source for a group of customers. A radial network leaves the station and passes through the network area with no normal connection to any other supply. This is typical of long rural lines with isolated load areas. A power failure, short-circuit, or a downed power line would interrupt power in the entire line which must be fixed before power can be restored.

3.14.2 Public Services and Utilities Surrounding PTA

The nearest community facilities to PTA is the Waikii Ranch and the Kilohana Girl Scout Camp that are located near the installation boundary at the northwest, just adjacent to the KMA.

Uniformed Police services are provided by the County of Hawaiʻi to this area. Fire services are provided by the Waikii Range 9A Volunteer FD that has two (2) fire response trucks (one engine with a 500-gallon tank, and a Brush Truck with a 300-gallon tank capacity) (Waikii Ranch HOA, 2009[87]). The Army, under a MOA for the Implementation of an Intensive Fire Management Zone (IFMZ) in the Proposed West PTA Acquisition Area (now known as KMA) (DACA84-9-06-51, 31 May 2006) agreed to fire management mitigations to be implemented at KMA to reduce the potential for fire ignition; and also included providing emergency medical services and to facilitate fire suppression at the Ranch as necessary. Emergency hospital services may be provided at North Hawaiʻi Community Hospital or at the Hilo Medical Center.

Water is provided to the community through two (2) deep wells on the premises that meets existing water demand. Other utilities are provided to that area via Hawaiiantel (Waikii Ranch HOA, 2009).

3.15 WILDFIRES

3.15.1 Introduction and Region of Influence

Wildfire management on PTA is conducted in accordance with the Integrated Wildland Fire Management Plan (IWFMP), (AR 420-90), DoDI 6055.6, Fire Protection Program (USAG-HI and the 25th ID, 2003), BOs, and MOA. The IWFMP for all Hawaiian Army-administered lands was developed to establish specific guidance, procedures, and protocols for managing wildfires on Army training lands (HDQA, 2006). The IWFMP is the primary guidance document with respect to environmental conditions and fire effects in Hawaiʻi, fire prevention, fire suppression, post-fire actions, and fire management areas. Impacts of project activities would occur in locations covered by the IWFMP (U.S. Army and USACE, 2008a; USAEC, 2009b). The IWFMP establishes specific guidance, procedures, and protocols for managing wildfires on Army training lands in Hawaiʻi, including PTA (USAEC, 2009b). These are presented below in Table 3.15-1. Implementation of these policies varies from installation to installation.

The ROI for wildfires is all areas in which project-related activities may occur, including the footprint of each training and construction area and the corridors of the military vehicle roads. The ROI studied for the purpose of this analysis is defined by the legal boundaries of PTA (see Figure 2.1-9, Chapter 2).

Table 3.15-1. Fire Prevention Policies for Army Training Areas in Hawaiʻi

Fire Prevention	Policies
Planning	Planning activities include procedures, purchases, and budgeting to improve the Army's prevention of and response to wildfires. Procedures include, but are

[87] http://www.waikiiranchhoa.com/index.php?option=com_content&view=article&id=48&Itemid=56

Fire Prevention	Policies
	not limited to, implementing a Fire Danger Rating System (FDRS), fire reporting procedures, and keeping records on the maintenance of vegetation modifications and wildfire occurrences.
Fuel Management	Fuel management activities include fire access road and fuel management corridor construction, expansion, and/or maintenance; and fuels management including prescribed burning, construction of dip ponds, and firefighting actions. Dip ponds are plastic-lined, earthen ponds that serve as a water storage resource that would be available for aerial fire bucket operations, thereby enhancing firefighting capabilities.
Fuels Modification	Fuels modification is defined as removing and/or modifying an area of flammable vegetation, thereby managing the fire hazard by changing the vegetation type. The goal is to maintain a fuel condition that makes fires easier to control. Mechanical treatments1, chemical treatments, biological treatments, and prescribed burns are implemented as part of the IWFMP.
Firefighting Actions	Firefighting actions may take place at any time and at any installation. This includes helicopter bucket drops of freshwater, retardant, foam, and in emergencies, saltwater. Firefighting activities may also involve cutting fire lines by hand or by bulldozer, burnout operations, and increased traffic in the form of firefighters on foot and in vehicles as well as in the air. Because firefighting is considered an emergency operation, it is exempted from NEPA under 32 CFR part 651.11.

Source: US Army Garrison-HI and 25th ID, 2003.
1 Mechanical treatments – Consist of altering vegetation (rip up, bury, flail, or cut down) often with the use of a bulldozer or tractor.

Military training activities, the existence of heavy loads of readily ignitable fuel and the prevalent dry conditions of the area presents fire management problems for the training area and adjoining lands. Military use for live-fire exercises and target practice has increased ignition frequency dramatically and resulted in numerous small fires. Fires caused by tracer ammunition are the largest cause of fires at PTA. Since July 1990, over 3,237 hectares (8,000 acres) have been recorded as burned at PTA. Based on fire history at PTA, the data show that the western and the northern sections of PTA potentially face the greatest threat of wildfire (USAG-HI and 25th ID, 2003).

The PTA Wildfire SOP (PTA Wildfire SOP) provides specific responsibilities of the Army Federal FD (PTA FD), Range Control Safety staff, and military training units conducting live-fire exercises at PTA for the prevention and suppression of wildfires. The SOPs main objective is to prevent unplanned ignitions by means of preventive measures and the establishment of procedures for fire control and natural / cultural resources protection from wildfires (Moller, 2003).

Fire prevention and the ability to control the spread of fires is critical for the continued survival of endangered plants, animals, and native ecosystems, and the Army's continued use of PTA for live-fire training. As detailed in Water Resources (Section 3.7), there is no natural surface water at PTA. At PTA, these native habitats are located throughout the training area and adjacent to the installation boundary. Currently, there are many instances where military operations conflict with the management of these special natural resources. The use of various ammunitions, weapon systems, and pyrotechnics during live-fire training exercises can increase the risk of wildfire. Live-fire training has the potential to burn large areas of native vegetation and threatened endangered species of plants and animals if not properly planned and executed. The continued use of Army training lands in Hawaiʻi depends upon the Army's ability to reduce the number of fire starts and control fires within the installation boundary. These conflicts often result in reduced training capability as wildfires cease valuable training opportunities. Fire management actions are designed to reduce existing conflicts between necessary military training activities and the conservation of natural and cultural resources found within PTA (USAG-HI and 25th ID, 2003).

Fire prevention includes fire management, education, enforcement, engineering, ignition control, and fire management actions. The actions below are components of the PTA Wildfire SOP and IWFMP and provide the overall framework to address wildfire management and prevention (Moller, 2003; USAG-HI and 25th ID, 2003).

3.15.1.1 Fire Prevention

Fire prevention is critical for the continued survival of endangered plants, animals, and native ecosystems, and the Army's continued use of PTA as a live-fire range. Fire management actions are designed to reduce existing conflicts between necessary military training activities and the conservation of natural and cultural resources found within PTA. The following classifications aide in fire prevention at PTA:

Vegetation Fuels Classification

The wildland fire fuel types found at PTA are based on plant communities mapped by Shaw et al. (1997). These were grouped into seven classes to aid in mapping (refer to Figure 3.9-1) derived from a set of fuel models representing fire behavior fuel models. More information on plant communities are also discussed in Biological Resources, Section 3.9. The vegetation classes at PTA are shown below in Table 3.15-2 (USAG-HI and 25th ID, 2003).

Table 3.15-2. Vegetation Fuels Classification

Class	Description	Fuel Model Correlate
Barren and Sparsely Vegetated Lands	Lands dominated by barren lava or lava possessing a discontinuous and open vegetation structure. These lands comprise the majority of PTA. They do not have fuel loads sufficient to carry fire and are suitable to use as natural firebreaks	None

Class	Description	Fuel Model Correlate
Perennial Grassland	Land dominated by perennial alien (*Pennisetum setaceum*) and native (predominately *Eragrostis atropioides*) grasses averaging about 1 m in height. Found primarily on older substrates having relatively developed soils (~10,000 years old), however, some *P. setaceum* dominated lands are found on younger lava. These grasslands extend down slope from PTA on the leeward side of Hawai‘i in the North Kona and South Kohala districts below 1900 m (6232 ft AMSL). Fine fuel loads are usually continuous and 0” to 3” deep. Grass litter accumulation is usually high	1
Lowland Montane Shrubland	Land dominated by low-structure shrubs or a mixture of low-structure shrubs and annual and perennial grasses. Includes Dodonaea shrubland, Myoporum Shrubland and Chenopodium shrubland. Found primarily on Mauna Kea substrate with relatively developed soils. Grass and shrub litter accumulates to form continuous fine fuel loads, which carry flame lengths of 2-3 m on the average (observation). These shrublands occupy portions of the Pōhakuloa plain along Saddle Road (2,428m or 6,000 ft) and parts of the Kīpuka Kālawamauna down slope into the lowland regions of Pu‘u Anahulu and Pu‘u Nohona o Hae (1,009m or 2,493 ft). These shrublands burn frequently (every 1-4 years)	2
Tall Montane Shrubland and Scrub	Land possessing vegetation that is dominated by a mixture of taller (>2 m) woody plant species in a relatively dense structure. A continuum of fine fuels in the understory creates an environment where fire is easily carried. This fuel type includes dense mixtures of woody and herbaceous plants in the Kīpuka ‘Alalā and other relatively old Mauna Loa kīpukas, and the Dodonaea mixed shrubland and Chamaesyce treeland of Kīpuka Kālawamauna. These types occur below 2,428m (6,000 ft). Observed flame lengths in this type average 3-4 m	3
Subalpine Open Treelands and Low Shrub	These plant communities exist on Mauna Loa lava where soil development is minimal. The overstory is sometimes scattered with Ohia (*Metrosideros polymorpha*) trees and the understory is made up of a mixture of ‘a’ali’i (*Dodonaea viscosa*), pūkiawe (*Styphelia tameiameia*), and ‘Ūlei (*Osteomeles anthylidifolia*). Herbaceous fuel loads are low, however, in many of these areas the shrub layer is dense enough to carry a fire. These types occur in the southwestern and southeastern portions of PTA up to 2,655 m (6,560 ft)	4

Class	Description	Fuel Model Correlate
High-stature Upland Shrub	Land dominated by some form on the Naio (*Myoporum sandwicense*) and māmane (*Sophora chrysophyla*) tall shrub formation. These vegetation associations vary in quantity of fine fuels in the understory and density of the shrub overstory. On younger lava, this type can possess an open or closed stand structure and has little herbaceous material in the understory. On older sites, like those on the slope of Mauna Kea, and in older kīpukas of Mauna Loa, native and alien grasses create a continuous fine fuel bed in the understory. At PTA these types occur below 3,035 m (7,500 ft)	5
Ohia Mixed Treeland	This fuel type is restricted to middle-aged Mauna Loa lava between below 2,124 m (5,248 ft). The overstory is dominated by Ohia and other native tree species (*Myrsine lanaiensis*, *Myoporum sandwicense*, and *Santalum paniculatum*), while the understory is a continuous fuel bed of shrub grasses and forbs	6

Source: US Army Garrison-HI and 25th ID, 2003

Furthermore, prescribed burns are conducted as part of firefighting activities should a fire originate to prevent the further spread of the fire. If prescribed burns are used as an ongoing management procedure, the Army would consult with the USFWS and perform a Section 106 consultation prior to implementation (USAG-HI, 2010c).

Furthermore, in accordance with a 2006 MOA between the U.S. Army and the Waikii Range Homeowners' Association, the KMA (discussed as West PTA Acquisition Area under the MOA) requires the Army to manage the parcel as an IFMZ to alleviate concerns regarding potential impacts associated with military training, due to its high ignition and hazard rating (described below). The MOA also requires several mitigation measures to be conducted by the Army, ensuring such impacts do not occur to the extent possible (U.S. Army and USACE, 2008a).

Resource Protection

PTA contains an abundance of biological and cultural resources. Based on the numerous natural resources present on PTA, five wildfire areas have been designated based on existing and planned fuel management corridors. The impact area is not considered because pre-suppression activities there are not possible and resources at risk are largely unknown. Each area was assigned an ignition potential, hazard, and value based upon the best currently available information and is presented below in Table 3.15-3. The ratings listed were agreed upon by representatives of the USFWS and USARHAW. Kīpuka Kālawamauna, Mauna Kea, and Kīpuka 'Alalā areas are at highest risk (USAG-HI and 25th ID, 2003).

Table 3.15-3. Wildfire Areas and Prevention Analysis at PTA

UNIT	IGNITION RATING	HAZARD RATING	VALUE RATING
Unit A – Kipuka Kālawamauna	**Moderate** - Restricted training and maneuvers, fire threat from Puʻu Anahulu	**Heavy** - Heavy shrub fuels mixed with Pennisetum setaceum	**High** - Presence of listed plant species
Unit B – Mauna Kea	**High** - Heavy military activity	**Moderate** - Fine fuels or shrubs with little understory in discontinuous Fuelbeds	**High** - Adjacent to Critical Habitat and palila core population, and presence of listed species
Unit C – Kīpuka ʻAlalā	**Low** - No military training, little human activity	**High** - Heavy shrub fuels with fine fuels in the understory, few existing firebreaks	**High** - presence of listed plant species
Unit D – Red Leg Trail	**High** - Heavy military activity	**Low** - Mostly barren, isolated vegetated areas, fires easily contained	**Low** - Minimal presence of listed plant species
Unit E – Mauna Loa	**Moderate** - Occasional firing of fire prone weapons, little human activity	**Low** - Sparsely vegetated and barren lands	**Low** - No known listed species
Unit F – Ke'āmuku Maneuver Area	**High** - Military activity expected to be heavy, pyrotechnics authorized	**High** - Expected removal of grazing will increase fuel load and continuity	**Low** - Several scattered populations of listed species

Source: US Army Garrison-HI and 25th ID, 2003

By assigning values of 0, 1, and 2 to the low, moderate, and high designations respectively, and adding the values for ignition potential, hazard, and value, a priority level for each area has been determined (Table 3.15-4) (USAG-HI and 25th ID, 2003).

Table 3.15-4. Pre-Suppression Priorities for Locations on PTA

Map Label	Location	Pre-Suppression Priority
Unit A	Kīpuka Kālawamauna	5
Unit B	Mauna Kea	5
Unit C	Kīpuka ʻAlalā	4
Unit F	Ke'āmuku Maneuver Area	4
Unit D	Red Leg Trail	2
Unit E	Mauna Loa	1

Source: US Army Garrison-HI and 25th ID, 2003.

Education

Education activities include briefing Soldiers, posting signs, and providing brochures. Soldiers are briefed prior to training about fire prevention, and cultural and natural resource protection. Signs are posted throughout various areas as reminders of prevention and awareness of the FDRS. The FDRS is used to rank fire danger based on known ignition sources. The ITAM and directorate of DPW, Environmental Conservation Office provides training units within informational brochures to increase public and Soldier awareness of the threat that wildfires pose to natural resource values.

Enforcement

Enforcement consists of existing military training regulations and SOPs that cover training activities and restrictions based on potential fire danger. PTA Range Control safety staff has the primary responsibility for ensuring that all regulations and SOPs are adhered to. Range Control and FD personnel have the authority to stop live-fire training for noncompliance with any training regulation and/or SOP. Secondary responsibility rests with using unit commanders.

Engineering

Fire access roads, along with fuel management corridors, are part of the fire-fighting infrastructure system at PTA. Numerous fuelbreaks/firebreaks and fuel management corridors have been constructed on PTA and several are planned in the future. Planned engineering projects on training ranges are reviewed by the Wildland Fire Program Manager to ensure that fire prevention measures are considered during design, construction or alignment of new ranges. An annual work plan identifying fire management projects is developed each year. This ensures projects such as prescribed fire, maintenance of firebreak roads, herbicide treatments, etc. are accomplished while avoiding conflicts with military training activities.

Ignition Control

Ignition control is used to protect sensitive resources as well as training lands throughout PTA. A FDRS is used at PTA, as well as wind speed criteria for the restrictions and/or use of pyrotechnics at PTA. The following ignition control measures are currently used at PTA:

<u>Fire Danger Rating System</u>

A FDRS is currently used at PTA to prevent fires. The intent of rules governing the use of weapons systems and pyrotechnics is to protect endangered plants and their habitats as well as training lands throughout PTA. A FDRS designed specifically for PTA was developed by the USFWS and CSU based on analysis of PTA's fire history, fuels, fire behavior models, and weather/climatology. National fire danger rating indices as recommended by the U.S. Forest Service and CSU are applied to the predominant fire carrying vegetation in each of six fire danger rating areas (refer to Table 3.15-5).

Table 3.15-5. Fire Danger Class System for PTA

Station	Training Area	FIRE DANGER CLASS (BURNING INDEX)				
		Low	Moderate	High	Very High	Extreme
PTA East	1-6, 21	1-24	25-32	33-41	52-58	59+
PTA North	7-17	1-21	22-30	31-37	38-54	55+
PTA Kīpuka ‘Alalā	23	1-19	20-29	30-36	37-50	51+
PTA West	18-20, 22	1-34	35-54	55-66	67-84	85+
PTA Kīpuka ‘Alalā	Impact Area	1-17	18-26	27-36	37-48	49+
PTA West	Ke’āmuku	1-34	35-54	55-66	67-84	85+

Source: US Army Garrison-HI and 25th ID, 2003.

The burning index (BI) for each danger rating area, as determined by the FDRS, is used to rank fire danger based on known ignition sources. The BI's are monitored every hour, on the hour, and prior to projected "hot" range status. Range control notifies training units every hour, on the hour, of any training restrictions being imposed as a result of unfavorable fire danger ratings. Additionally, at any time that the BI changes from one category to another, the training unit is notified. Training restrictions based on the different fire danger classes is provided below in Table 3.15-6.

Table 3.15-6. Fire Danger Class System Training Restrictions

Fire Danger	Training Restrictions
Low	None
Moderate	None
High	No tracers, WP
Very High	No pyrotechnics, smoking or cooking/warming fires
Extreme	No live-fire except ball and blank munitions. Ball and blanks allowed only at fixed ranges. Maneuver training limited to fixed ranges, Training Areas 7-9, 12-16, and 21.

Source: US Army Garrison-HI and 25th ID, 2003.

A supplemental system using wind speed criteria is currently in place for the restriction and/or use of pyrotechnics at PTA. Wind speed criteria and rules describing specific restrictions in various training areas are outlined in Table 3.15-7 below (USAG-HI and 25th ID, 2003).

Table 3.15-7. Wind Speed Criteria used on PTA

<table>
<tr><th>FACTORS</th><th colspan="3">RULES FOR PYROTECHNICS FIRED INTO:</th></tr>
<tr><th>Average Wind Speed (knots)</th><th>Impact Area</th><th>Training Areas</th><th>Fixed Ranges</th></tr>
<tr><td>0-10</td><td>Pyrotechnics allowed in Areas E and W1.</td><td rowspan="2">Blank Ammunition and simulators allowed except in Palila Critical Habitat and Endangered Plant Habitats2.</td><td rowspan="2">Pyrotechnics allowed in Area E.</td></tr>
<tr><td>11-15</td><td rowspan="2">Pyrotechnics not allowed Area W.
Pyrotechnics allowed in Area E.</td></tr>
<tr><td>16-20</td><td rowspan="2">Pyrotechnics not allowed.

Blank ammunition only in cleared areas.</td><td rowspan="2">Pyrotechnics not allowed in Area E.</td></tr>
<tr><td>>20</td><td>Pyrotechnics not allowed in Areas E and W.</td></tr>
</table>

Source: US Army Garrison-HI and 25th ID, 2003.

1 Area E = Impact Area which lies east of a line between grid coordinates 2175 and 3084; Area W = Impact Area west of the same line. See map in Appendix 3 to the PTA External SOP.

2 Aerial signal flares and hand-held illumination pyrotechnics are not to be fired into any training areas or fixed ranges, unless for emergency purposes.

Fire Management Actions

PTA has one FD, which consists of 29 firefighters (Moller, 2011), three fire trucks, one military helicopter, one UH-60, CH-46/7, or CH-53, and one backup helicopter. PTA has a minimum of ten fully qualified and trained firefighting staff, at least one Humvee equipped to fight fire, and a radio dispatcher. The PTA FD also has, upon request, a platoon unit (minimum of 20 members) to assist in fighting wildfires per the PTA Wildfire SOP. PTA currently maintains three Bambi fire buckets: two (2) 660-gallon (2,498-liter) and one (1) 2,000-gallon (7,571-liter) for emergency backup use by military UH-60, CH-53, or CH-47 aircraft assigned to conduct fire bucket operations. A military helicopter with a certified and trained aircrew capable of performing fire bucket operations are on site at PTA during live-fire training operations. A UH-60, CH-46/7, or CH-53 are on site when Battalion or Brigade sized units deploy to PTA. In addition, a backup helicopter under contract services to the Army is available and able to arrive at PTA within 90 minutes after notification (USAEC, 2009b).

Other firefighting resources include three leased 5,000-gallon [18,927-liter] water tankers, HMMWV's, and helicopters. The water tankers are parked at designated spots to shuttle water to refill dip tanks or provide a water source for ground fire-fighting crews. In addition, two HMMWV's or brush engines equipped with a 300-gallon [1,135-liters] slip-on pump unit (Class A foam capable) and one water tender (2,000-gallon [7,571-liter] capacity) or equivalent are assigned and available for initial attack response at PTA

In the event of a wildland fire on any range, impact area or maneuver area at PTA, the Officer in Charge (OIC) immediately initiates a "cease fire" order and remains in the area with the unit subject to the orders of the Range Control and/or PTA FD when they arrive on the scene. Fires started in the impact area are monitored for potential escape or threat to high valued areas. Units are not allowed to resume training until the fire is extinguished or until approved by the Range Operations Supervisor and/or PTA Deputy Fire Chief (USAG-HI and 25th ID, 2003).

An auxiliary wildland firefighting force provides an initial attack on a fire before the FD arrives. The Hawaiʻi County FD, HDLNR, and Hawaiʻi Volcanoes National Park also assist with wildfire suppression. An additional position, PTA Wildland Fire Coordinator was added to the PTA FD. The PTA Wildland Fire Coordinator works closely with the Wildland Fire Program Manager to facilitate pre-suppression actions on Hawaiʻi Island and assists in the firefighting duties of the PTA FD.

In addition to the PTA FD, there are cooperative agreements with other local fire cooperators (Hawaiʻi County FD, NPS, State Civil Defense, National Guard, and Division of Forestry and Wildlife) for mutual aid support to provide for multiple agency response and cooperative assistance between agencies. The 25th ID and USARHAW on Oʻahu also provides additional firefighting resources upon request (USAEC, 2009b).

Should a fire occur, fire incidents (to include fires in the impact areas) are documented at PTA to ensure an accurate fire history is maintained. Fire reports are used to track location, size, cause, frequency, and for fire trend analysis for future input and use in fire threat analyses (Moller, 2003).

3.15.2 PTA Cantonment Area

Fire Fighting Infrastructure

There is no natural surface water at PTA; therefore, water storage for dipping is located throughout the installation. In 1996, the Army constructed six above ground dip tanks (each 80,000-gallon [302.83-liter] capacity) at PTA to enhance its water supply resources and firefighting capability. One non-potable 60,000-gallon [227,124-liter] dip tank is located near the Cantonment Area located at BAAF. It is equipped with a fire pump capable of providing rapid water resupply services to fire vehicles or water tenders in support of water shuttle delivery to and from the fire area (USAEC, 2009b). The Cantonment Area also has one fire cache, one fire hydrant, one fire pump, and five water tanks. A fire access road/fuel management corridor and one fuelbreak/firebreak are located at the northern perimeter of the Cantonment Area (USAG-HI and 25th ID, 2003).

There are also numerous locations to refill fire fighting vehicles or tankers throughout PTA. The PTA Cantonment Area has a fire hydrant water distribution system that can be used in support of wildfire suppression operations. However, water usage must be closely monitored during extended fire operations to ensure that water levels are not entirely depleted from the main storage tanks at PTA. During major fire operations, the DPW shall continuously monitor usage for replenishment and to ensure safe and acceptable water levels for base camp usage.

Vegetation Fuels Classification

The vegetation fuels classification for the Cantonment Area is identified as Barren and Sparsely Vegetated Lands and Lowland Montane Shrubland (refer to Table 2). Barren and Sparsely Vegetated Land do not have fuel loads sufficient to carry fire and are suitable to use as natural firebreaks. Lowland Montane Shrubland has grass and shrub litter that can form continuous fine fuel loads, which carry flame lengths of 2-3 m on the average. The majority of the Cantonment Area consists of Barren and Sparsely Vegetated Lands.

Fire Danger Rating System

FDRS information for the Cantonment Area is provided above in Table 3.15-5, under PTA North.

According to the Integrated Wildland Fire Program Manager, the development and enforcement of the FDRS, on-site dip ponds and other required firefighting resources, and a comprehensive IWFMP have been the most important resources used to prevent the start and spread of wildfires. The IWFMP establishes guidance, procedures, and protocols for managing wildfires that may occur within the Cantonment Area (USAEC, 2009b).

Resource Protection

As previously mentioned, six wildfire areas have been designated on PTA to protect natural and cultural resources. The Cantonment Area falls under Unit B – Mauna Kea, which is an area that has a high Ignition Rating, high Value Rating, and moderate Hazard Rating. Natural resources within the Cantonment Area are limited, and cultural resources include Quonset huts (potential historic properties) and the PTA Curation facility, which houses artifacts recovered from archaeological sites throughout the installation (refer to Section 3.9 Biological Resources, and 3.10 Cultural Resources).

3.15.3 PTA Range Area

3.15.3.1 General Range Area

Fire Fighting Infrastructure

Fire access roads, along with fuel management corridors, and dip tanks are part of the fire control system at PTA. Fire access roads are the Army's first defense to fires initiated off the installation. All fire access roads have been constructed to USARHAW standards (outside / approaching fire direction of 30 feet [20 feet wide with a buffer area of reduced vegetation maintained at 10 feet) (Moller, 2011). Fire access roads are maintained twice a year and fuels controlled with herbicides or vegetation cutting. The current firefighting infrastructure in place on PTA is shown in Figure 3.15-1 (Fire Management Facilities), and 3.15-2 (Fire Access Roads).

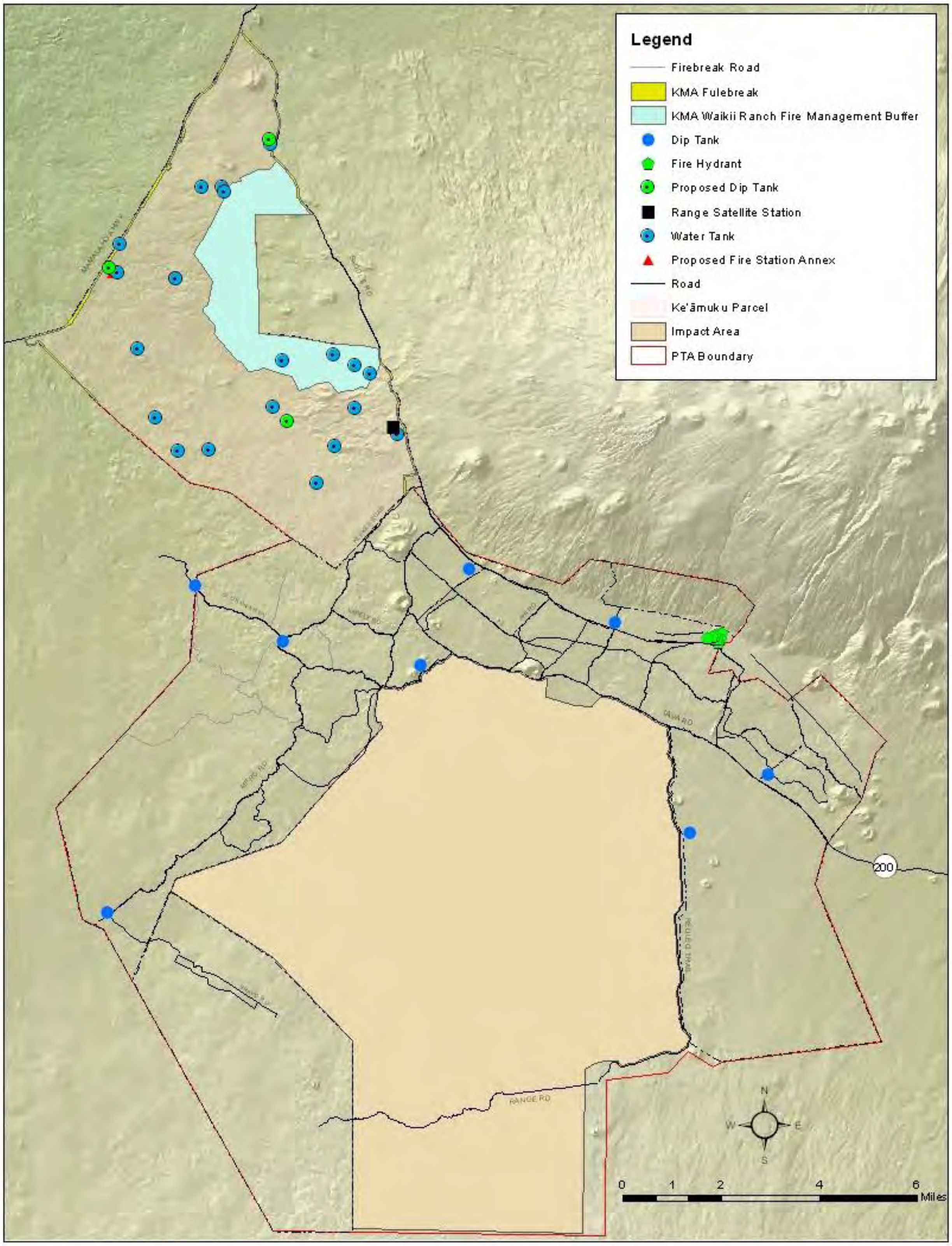

Figure 3.15-1. Fire Management Facilities

As of June 2006, approximately 27 km (17 mi) of access roads exist in the northwest portion of PTA with an additional 24 km (15 mi) requiring construction. An additional 10 km (6.4 mi) of access road has been constructed along Saddle Road, which serves an approximately 16.4 km (10 mi) fire access road for the northern portion of the installation (Moller, 2011).

Currently, the Range Area is surrounded by an access road. Adjacent to the Twin Pu'us, a firebreak (10-20-30 standard) has been constructed and maintained (Moller, 2011).

Firebreaks/fuelbreaks at PTA are currently in the planning and development stage. Existing firebreaks/fuelbreaks include Mamaloahoe Highway to the west, and Saddle Road to the east of PTA. The new Saddle Road realignment will also act as part of the firebreak/fuelbreak system to the south of KMA. There are currently 12 priority firebreaks/fuelbreaks at PTA, with 10 firebreaks/fuelbreaks located in the western PTA conservation lands, and two located around the pu'us in the KMA (Peshut, 2011). Several firebreaks/fuelbreaks are planned for construction in the near future (refer to Figure 3.15-2) (Moller, 2011). The proposed firebreaks/fuelbreaks would encompass approximately 60.5 km of road. Of the total, 83% (50.3 km) would utilize existing roads and the remainder would require new construction. Approximately half (23.7 km) of the existing roads would need some improvement. Gates would be installed on west side fire access roads to prohibit vehicle access (including motorcycles and all-terrain vehicles) (HQDA, 25th ID and USAG-HI). Four fuel management corridors have been constructed in the western portion of PTA (Moller, 2011).

Existing fire access roads within the western portion of PTA are currently being maintained (Moller, 2011). Maintenance projects, as well as future planned construction of firebreaks/fuelbreaks, will be monitored and measures will be taken to reduce erosion. Palliatives for dust suppression are applied when necessary. Access roads will be kept clear of vegetation. The Army actively works to consider all possible fire prevention and management options, knowing that any fire on PTA is more significant than in most other places because of its native communities and federally listed species. Information will be included in all pamphlets (e.g., hunting, Soldier field cards, etc.) as to the need to prevent fire (e.g., no smoking, don't drive vehicles with catalytic converters off roads), the valuable resources that can be lost, as well as who to contact in case of a fire (USAG-HI, 2010c).

The KMA currently has existing firebreaks/fuelbreaks that border most of the parcel. The existing roads along the southwestern boundary are proposed for improvement (not an action proposed in this Programmatic EIS) in the near future. A fire access road system utilizing existing roads and new construction is proposed for KMA (refer to Figure 3.15-2). Fire access roads are also proposed in the near future for the Waiki'i Ranch properties. One satellite fire station is also proposed for construction in the KMA sometime in the future (Waiki'i Ranch HOA, 2009). The fire station would house four personnel during training rotations that are occurring during higher fire danger ratings. The station will have one or two (depending on the risk) Type VI brush trucks (Moller, 2011). Firebreaks/fuelbreaks are also around Pu'u Nohona o Hae and Pu'u Papapa, both put in for protection of endangered plant species that grow on those pu'u.

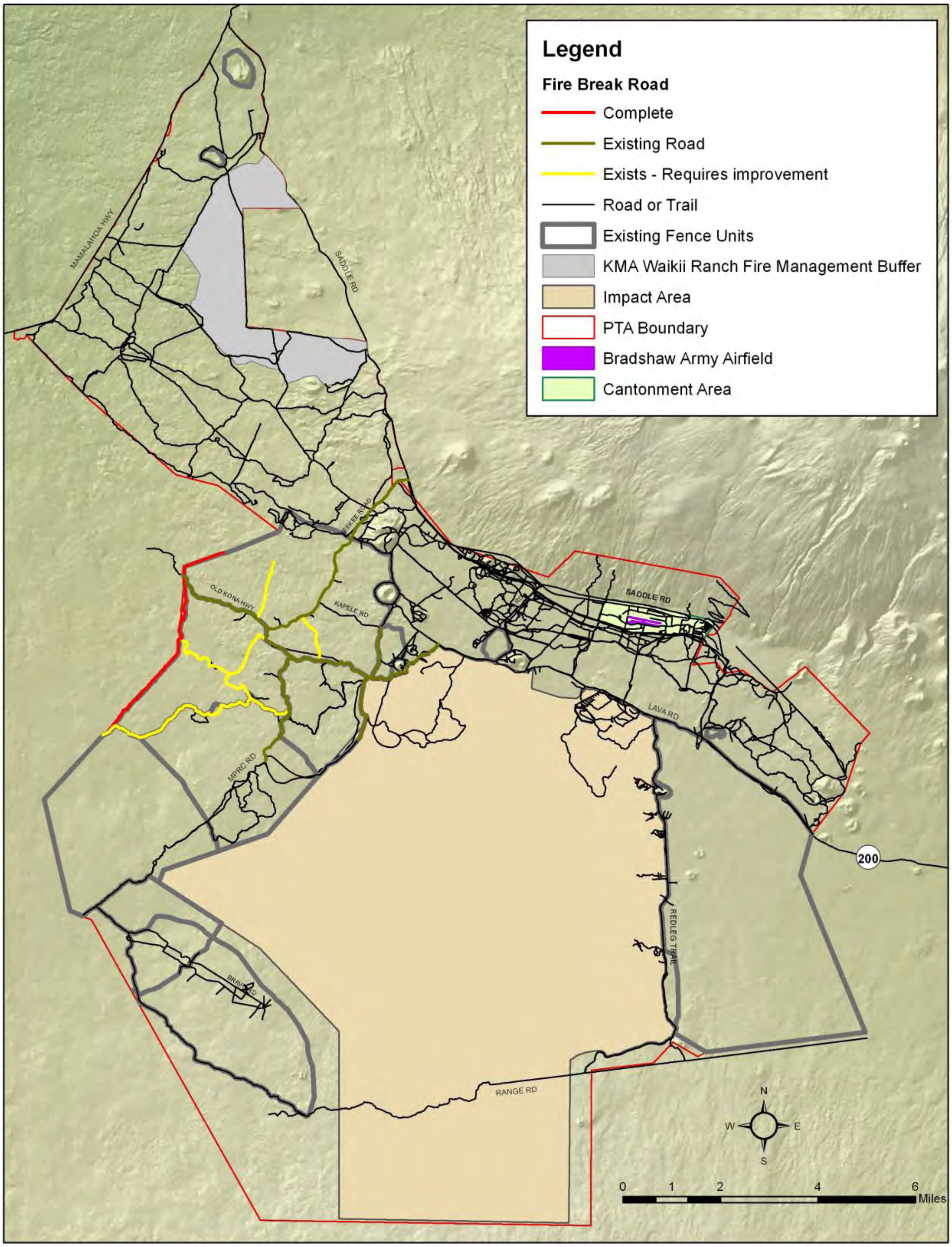

Figure 3.15-2. Fire Access Road System for KMA

Fuel corridors help reduce the chance of a catastrophic wildfire event (USFWS, 2003). PTA currently has one fuel corridor, the Eastern Fuel Management Corridor, which is located on the north end of Red Leg Trail along the Old Saddle Road (Moller, 2011). Three fuel management corridors are proposed for construction on PTA sometime in the future if fuels grow in the area (Moller, 2011). Each corridor will be approximately 100 to 300 m (328 to 984 ft) wide and canopy cover is not to exceed 20 percent. Four fuel management corridors will be constructed in areas with little or no existing fuel. Initially, the corridors would be monitored once every five years to determine whether fuels management needs to be initiated.

Once management has begun, these corridors will be monitored biannually and treated whenever necessary to remain within specifications (HQDA, 25th ID and USAG-HI). The formation of Fuel Management Areas allows for the outplanting of listed species on-site and reduces the risk of species loss due to large, catastrophic wildland fires (USFWS, 2003). These corridors consist of the following (USAG-HI, 2010c):

- **Ke‘āmuku Fuel Management Corridor.** This corridor runs from Bobcat Trail northwest along the center of the Ke‘āmuku lava flow.
- **Southern Fuel Management Corridor.** Starts at the southern end of Red Leg Trail, following the Old Hilo Road west to the ‘Alalā Fuel Management Corridor. The area is sparsely vegetated. Mechanical or herbicide application may be necessary is some areas.
- **‘Alalā Fuel Management Corridor.** Runs along the 1859 lava flow at the southwestern edge of the installation proper. This corridor is lightly vegetated and runs to the east of the Kīpuka ‘Alalā, thereby isolating the kīpuka from the rest of the installation.

PTA also has dip tanks at various locations. One dip tank is located adjacent to the Kīpuka Kālawamauna Endangered Plant Habitat area by the Twin Pu’u range footprint. Another dip tank is located in the Kīpuka Kālawamauna area. Three dip tanks, each with an 80,000 gallon capacity, are present in the western area of PTA, as well as one near the Training Area 23 Quarry, one near Old Kona Highway, and three for KMA (Moller, 2011).

<u>Vegetation Fuels Classification</u>

The vegetation fuels classification for PTA is discussed above in Table 3.15-2.

<u>Fire Danger Rating System</u>

FDRS information for PTA is provided above in Table 3.15-5.

<u>Resource Protection</u>

As previously presented in Tables 3.15-3 and 3.15-4, six wildfire areas have been designated on PTA to assist in the protection of natural resources. Furthermore, prior to a training exercise, all Soldiers are briefed about fire prevention, and cultural and natural resources protection.

There is also a Range Control safety staff that ensures all regulations and SOPs are adhered to. Range Control and FD personnel have the authority to stop any live-fire training activity for noncompliance with any training regulation or SOP. The unit commanders are also responsible for compliance with training regulations and SOPs. Failure to comply with regulations governing fire safety and prevention policies may result in termination of training activities, de-certification, and administrative disciplinary action.

3.15.3.2 IPBA at Western Range Area

Fire Fighting Infrastructure

The Western Range Area does not have any fire access roads or fuel management corridors; however, an access road is located along the perimeter of the impact area (Moller, 2011).

Vegetation Fuels Classification

The vegetation fuels classification for the Western Range Area consists of Barren and Sparsely Vegetated Lands, Subalpine Open Treelands and Low Shrub, and High-stature Upland Shrub (refer to Table 3.15-2). Barren and Sparsely Vegetated Lands do not have fuel loads sufficient to carry fire and are used as natural firebreaks. Subalpine Open Treelands have low herbaceous fuel loads, however, in some areas the shrub layer is dense enough to carry a fire. High stature Upland Shrub varies in quantity of fine fuels in the understory and density of the shrub overstory. On younger lava, this type can possess an open or closed stand structure and has little herbaceous material in the understory. On older sites, native and alien grasses in some of these areas can create a continuous fine fuel bed in the understory. The main vegetation community within the Western Range Area is the Subalpine Open Treelands and Low Shrub.

Fire Danger Rating System

The FDRS for the Western Range Area falls under PTA Kīpuka ʻAlalā– Impact Area, as provided in Table 3.15-5.

Resource Protection

Although the impact area is not presented in Table 3.15-3, the ignition and hazard ratings are not expected to be extreme due to the overall lack of continuous fine fuel bed in the understory. Listed plants are known to be present within the proposed range as previously described in the Biological Resources section, Section 3.9.2.2. Fires within this area would not be expected to spread easily due to the overall lack of fuel loads sufficient to carry a fire; however some areas with dense shrub may be able to sustain a fire.

3.15.3.3 IPBA at Charlie's Circle

Fire Fighting Infrastructure

Charlie's Circle does not have any fire access roads or fuel management corridors (Moller, 2011).

Vegetation Fuels Classification

The vegetation fuels classification for Charlie's Circle is the same as the Western Range Area.

Fire Danger Rating System

FDRS information for Charlie's Circle is provided in Table 3.15-5 and would be the same as that described for the Western Range Area.

Resource Protection

The ignition and hazard ratings for Charlie's Circle are expected to be the same as the Western Range Area based on the same vegetation fuels classification for the area. Listed plants are also known to be present within the range as discussed in the Biological Resources section, Section 3.9.2.3.

3.15.3.4 IPBA at Southwest of Range 20

Fire Fighting Infrastructure

The proposed IPBA at Southwest of Range 20 location does not have any fire access roads or fuel management corridors (Moller, 2011).

Fire Danger Rating System

The FDRS for the proposed IPBA at Southwest of Range 20 falls under PTA Kīpuka ʻAlalā– Impact Area, as provided in Table 3.15-5.

Vegetation Fuels Classification

The vegetation fuels classification for the proposed IPBA at Southwest of Range 20 consists of Barren and Sparsely Vegetated Lands and Subalpine Open Treelands and Low Shrub (refer to Table 3.15-2). The predominant vegetation community in Southwest of Range 20 is Subalpine Open Treelands and Low Shrub.

Resource Protection

Although the impact area is not presented in Table 3.15-3, the ignition and hazard ratings are not expected to be extreme due to the overall lack of continuous fine fuel bed in the understory. Listed plants have the potential to be present within the area as discussed in the Biological Resources section, Section 3.9.2.4. Fires within this area would not be expected to spread easily due to the overall lack of fuel loads sufficient to carry a fire; however some areas with dense shrub may be able to sustain a fire.

3.15.4 Wildfires Surrounding PTA

Historically, fire in the area of PTA was most likely rare and of little significance, limited to volcanically started fires and occasional lightning ignitions. Lightning, arson, or discarded cigarettes have been the largest fires started near PTA that later burned into the installation (US Army Garrison-HI and 25th ID, 2003).

Wildfires within the surrounding area have predominantly occurred near the western portion of PTA. The most recent fire burned 3,500 acres along PTA's western border (Moller, 2011). There have been four fires in the past 15 years on PTA. KMA has had six fires in the past three years (Moller, 2011). The Hawaiʻi County FD, NPS, State Civil Defense, National Guard, and Division of Forestry and Wildlife are available for fire suppression should a fire occur within the surrounding area.

Hawai‘i’s Comprehensive Wildlife Conservation Strategy outlines a statewide strategy for native wildlife conservation, including wildfires. The Comprehensive Wildlife Conservation Strategy also identifies the cooperative efforts of the U.S. Army, Hawai‘i State DLNR and the Hawai’i Department of Forestry and Wildlife at the Manua Loa Forest Reserve. Collectively, these agencies work to protect natural resources and prevent fire. In addition to this, the Pōhakuloa INRMP outlines the use of exclosures and “intensive management areas” on PTA along with ongoing monitoring and fire prevention and control to help prevent the spread of wildfires to the surrounding area (USAG-HI, 2010c).

3.16 SUSTAINABILITY

This section describes the installation-level sustainability initiatives undertaken at PTA which address a number of Federal and Army-level regulations and statutes that establish energy efficiency, sustainability, and GHG directives.

Given increasing constraints on installation resources, the Army needs to maintain mission readiness and training realism while balancing its regulatory compliance responsibilities. DoD’s sustainability vision, as stated in its Strategic Sustainability Performance Plan, is “to maintain the ability to operate into the future without decline – either in the mission or in the natural and manufactured systems that support it” (DoD, 2010b). The Army developed sustainability initiatives to comply with a number of Federal regulations and mandates that focus on realizing efficiencies in current and future Army operations in the following major categories: energy and reliance on fossil fuels, waste, water resources, and elements of climate change.

3.16.1 Federal Regulations and Policies

The following major Federal mandates include sustainability provisions applicable to Army activities:

- EISA of 2007
- EO 13423 Strengthening Federal Environmental, Energy, and Transportation Management in Acquisition
- EO 13514 Federal Leadership in Environmental, Energy, and Economic Performance

EISA 2007 was enacted to increase energy efficiency, increase use of renewable energy, and decrease dependence on foreign fuel sources. The provisions associated with EISA 2007 that affect Army activities include those on fleet fuel economy, lighting efficiency, and energy efficiency in electronics (EISA 2007).

EO 13423 established goals for Federal agencies to “conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.” Goals set under EO 13423 include reducing energy intensity by 3% annually; reducing water consumption intensity by 2% annually; reducing petroleum consumption by 2% annually; increasing alternative fuel consumption by 10% annually; and ensuring that 15% of new Federal construction incorporates sustainable building practices. In addition to these quantifiable targets, EO 13423 also sets a number of other more general sustainability goals, such as reducing hazardous waste production, increasing renewable energy consumption and sustainable acquisition practices, and preventing excess waste.

EO 13514 expands upon EO 13423 by requiring that Federal agencies make greater strides in reducing GHGs. EO 13514 establishes a series of edicts for Federal agencies to reduce GHGs, with deadlines, including appointment of a Senior Sustainability Officer; setting reduction targets for scope 1 and scope 2 GHG emissions; setting reduction targets for scope 3 GHG emissions and drafting a Strategic Sustainability Performance plan; and conducting a GHG inventory.

- Scope 1 GHG emissions are direct emissions from sources belonging to the Federal government, such as direct tailpipe emissions from Government-owned vehicles.
- Scope 2 GHG emissions are direct emissions from generating electricity, steam or heat used by Federal agencies.
- Scope 3 emissions are indirect emissions from sources related to Federal agency activities, such as emissions resulting from Government employee travel and commuting.

These regulations and policies were designed to make all Federal operations more sustainable in a general sense. At the Federal level, the focus is to "create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations" (EO 13514, 2009). Sustainability, as it applies to Army and PTA activities, means adherence to the mission, environment, and community. Sustainability, in this respect, takes into consideration current and future activities along with best management and environmental practices.

3.16.2 Army and USAG-HI Regulations and Policies

The following Army and USAG-HI (Garrison-level) sustainability initiatives were derived to execute the sustainability requirements of the Federal mandates listed above:

- DoD GHG Targets
- DoD Strategic Sustainability Performance Plan
- 2004 Army Strategy for the Environment
- USAG-HI Strategic Sustainability Action Plan 2008-2010

In compliance with EO 13514, DoD announced its GHG reduction target on January 29, 2010 with a GHG emissions reduction goal 34% lower than its 2008 GHG emissions baseline, to be achieved by FY 2020 (DoD, 2010a). This goal is applicable to non-combat activities only, and would be implemented in part through DoD's compliance with the other energy efficiency aspects of EO 13514, EO 13423, and EISA 2007 as part of the FY 2010 DoD Strategic Sustainability Performance Plan.

The DoD Strategic Sustainability Performance Plan mirrors the environmental areas addressed by the Federal regulations: energy and reliance on fossil fuels, chemicals and materials, water resources management, and maintaining readiness in the face of climate change. In addition, the Plan also establishes a detailed implementation plan for achieving the 34% GHG reduction target. Scope 1 and 2 GHG emissions would be reduced through facility energy efficiency, increased utilization of renewable energy, decreased use of petroleum products in non-tactical fleet vehicles, and increased methane capture (DoD 2010b).

At the installation level, USAG-HI developed the Strategic Sustainability Action Plan outlining the installation's objectives for providing "sustainable installation support and services for Joint War fighters, their Families and the military community that meets current and future mission requirements, safeguards human health, improves quality of life and enhances the natural environment" (USAG-HI, 2010g). In conjunction with Federal regulations and DoD sustainability directives, USAG-HI has adopted six major sustainability goals, as outlined in the Strategic Sustainability Action Plan: (1) execute all requirements in support of Army Force Generation cycles; (2) promote community well-being; (3) recruit, develop and retain an adaptive, innovative, customer-focused workforce; (4) optimize resources and environmental stewardship to minimize the impact on the natural environment and community; (5) provide quality facility, infrastructure and responsive services to support mission requirements; (6) advance and enhance internal/external community relationships and partnerships.

Table 3.16-1 shows the sustainability goals at the Federal and USAG-HI levels that may be applicable to the Proposed Action.

Table 3.16-1. DoD and USAG-HI Sustainability Goal Matrix

Resource Area	EO 13514 and DoD Strategic Sustainability Performance Plan Goals	USAG-HI Strategic Sustainability Action Plan Goals
Water Resource Management	Reduce potable water intensity by 2% annually (26% total) by FY 2020 as compared to FY 2007 baseline	Reduce potable water consumption per capita by 50% by 2032 as compared to 2000 baseline
Waste Management	Achieve 50% diversion rate of non-hazardous solid waste by FY 2015; achieve 50% diversion rate of construction and demolition materials by FY 2015	40% reduction of solid waste disposal by FY 2015 as compared to FY 2006 baseline
Acquisition	Ensure 95% of new contracts require use of sustainable products and services*	Increase sustainable products and services to 30% by FY 2015, to 50% by FY 2022, and to 100% by FY 2032
Energy conservation	Achieve 25% renewable electrical energy use by 2025	Maintain utility consumption per sf (BTUs) at or below current usage
	Reduce facility energy intensity by 3% each year from FY 2006 through FY 2015, and by 1.5% each year from FY 2016 through FY 2020	
	Produce or procure 18.3% of all facility energy during FY 2020 from renewable energy sources	

Resource Area	EO 13514 and DoD Strategic Sustainability Performance Plan Goals	USAG-HI Strategic Sustainability Action Plan Goals
	Reduce petroleum use in non-tactical vehicle fleets by 2% annually as compared to 2005 baseline for a total reduction of 30% by FY 2020	
GHG Emissions Reduction	Reduce scope 1 and scope 2 facility GHG emissions by 34% by FY2020 as compared to 2008 baseline	
	Reduce scope 3 GHG emissions by 13.5% by FY 2020 as compared to a 2008 baseline	
	Reduce GHG emissions from employee commuting by 7% by FY 2020 as compared to 2008 baseline	

*Detailed description of requirement can be found in EO 2009

3.16.3 Baseline Energy Usage at PTA

Evaluation of potential impacts of the Proposed Action against the DoD and installation sustainability goals listed in Table 3.16-1 requires baseline assessments of current energy and water usage, GHG emissions, and waste production. In September 2010, a Net Zero Energy Installation (NZEI) assessment was completed at PTA under the DOE Federal Energy Management Program (FEMP). The NZEI assessment identified PTA's current energy usage from all on-site buildings and facilities, and fleet vehicles (DOE, 2010). The assessment also and looked at PTA's water usage, GHG emissions, and waste production. The goal of a net zero installation is to be self-sufficient, using as much energy and water as it produces, and minimizing GHG emissions and waste production to the maximum extent possible.

3.16.3.1 Energy

Energy use at PTA can be quantified by primary and secondary energy consumption. Primary energy consumption consists of fuel that is directly consumed to create electricity at the installation, while secondary energy consumption consists of purchased electricity or thermal energy that is produced through combustion outside of the installation (DOE, 2010). Electricity used at PTA, measured in MWhs and recorded by the installation's utility provider (HELCO), is considered secondary energy.

The NZEI assessment shows PTA's annual energy usage for electricity, propane, and gasoline and diesel fuels. In 2009, the total electricity usage at PTA was 1,896 MWh, up 10% from total installation electricity usage in 2007 (DOE, 2010). Using data from 2007 and 2008, the annual electrical load at PTA was calculated to be 175 kW on average, and 377 kW at peak demand. Peak demand electricity loads can significantly affect installation microgrids and interconnection requirements (DOE, 2010). In addition, peak demand electricity usage is used to calculate future base electricity unit costs, and can therefore considerably affect future electricity costs.

In addition to primary and secondary electricity, PTA's energy usage includes gasoline, diesel, and tactical fuel (JP-8). The majority (80 percent) of the fuel consumed at PTA is for tactical purposes exclusively. Gasoline comprises only 8% of PTA's fuel consumption with diesel only 10% (DOE, 2010).

Fuel consumption associated with employee commuting to and from PTA also factors into the overall energy footprint, but was excluded as a measured component in the NZEI assessment of PTA's energy use baseline because it is not primary energy nor secondary energy. Employee commuting is not fuel acquired and consumed by PTA as is the fuel used for fleet and training requirements. The amount of gasoline consumed by employees commuting to and from PTA for work cannot be dictated or changed by installation, Army or DoD regulations. However, the NZEI assessment determined that employee commuting consumes about 136,000 gallons of gasoline annually based on the average distance traveled to and from work from both the east and west sides of the island, accounting for carpooling, and average gas mileages for the vehicles assumed to be used for commuting (DOE, 2010).

PTA also purchases and burns propane on-site for activities associated with dining halls, such as meal preparation and clean-up, and to heat water for personal use. The NZEI assessment recorded an annual consumption of 10,479 gallons of propane at PTA in 2009 (DOE, 2010).

3.16.3.2 Water

As discussed in Section 3.14.1.2 (Water Resources), the Army trucks potable water to PTA in tankers with a 5,000-gallon capacity. Water consumption at PTA may use 10,000 gpd corresponding to minimal Troop presence, to up to approximately 70,000-gpd when PTA is near full training capacity. Table 3.16-2 shows the annual water consumption of gpd from FY 07 to FY10. These relatively low numbers compare to low levels of troop training at the installation due to deployments overseas. A small spike in this 4-year snapshot, in FY10 was likely due in part to redeployment of some units from overseas, and also due to a large amount of water used to fight a 2010 fire near the installation border. Once more units redeploy back to their Home Station and recommence semi-annual training at PTA, the water usage will return to historic usage levels.

Table 3.16-2. FY07 to FY10 Water consumption at PTA

FY10	9,983 gpd
FY09	7,209 gpd
FY08	6,804 gpd
FY07	2,434 gpd

3.16.3.3 Waste

The NZEI assessment estimated 12.5 lbs of waste produced per Soldier per day at PTA, assuming a training average of 1,000 Soldiers and 200 operating days per year (DOE, 2010). This equates to 1,100 tons of waste produced per year at the installation. Of this, about 12%, or 150 tons per year, is recyclable and recycled material (DOE, 2010)[88].

3.16.3.4 GHG Emissions

GHGs are emitted through a number of sources, mainly electricity and fuel and gasoline consumption, at PTA. The GHG inventory completed as part of the NZEI assessment measured baseline GHG emissions for PTA at 1,245 metric tons of CO2e (DOE, 2010). This total includes scope 1, 2, and 3 emissions at PTA, but does not include GHG emissions from tactical vehicle use or employee commuting as these categories were exempted from detailed analysis of the installation's Net Zero potential. Baseline GHG emissions inclusive of all PTA sources was measured to be 8,156 metric tons of CO2e (DOE, 2010). Table 3.16-2 provides the PTA baseline GHG emissions totals from the NZEI assessment by source and scope. The primary source of GHG emissions at PTA are indirect scope 2 GHG emissions associated with production of the electricity purchased by PTA through HELCO, followed closely by scope 3 GHG emissions produced through staff commuting (DOE, 2010).

Table 3.16-3. Baseline GHG Emissions for PTA (in MT Co2e)

Scope 1 Emissions	
Stationary Combustion Sources (propane)	59
Mobile Combustion Sources (JP-8, diesel, and gasoline)	4,734
Total Scope 1 (not including fuel use)	59
Scope 2 Emissions	
Purchased electricity	1,141
Scope 3 Emissions	
Employee Commuting	1,066
T&D Losses	45
Total Scope 3	1,111
Total GHG Emissions (not including fuel use or commuting)	1,245
Total GHG Emissions (all known sources)	8,156

Source: DOE, 2010 Table 5, pg 19

Table 3.16-3 shows the NZEI assessment of GHG emissions attributable to employees commuting to and from PTA. Employee commuting accounts for 1,066 metric tons of CO2e. DoD-wide, employee travel is responsible for more than 75% of scope 3 GHG emissions, including business air travel, business ground travel, and employee commuting (DoD, 2010b). Table 3.16-4 shows the GHG emissions factors resulting from employee commuting at PTA.

Table 3.16-4. GHG Emissions Factors from Employee Commuting

[88] The Army has applied to conduct a waste to energy demonstration project at PTA through the ESTCP program.

	CO2 Emission Factor (kg CO2/mi)	CH4 Emission Factor (kg/mi)	N2O Emission Factor (kg/mi)
Personally-owned passenger gasoline car	0.364	3.1 x 10-5	3.2 x 10-5
Van pool	0.12975	9 x 10-6	1.175 x 10-5