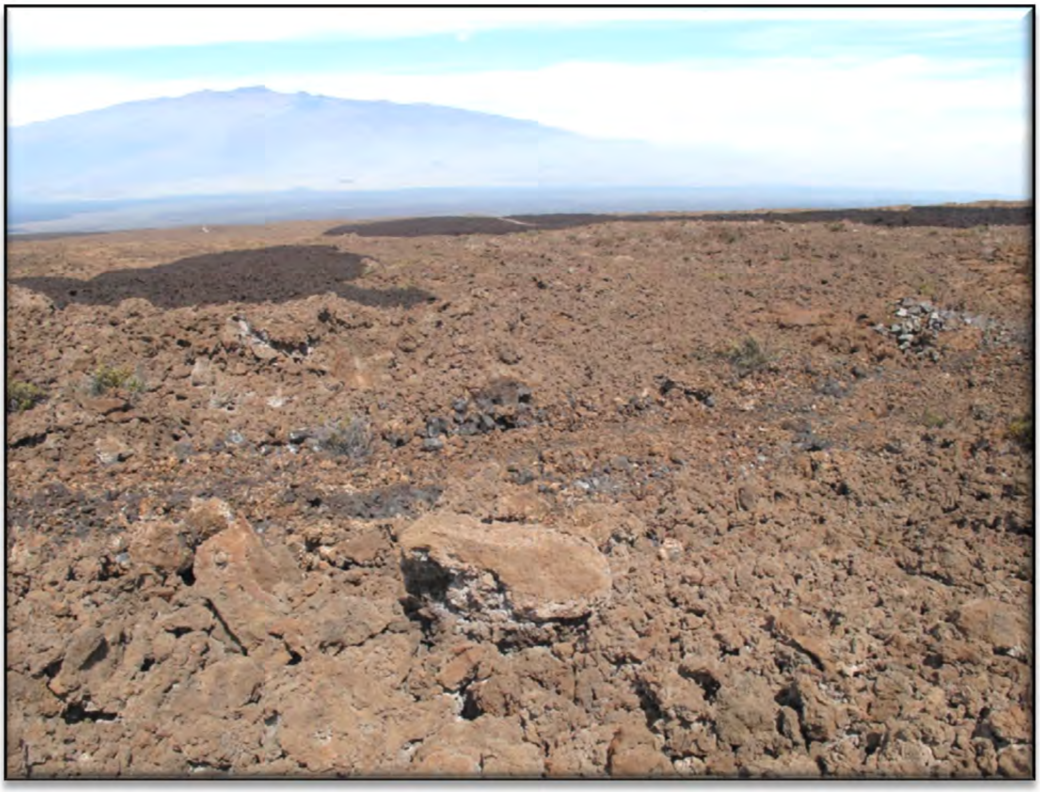
25th Combat Aviation Brigade and Army National Guard, Hawai‘i

Aviation Landing Zones Environmental Assessment



December 19, 2013

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Draft Finding of No Significant Impact for 25th Combat Aviation Brigade and Army National Guard, Hawaiʻi Aviation Landing Zones at Pōhakuloa Training Area

PROPOSED ACTION

Military helicopter pilots need to train on varied terrain, under diverse conditions, and at multiple altitudes. This includes austere (i.e., harsh, severe) environments such as mountainous terrain with its associated high wind, turbulence, and atmospheric instability. Pilots need to understand how differing conditions affect the flight performance and handling characteristics of helicopters. The Proposed Action is to construct four aviation landing zones (LZs) for training within the boundaries of the Pōhakuloa Training Area (PTA) on the island of Hawaiʻi. These LZs would be used in conjunction with regularly scheduled training exercises at PTA. Training hours would not be increased under the Proposed Action.

The purpose of the Proposed Action is to provide additional aviation LZs at PTA above 8,000 ft (2,438 m) for training use by military aviation units, including the Hawaiʻi Army National Guard (HIARNG) and the U.S. Army Garrison, Hawaiʻi (USAG-HI) 25th Infantry Division – 25th Army Combat Aviation Brigade (CAB) to meet the proficiency requirements found in USARPAC 350-1-7, "Proponent and Additional Training Program." The need for the Proposed Action is to ready military aviation units to successfully complete their missions.

The USAG-HI and the HIARNG co-prepared an EA, *25th Combat Aviation Brigade and Army National Guard, Hawaiʻi, Aviation Landing Zones Environmental Assessment*, to publicly disclose the results of an environmental impact analysis to construct aviation LZs for training use at the PTA. The action being proposed does not involve the acquisition of additional land, training outside of the current installation boundary, or live-fire exercises conducted outside of the approved/existing PTA impact area.

ALTERNATIVES

The four additional LZs, an access trail (also known as the Pioneer Trail), and a trail linking the four LZs would be constructed on the northern slope of Mauna Loa, within the southern PTA boundary. Construction duration for the Proposed Action is estimated to be 40 days.

The LZs, access trail, and trail linking the LZs would be constructed by leveling the substrate using heavy equipment, including bulldozers, graders and excavators. The LZs would differ in size to enable various helicopters to conduct a variety of flight and landing maneuvers of varying complexity. The LZs would be located at elevations from 8,520 to 8,800 ft (2,597 to 2,682 m) and are approximately 1.2 to 1.7 mi (1.9 to 2.7 km) apart. On one of the LZs, a pinnacle feature approximately 35 × 20 ft (11 × 6 m) and 15 ft (4.6 m) tall would be constructed to provide additional training opportunities.

Flights would originate at Bradshaw Army Airfield and proceed by any permissible flight path and altitude within PTA's airspace and perimeter to any of the proposed LZs. Multiple helicopters could be in the air and/or conducting maneuvers simultaneously, if pilots maintain a distance of at least 328 ft (100 m) from each other. Approximately 10% of PTA's current total flight hours would be spent at the proposed LZs. The Proposed Action would include flight maneuvers, landing maneuvers, and troop activities conducted under the CAB and HIARNG's training schedules.

The Proposed Action is the USAG-HI's and HIARNG's preferred alternative, because the additional LZs would provide training opportunities under austere, mountainous flight and landing conditions, which are often encountered in theater but not available as training areas elsewhere on PTA.

ALTERNATIVES

In addition to the preferred alternative, five alternatives were fully evaluated in the EA:

- Alternative 1 – Proposed Action but with an Alternate Trail Location. This alternative is the same as the proposed alternative, except for the location of the access trail. The alternative trail runs parallel to, but east of, the Pioneer Trail.

- Alternative 2 – Construction of Only One LZ. This alternative includes the access trail and one LZ.

- Alternative 3 – Construction of Only Two LZs. This alternative includes the access trail, two LZs, and the trail that links the two LZs.

- Alternative 4 – Construction of Only Three LZs. This alternative includes the access trail, three LZs, and the trail that links the three LZs.

- No Action Alternative. This alternative would not meet the purpose and need, because the LZs would not be constructed or used; however, the No Action Alternative is required by the National Environmental Policy Act (NEPA) to be fully considered and serve as the baseline with which to compare the Action Alternatives.

Other alternatives considered but not studied in detail as they would not meet the purpose and need for the Proposed Action include constructing LZs without trail construction, using LZs without leveling the substrate, locating LZs at other locations within PTA, and training exclusively with simulators.

SUMMARY OF ENVIRONMENTAL EFFECTS

The EA, which is incorporated by reference into this Finding of No Significant Impact (FNSI), analyzed the potential effects of the proposed action and alternatives. Complete environment impact discussions for all resources are found in Sections 4, 5, and 6 (Conclusions) of the EA. A summary of the more notable less-than-significant impact findings follow.

Air Quality

Based on air quality modeling, the maximum concentration of fugitive dust generated from construction and operations activities result in values below the state and U.S. Environmental Protection Agency emission thresholds.

Biological Resources

Potential habitat for food and cover is limited to all but a few species in the area of the proposed LZs and trails. Impacts to sensitive species from construction activities are anticipated to be low because of the lack of habitat and the implementation of measures to mitigate potential habitat loss and species injury/death. Near the LZs, the potential impact between helicopters and sensitive species is low because of the locations of known bird and bat habitat, the lack of potential habitat near the LZs, established flight procedures, and mitigations to prevent collisions. The overall potential impacts from noise to sensitive species are anticipated to be low, because species would not be attracted to noise and would vacate the area until the noise subsides, the duration of noise events will be less than 10 minutes.

Cultural Resources

A survey conducted in February and March 2013 of the LZs and proposed trails of the Action Alternatives revealed no cultural resources directly within the LZs, but the survey did identify three potential cultural sites located on the northern portion of Pioneer Trail. Under the Action Alternatives, no cultural sites would be directly impacted. The only cultural sites identified during the 2013 survey are located a minimum of 111.5 ft (34 m) from the proposed Pioneer Trail and could be avoided during construction activities. No direct impacts would occur from project activities. The noise analysis found that cultural practitioners in areas near PTA may experience and perceive noise as a distraction/annoyance under all Action Alternatives. However, the extent and magnitude of the distraction would be dependent on the distance the practitioner is from the noise source (i.e., PTA) at any point in time during use of the LZs. Modeled average noise levels were compatible with current recreational land uses, as outlined in

Army Regulation 200-1. Noise from flights using the proposed LZs would be expected to be of short duration and should not obstruct or curtail practitioner activities.

Noise

The number of training flights at PTA, which would not be increased under the Action Alternatives, would not alter the existing sound levels, and the annual average noise levels from aviation activities would remain compatible with the surrounding land uses. Helicopter use of the proposed LZs may annoy Mauna Loa Forest Reserve recreational users in the immediate vicinity of the LZs. However, the low number of operations would minimize annoyance potential.

Recreation

Recreationists using the Mauna Loa Forest Reserve to the south of the LZs may experience short-term increases in noise during the construction phase, and operations activities may be perceived as slight noise annoyances and visual distractions.

CONSERVATION MEASURES

In addition to following best management practices, the following conservation measures will be implemented: 1) conduct the majority of flight operations during the day to allow birds to roost at night; 2) Mark locations for known plant species, identify potential nesting habitat prior to construction activities, and observe construction operations to avoid any potential incidental deaths; and 3) discontinue use of specific LZs for a period when the presence of nesting birds is observed within 100 m of an LZ.

CONCLUSION

Based on careful review of the analysis and conservation measures set forth in the EA, the Proposed Action/Preferred Alternative would result in no significant direct, indirect, or cumulative impacts on the resources previously discussed. Accordingly, the preparation of an environmental impact statement is not required and will not be prepared. The EA supports the issuance of this FNSI. Thus, taking all of the information into consideration, I have decided to select the Preferred Alternative.

PUBLIC INVOLVEMENT

A notice of availability of the EA and draft FNSI was published in the *Hawaii Tribune Herald* and *West Hawaii Today* newspapers, on December 19 and 21, 2013, which starts the 30-day public review and comment process. The EA and draft FNSI are available for public review at the following public libraries: Hilo Public Library, Kailua–Kona Public Library, and Thelma Parker Memorial Public and School Library. Copies can also be obtained by contacting Mrs. Dale T. Kanehisa-Lam, NEPA Program Manager, at (808) 656-5670 or dale.t.kanehisa-lam.civ@mail.mil. Additionally, the Army has provided electronic versions of the EA and FNSI through its NEPA website at http://www.garrison.hawaii.army.mil/NEPA/NEPA.htm.

Written comments will be received and considered from December 19, 2013, through January 18, 2014, and should be directed to the email address above, or mailed to: Directorate of Public Works, Environmental Division (IMHW-PWE), Attn: Mrs. Dale T. Kanehisa-Lam, 947 Wright Avenue, Wheeler Army Airfield, Schofield Barracks, 96857-5013.

______________________ ____________

Daniel W. Whitney — Date

Colonel, US Army

Commanding

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25TH COMBAT AVIATION BRIGADE AND
ARMY NATIONAL GUARD, HAWAI‘I

AVIATION LANDING ZONES
ENVIRONMENTAL ASSESSMENT

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December 2013

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EXECUTIVE SUMMARY

The U.S. Army Garrison-Hawaiʻi and the Hawaiʻi Army National Guard prepared this environmental assessment (EA) to publicly disclose the results of an environmental impact analysis to construct up to four aviation landing zones (LZs) for training use at the Pōhakuloa Training Area (PTA) on the island of Hawaiʻi. The LZs would provide locations that allow pilots and troops to be trained to proficiency in austere environmental conditions above 8,000 ft (2,438 m). Current PTA LZs do not provide these conditions or training opportunities. The Proposed Action does not involve the acquisition of additional land, training outside of the current installation boundary, or live-fire exercises conducted outside the approved/existing PTA impact area.

Proposed Action and Alternatives

The Proposed Action and nine alternatives are evaluated in this EA. The Proposed Action, which is the preferred alternative, is to construct four LZs, an access trail to them, and a trail linking them together on the northern slope of Mauna Loa, within the southern PTA boundary. The estimated duration of the construction for the Proposed Action is 40 days. The four LZs are located above 8,000 ft (2,438 m) to meet the proficiency requirement found in USARPAC 350-1-7, "Proponent and Additional Training Program" (U.S. Army 2012).

In summary, to construct the LZs, a single-lane access trail would be bulldozed south from Hilo Kona Highway, along the eastern boundary of PTA, to access the area near the southern PTA boundary. Here, a bulldozer would level the LZs and create a trail linking them. The LZs would differ in size to enable various helicopters to conduct a variety of flight and landing maneuvers of varying complexity. On one of the LZs, a pinnacle feature would be constructed to allow pilots to practice pinnacle maneuvers. Equipment needed for construction activities is anticipated to be one four-wheel-drive supervisor's vehicle, one fuel truck, one water truck, and less than five pieces of heavy equipment that could include various combinations of bulldozers, graders, and excavators.

The primary purpose of the trails under the Proposed Action would only be to provide a means to transport heavy equipment to construct the LZs. There are no additional plans or foreseeable uses for the access or linking trails that result from the Proposed Action.

No increase in training flights is being proposed under the Proposed Action. It is estimated that approximately 10% of current training flight would use the new LZs once they are constructed.

The Alternative Actions are as follows:

- Alternative 1 – Proposed Action with Alternate Trail Location. This alternative is the same as the Proposed Action, with the exception that the bulldozer would use an alternate path for the trail that accesses the LZ area. The estimated duration of the construction for this alternative is 40 days. This modified alternative is provided to evaluate whether there are differing impacts related to the placement of the trail.

- Alternative 2 – Construction of Only One LZ. This alternative is the same as the Proposed Action, with the exception that only LZ 4 would be constructed. The estimated duration of the construction for this alternative is 35 days.

- Alternative 3 – Construction of Only Two LZs. This alternative is the same as the Proposed Action, with the exception that only LZs 3 and 4 would be constructed. The estimated duration of the construction for this alternative is 38 days.

- Alternative 4 – Construction of Only Three LZs. This alternative is the same as the Proposed Action, with the exception that only LZs 2, 3, and 4 would be constructed. The estimated duration of the construction for this alternative is 39 days.

- Alternative 5 – Proposed Action Excluding Trails. This alternative is the same as the Proposed Action, with the exception that a bulldozer would not make either the access or linking trails to the LZs. In this case, the bulldozer would need to be airlifted to all four of the new LZ sites to level them. The bulldozer would then be airlifted out of the area upon completion of the work. This alternative was considered to evaluate the impacts of not constructing the trail. The estimated duration of the construction for this alternative is 36 days.

- Alternative 6 – Proposed Action Excluding Trails and without LZ Leveling. This alternative is the same as the Proposed Action, with the exception that a bulldozer would not be used to either construct the access or linking trails or level the LZs. Thus, the LZs would be used by pilots as they exist naturally. This alternative was considered to evaluate the impacts of not leveling the LZs.

- Alternative 7 – Other PTA LZ Locations. This alternative explored the possibility of additional LZs at other available locations within PTA. Alternative locations in a layout similar to the Proposed Action were considered—i.e., groups of four LZs, of the same sizes as those of the Proposed Action, located in similar configurations [roughly linear groupings], and placed at various altitudes within the boundary of PTA. This alternative was considered to evaluate whether there are differing impacts related to placement of LZs within the PTA boundary.

- Alternative 8 – Simulator Landing Training. Under this alternative, LZs would not be constructed and trainees would acquire simulator training specific to their assigned helicopter to meet the training requirements of the aviation training program.

- No Action Alternative. The No Action Alternative for this Proposed Action would be to not construct additional LZs.

After evaluating the alternatives for the purpose and need, the following alternatives were analyzed fully:

- Proposed Action

- Alternative 1 – Proposed Action with Alternate Trail Location

- Alternative 2 – Construction of Only One LZ

- Alternative 3 – Construction of Only Two LZs

- Alternative 4 – Construction of Only Three LZs

- No Action Alternative.

Impact Analysis Summary

The Action Alternatives and the No Action Alternative were evaluated with respect to the potential effects on the environment resulting from the construction and operations phases. The following impacts were identified:

- Land Use – The Action Alternatives and the No Action Alternative were found to have no impacts on land use.

- Recreation – The Action Alternatives were found to have less-than-significant impacts on recreation with respect to scenic vistas and view planes and disruption of recreational use of conservation areas surrounding PTA. The Action Alternatives and the No Acton Alternative were found to have no other impacts on recreation.

- Airspace – The Action Alternatives and the No Action Alternative were found to have no impacts on airspace.

- Visual and Aesthetic Resources – A visual contrast analysis was conducted, and the Action Alternatives were found to have less-than-significant impacts on visual and aesthetic resources with respect to obscuring or changing viewing areas. The Action Alternatives and the No Acton Alternative were found to have no other impacts on visual and aesthetic resources.

- Air Quality – The Action Alternatives were found to have less-than-significant impacts on air quality with respect to particulate emissions. The Action Alternatives and the No Acton Alternative were found to have no other impacts on air quality.

- Land-Based Traffic – The Action Alternatives were found to have less-than-significant impacts on land-based traffic with respect to increased traffic on public roads that would disrupt or alter local circulation patterns and cause safety hazards on roadways. The Action Alternatives and the No Acton Alternative were found to have no other impacts on land-based traffic.

- Noise – The Action Alternatives were found to have less-than-significant impacts on noise with respect to incompatibilities with current land uses, generating noise levels that exceed community noise control rules, and increasing the likelihood of annoyance caused by individual noise events. The Action Alternatives and the No Acton Alternative were found to have no other impacts on noise.

- Water Resources – The Action Alternatives were found to have less-than-significant impacts on water resources with respect to impacting surface water. The Action Alternatives and the No Acton Alternative were found to have no other impacts on water resources.

- Soil Resources – The Action Alternatives were found to have less-than-significant impacts on soil resources with respect to soil erosion and exposure to geologic hazards. The Action Alternatives and the No Acton Alternative were found to have no other impacts on soil resources.

- Biological Resources – The Action Alternatives were found to have less-than-significant impacts on biological resources with respect to site clearing and grading and collisions with helicopters. The Action Alternatives and the No Acton Alternative were found to have no other impacts on biological resources. The Army consulted with the Fish and Wildlife Service, which is reported in the analysis.

- Cultural Resources – The Action Alternatives were found, with the implementation of conservation measures, to have less-than-significant impacts on cultural resources with respect to potential for physical destruction, damage, or alteration of all or part of a traditional cultural property, except for the Alternate Trail alternative, which was found to have no impact on any cultural property. The Action Alternatives were also found to have less-than-significant impacts on cultural practices and beliefs due to the introduction of visual, audible, or atmospheric elements from the presence of military helicopters. The Action Alternatives and the No Acton Alternative were found to have no other impacts on cultural resources. The Army conducted cultural resources consultation, which is reported in the analysis.

- Human Health and Safety – The Action Alternatives were found to have less-than-significant impacts on human health and safety with respect to all areas analyzed. These impacts include hazardous substance release, hazardous materials or waste exposure, radiation exposure in excess of regulatory exposure levels, public access to active construction and operational areas, exposure to health and safety hazards not covered under existing plans and standard operating procedures, and wildfire ignition.

- Socioeconomics and Environmental Justice – The Action Alternatives were found to have less-than-significant impacts on socioeconomics and environmental justice with respect to economic development. The Action Alternatives and the No Acton Alternative were found to have no other impacts on socioeconomics and environmental justice.

- Conservation Recommendations – The Army and the Hawaiʻi Army National Guard regularly implement conservation measures as part of their daily operations and stewardship responsibilities to the people and State of Hawaiʻi. Measures that would be implemented to keep impacts lower than the less-than-significant impacts determined in the EA are discussed in the affected environment and impacts sections by resource area.

CONTENTS

FIGURES

TABLES

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ACRONYMS

AAQS	ambient air quality standard
ADNL	A-weighted day-night average sound level
AGL	above ground level
AGR	aerial gunnery range
amsl	above mean sea level
ARPA	Archaeological Resources Protection Act
BAAF	Bradshaw Army Airfield
BMP	best management practice
BRA	baseline risk assessment
CAB	combat aviation brigade
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CZMA	Coastal Zone Management Act
dBA	A-weighted decibel
dBC	C-weighted decibel
DHHL	Department of Hawaiian Home Lands
DIS	Directorate of Installation Safety
DLNR	Department of Land and Natural Resources
DNL	day-night average sound level
DoD	U.S. Department of Defense
DOFW	Division of Forestry and Wildlife
DU	depleted uranium
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency

ESA	Endangered Species Act
FAA	Federal Aviation Administration
FM	field manual
FNSI	Finding of No Significant Impact
GHG	greenhouse gas
GMA	game management area
HIARNG	Hawaiʻi Army National Guard
IMC	instrument meteorological conditions
IWFMP	integrated wildland fire management plan
KMA	Keʻāmuku Maneuver Area
kph	kilometers per hour
LUPZ	Land Use Planning Zone
LZ	landing zone
MBTA	Migratory Bird Treaty Act
MCBH	Marine Corps Base Hawaiʻi
MGD	million gallons per day
MLO	Mauna Loa Observatory
MOU	memorandum of understanding
mph	miles per hour
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NI	no impact
NNL	National Natural Landmark
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NVG	night vision goggles

OSHA	Occupational Safety and Health Administration
PCH	palila critical habitat
PIP	Pōhakuloa implementation plan
PM	particulate matter
POL	petroleum oil and lubricants
PTA	Pōhakuloa Training Area
RCA	Radiological Control Area
ROI	region of influence
S	significant
S/MI	significant impact but mitigable to less than significant
SEL	sound exposure level
SHPD	State Historic Preservation Division
SI	significant impact
SONMP	statewide operational noise management plan
SOP	standard operating procedure
TC	training circular
TLV	threshold level value
TM	technical manual
USAG-HI	United States Army Garrison-Hawai‘i
USFWS	U. S. Fish and Wildlife Service
VMC	visual meteorological conditions
WRCC	Western Regional Climate Center

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25^{TH} COMBAT AVIATION BRIGADE AND ARMY NATIONAL GUARD, HAWAI‘I

AVIATION LANDING ZONES ENVIRONMENTAL ASSESSMENT

1. INTRODUCTION

Military helicopter pilots need to train on a variety terrains, under diverse conditions, and at multiple altitudes. This includes austere (i.e., harsh, severe) environments such as mountainous terrain with its associated high wind, turbulence, and atmospheric instability. Pilots need to understand how differing conditions affect the flight performance and the handling characteristics of their helicopters.

Pilots must also master techniques associated with landing in austere environments. The same conditions that affect flight performance and handling of a helicopter also affect landings and takeoffs. For example, surface winds and wind characteristics (i.e., speed, turbulence, pressure, updrafts/downdrafts) surrounding a landing zone (LZ) must be identified, understood, and constantly monitored throughout landing maneuvers.

In addition to proficiency with flight and landing maneuvers under difficult environmental conditions, intense physiological and psychological stresses experienced in these environments, including anxiety, fatigue, hypoxia, and dehydration, must be understood. To succeed in missions conducted in demanding environments, pilots and troops must be rigorously trained in such environments.

In theater, military helicopters are a crucial means of transport for ground forces and supplies and for air assaults on remote enemy-occupied positions. At home, in the Hawaiian Islands, Army and Hawai‘i Army National Guard (HIARNG) helicopters are used to support mission and domestic operations such as conducting disaster surveys and transporting military and emergency personnel and supplies. In Hawai‘i, military helicopters are also used for fire suppression and search-and-rescue missions, from the sea-level coastal beaches to peaks ranging from 2,297-ft (700-m) Ha‘upu, on the island of Kaua‘i, to 13,796-ft (4,205-m) Mauna Kea, on the island of Hawai‘i.

Understanding and being proficient in austere environments must be learned, maintained, refreshed, and continually taught to incoming pilots to ensure the military maintains its ability and responsibility to respond successfully on behalf of the U.S. Government to defend and protect its people, interests, and responsibilities at home and around the world.

1.1 Proposed Action

To satisfy mandated annual training requirements and to prepare for upcoming deployments, the 25^{th} Combat Aviation Brigade (CAB) and HIARNG propose to construct four additional aviation LZs for training use at the Pōhakuloa Training Area (PTA) on the island of Hawai‘i. This document assesses the Proposed Action and its alternatives. The Proposed Action does not involve the acquisition of additional land, training off the current installation boundary, or live-fire training exercises conducted outside the approved/existing PTA impact area.

1.2 25th Combat Aviation Brigade

The 25th Aviation Brigade was constituted on February 1, 1957, in the Regular Army as the 25th Aviation Company, assigned to the 25th Infantry Division, and activated at Schofield Barracks, Hawaiʻi. In 2006, the 25th Aviation Brigade began a transition to the U.S. Army's new modular force structure as part of an overall transformation of the 25th Infantry Division. The unit was reorganized and renamed the 25th CAB.

The mission of the 25th CAB is to prepare for worldwide deployment and, when directed, conduct day and night combat or other military operations. During the past 10 years, the CAB has deployed six times in support of operations, including Operation Joint Forge, Operation Iraqi Freedom, and Operation Enduring Freedom. In September 2010, the CAB returned from a 12-month deployment and only had dwell time[a] of approximately 14 months before it re-deployed in 2012 to Afghanistan to become Task Force Wings. In this capacity, the CAB conducted full-spectrum aviation operations in support of the Regional Command (South) Team, U.S. Special Operations Forces, and International Joint Command to defeat the insurgency; support improved governance, development, and enablement of Afghan-led security forces to secure the Afghan people, setting the conditions for sustainable peace; and provide medical evacuation support.

1.3 Hawaiʻi Army National Guard

HIARNG is a component of the U.S. Army and a component of the U.S. National Guard. HIARNG units are trained and equipped as part of the U.S. Army. The HIARNG has two primary missions. Its federal mission is to serve as an integral component of the Army by providing fully staffed, operationally ready, and well-equipped units that can respond to any national contingency such as war, peacekeeping missions, or nation-building operations. The state mission of HIARNG is to provide a highly effective, professional, and organized force that is able to respond to natural or human-caused disasters, human-made crises, or the unique needs of the state and its communities.

HIARNG aviation units have mobilized and deployed in support of Operation Iraqi Freedom, Operation Enduring Freedom, and Operation New Dawn as well as numerous domestic contingency operations within the state. HIARNG aviation units also provide aviation support to the 29th Infantry Brigade Combat Team, which is the largest formation within HIARNG and is required to be trained and ready to deploy in support of overseas contingency operations worldwide.

1.4 Pōhakuloa Training Area

PTA supports military training and training strategy for combined arms forces in the Pacific Region. PTA ranges and training areas have helped U.S. Army, U.S. Marine Corps, U.S. Air Force, U.S. Navy, and joint and multi-national forces in maintaining their combat readiness with realistic, relevant, and modern training opportunities. The Army is the primary land manager and user of PTA, which resides on lands leased from the State of Hawaiʻi. PTA is discussed in more detail throughout this environmental assessment (EA). Figure 1-1 shows the location of PTA on the island of Hawaiʻi.

a. Dwell time is defined as the time needed to recover from 1 year of deployment.

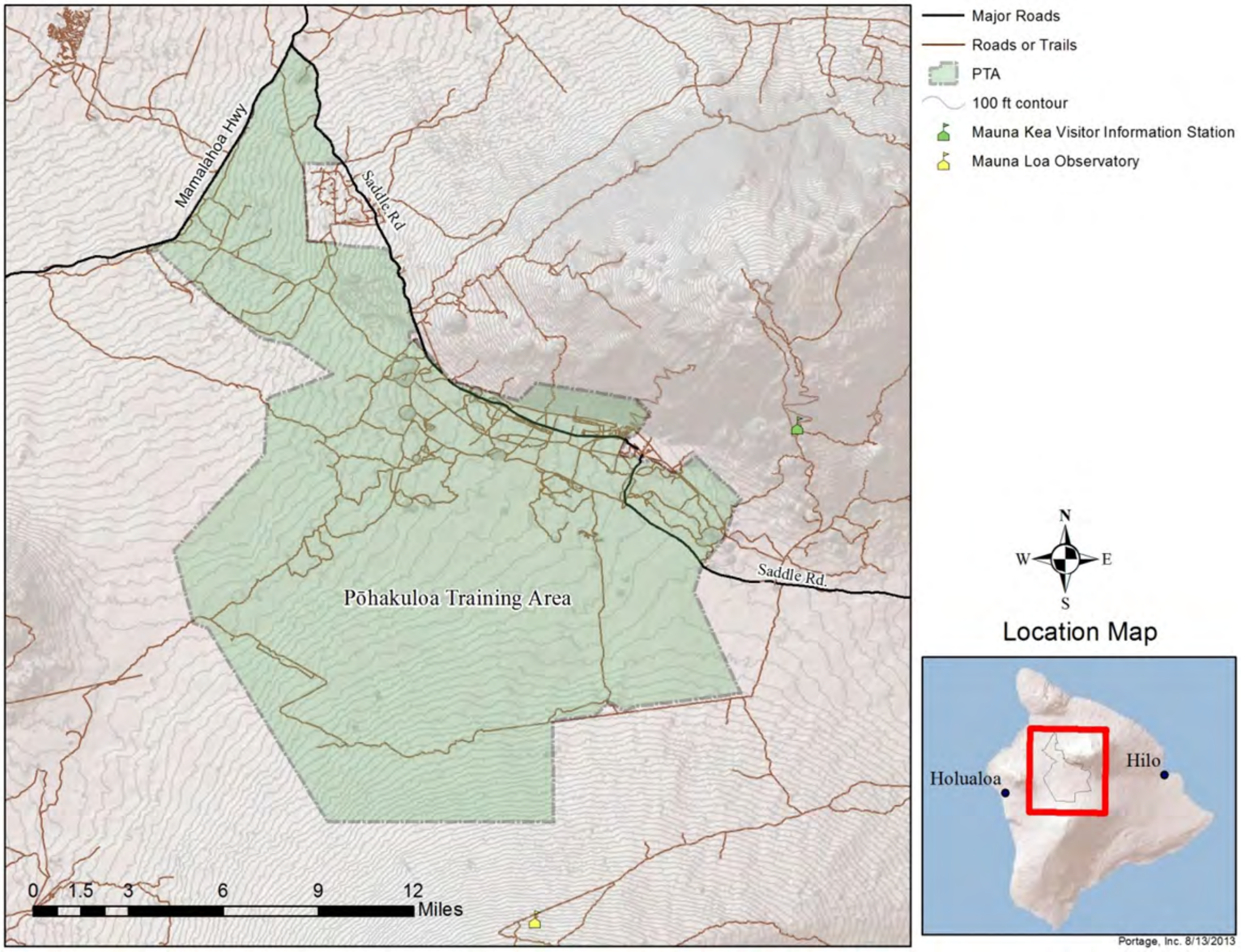

Figure 1-1. Location of PTA on the island of Hawai'i.

1.5 Purpose of the Purposed Action

The *purpose* of the Proposed Action is to provide additional aviation LZs at PTA above 8,000 ft (2,438 m) for training use by military aviation units, including the HIARNG and the 25th Infantry Division – 25th Army CAB.

1.6 Need for the Proposed Action

The *need* for the Proposed Action is to ready military aviation units to successfully complete their missions. The proposed additional LZs would provide training locations that allow pilots and troops to be trained to proficiency in austere environmental conditions above 8,000 ft (2,438 m). Other PTA LZs do not provide these conditions or training opportunities.

1.7 Relationship of the Environmental Assessment to Other Recent National Environmental Policy Act Documents

The National Environmental Policy Act (NEPA) of 1969 (42 USC 55 § 4321 et seq.) encourages agencies to incorporate material by reference when "…the effect will be to cut down on bulk without impeding agency and public review of the action." This EA references material from recent, relevant NEPA documents and records of decision. Most notably, the *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawai'i* (U.S. Army 2013a), released in March 2013, evaluated a site-specific action located on PTA just north and west of the Proposed Action analyzed in this EA. Likewise, the *Final Environmental Assessment High-Altitude Mountainous Environment Training* (U.S. Army 2011a) evaluated a site-specific action that included lands near the Proposed Action in this EA. These previous NEPA analyses were proposed by the Army, involve PTA and resources associated with PTA, and were analyzed within a short timeframe of each other (i.e., 2011 to 2013). Because of the similarity in a number of the affected environments previously analyzed to the affected environments discussed in this EA, extensive material has been incorporated from the other two analyses. Material that has been incorporated into this EA from these and other relevant documents was cited and summarized in accordance with NEPA requirements (40 CFR V §§ 1500 et seq.).

1.8 Document Scope

The U. S. Army Garrison-Hawai'i (USAG-HI) and HIARNG prepared this EA in accordance with NEPA (42 USC 55 § 4321 et seq.); the "Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" (40 CFR V § 1500–1508); "Environmental Analysis of Army Actions" (32 CFR V § 651 et seq. and 67 FR 61); *Hawai'i Revised Statutes*, Chapter 343, "Environmental Impact Statements" (HRS 2008); and *Hawai'i Administrative Rules*, Title 11, Chapter 200, "Environmental Impact Statement Rules" (State of Hawai'i 1996a).

The intent of this EA is to ensure that there is comprehensive and systematic consideration given to potential impacts on the natural and human environment that may be caused by implementing the Proposed Action. This EA serves as an environmental decision document that identifies the purpose and need of the Proposed Action, reasonable alternatives, existing environmental conditions, potential environmental impacts, and measures to mitigate such impacts. The purpose of the EA is to provide USAG-HI and HIARNG decision-makers and the public with a complete, objective appraisal of the environmental impacts associated with implementing the various activities associated with the Proposed Action. The impact evaluations presented in this EA provide the basis for determining whether such impacts are significant enough to warrant the preparation of an environmental impact statement (EIS) or whether a Finding of No Significant Impact (FNSI)/Negative Determination is appropriate.

1.9 Document Organization

The remainder of this EA is organized as follows:

- Section 2 of this EA, Proposed Action and Alternatives, considers eight Action Alternatives and the No Action Alternative in meeting the purpose and need of the Proposed Action.
- Section 3, Affected Environment, describes existing conditions of the environmental resources that constitute the baseline for analyzing potential effects of the Proposed Action.
- Section 4, Environmental Consequences, presents a summary of the potential environmental impacts from the Action Alternatives and the No Action Alternative on the environmental resources.

- Section 5, Cumulative Impacts, presents the direct and indirect effects of the Proposed Action's incremental impacts when considered in the context of other past, present, and reasonably foreseeable future actions regardless of who carries out the action.
- Section 6, Conclusions, presents the results of the consequences analysis.
- Section 7, Consultation and Coordination, lists the people and organizations contacted during the preparation of this EA.
- Section 8, Preparers, lists the personnel who conducted the analysis.
- Section 9, References, lists the literature used in the analysis.
- Appendix A, Section 7 Consultation
- Appendix B, Section 106 Consultation.

1.10 Agency Consultation

Consultation requirements contained in Section 7 of the Endangered Species Act (ESA) (16 USC 35 § 1531 et seq.) were satisfied and are reported in Subsection 3.11, Biological Resources, of this EA and described in Memoranda for Record (Appendix A), as referenced.

Consultation requirements contained in the National Historic Preservation Act (NHPA) (16 USC 1A § 470 et seq.) were satisfied and are reported in Subsection 3.12, Cultural Resources, of this EA and described in Memoranda for Record (Appendix B), as referenced.

1.11 Environmental Assessment Purpose and Public Involvement

Army NEPA regulations (32 CFR V § 651.33) state that a Proposed Action not covered by exemptions by law, emergencies, or categorical exclusions must be analyzed to determine whether it could cause significant impacts to the human or natural environment. This document evaluates the Proposed Action to construct four additional aviation LZs for training use at PTA. An interdisciplinary team of military scientists, engineers, archaeologists, military pilots, and private-sector consultants collaborated on, researched, and prepared this document.

The purpose of this EA is twofold:

- To determine whether possible impacts are significant, thereby warranting development of an EIS
- To inform Army and HIARNG decision-makers and the public of the likely environmental consequences of the Proposed Action and its alternatives.

The formal opportunity for the public to comment involves a 30-day period for public review of the draft EA and draft FNSI/Anticipated Negative Determination.

The USAG-HI and HIARNG reviewed comments received during the public comment period to determine whether the Proposed Action had potentially significant impacts that could not be reduced to less than significant with appropriate mitigation. The USAG-HI and HIARNG prepared this final EA and signed the final FNSI/Negative Determination.

1.12 Regulatory Framework

A decision on whether to proceed with the Proposed Action depends on numerous factors such as mission requirements, the schedule of proposed activities, availability of funds, and environmental considerations. In addressing environmental considerations, the USAG-HI and HIARNG are guided by NEPA; the Army's NEPA implementing regulations (32 CFR V §§ 651 et seq.); and all other applicable state and federal statutes and regulations.

Key provisions of these statutes and regulations are described in more detail in later sections of this EA if they are needed to better understand their application. Appendix A contains correspondence generated in conjunction with coordination activities under Section 7 of the ESA. Appendix B contains correspondence generated in conjunction with coordination activities under Section 106 of the NHPA.

2. PROPOSED ACTION AND ALTERNATIVES

The 25th CAB and HIARNG propose to construct four additional aviation LZs for training use at PTA on the island of Hawai‘i.

This section presents the details of the Proposed Action, the aviation training program that the Proposed Action would support, and the alternatives to the Proposed Action. This section also discusses the evaluation of the alternatives.

2.1 PTA Aviation Training Program

In overview, the helicopter aviation training program at PTA follows Army requirements for specific helicopters and skill levels. Generally, training includes academic classroom instruction, simulator training, individual flight technique training, and collective (group) training. Aviation training is typically taught in three phases. Phase I consists of academic classroom instruction and simulator training. Phase II is an element of annual and pre-deployment individual flight technique training conducted on LZs with aviators in their assigned helicopters. Phase III is collective (group) training during which tactical and mission flight training are conducted.

The individual flight technique training component, Phase II, is a hands-on, incremental process in which pilots proceed from basic to advanced techniques, building on skills acquired at each step. Phase II flight time is dependent on the ability of the pilot to reach proficiency in the required maneuvers. During individual flight-technique training, pilots must master flight skills such as performance planning, power management, and techniques used to compensate for decreased helicopter performance at altitude. Pilots must also master landing and low-level hovering skills. During Phase II of aviation training at PTA, pilots fly to and land at designated LZs using varying angles of approach, headings, and air speeds, under both day and night conditions, to reach flight, landing, and task proficiencies.

2.1.1 Training Requirements

The Proposed Action satisfies U.S. Department of Army and U.S. Department of Defense (DoD) training requirements. The intent of the requirements is to achieve and maintain flight and landing proficiencies in accordance with the following example directives:

- “25th CAB Flight Standardization Standard Operating Procedures”; training on these procedures is required for all crews prior to conducting operations at PTA

- Aircrew technical manuals (TMs) and training circulars (TCs) for Apache helicopters (AH-64A/D), such as TC 1-251(U.S. Army 2005a); Black Hawk helicopters (UH60A/L/M), such as TM 55-1520-237-10 and TC 1-237 (U.S. Army 2007a); Chinook helicopters (CH47D/F), such as TM 55-1520-240-10 and TC 1-240 (U.S. Army 2007b); Kiowa Warrior helicopters (OH-58D), such as TC 1-248 (U.S. Army 2007c); and Lakota helicopters (UH-72A series), such as TC 1-272 (U.S. Army 2009)

- U.S. Army Forces Command Pre-deployment Training Requirements in Support of Combatant Commands, December 10, 2012, Annex B

- High-Altitude Aviation Training Site Student Handouts

- Field Manual (FM) 3-21.38, *Pathfinder Operations*, April 2006

- USARPAC 350-1-7, “Proponent and Additional Training Program” (U.S. Army 2012)
- FM 3-04.203, *Fundamentals of Flight*, May 2007
- Army Tactic, Technique, and Procedure 3-18.12 (FM 90-4), Air Assault Operations, March 2011.

2.1.2 Helicopters Used for Aviation Training

The following helicopters would be used by the CAB and HIARNG under the Proposed Action:

- AH-64 Class Apache
- UH-60 Class Black Hawk
- CH-47 Class Chinook
- OH-58D Kiowa Warrior
- UH-72A Series Lakota.

2.1.2.1 Apache. The AH-64A/D Apache is a four-blade, twin-engine attack helicopter with a tail-wheel-type landing gear arrangement and a tandem cockpit for a two-person crew (Figure 2-1). The Apache is the Army’s primary attack helicopter and is designed to endure front-line environments, operating day or night and in adverse weather. The newest Apache design incorporates millimeter-wave fire control radar, a radar frequency interferometer, fire-and-forget radar-guided (HELLFIRE) missile and cockpit management, and digitization enhancements. The combination of the fire control radar, radar frequency interferometer, and the advanced navigation and avionics suite of the helicopter provide increased situational awareness, lethality, and survivability (U.S. Army 2013b). Training requirements that the Army meets for Apache pilots are found in the *Aircrew Training Manual Attack Helicopter AH-64D* (U.S. Army 2005a). Specifications for the AH-64 Apache are as follows:

- Maximum gross weight: 17,650 lb (8,000 kg)
- Empty weight: 11,387 lb (5,165 kg)
- Height: 12 ft 8 in. (3.87 m)
- Length: 58 ft 2 in. (17.73 m)
- Rotor diameter: 48 ft (14.63 m)
- Maximum cruise speed: 158 knots (293 kilometers per hour [kph]).

Figure 2-1. AH-64 Apache.

2.1.2.2 Black Hawk. The UH-60 Black Hawk is a dual-engine, four-bladed utility tactical transport helicopter (Figure 2-2). The UH-60, with a crew of four (two pilots and two crew chiefs), can lift an entire 11-person, fully equipped infantry squad in most weather conditions. The helicopter's critical systems are armored or redundant, and its frame is designed to progressively crush on impact to protect the crew and passengers. The Black Hawk is used to provide air assault, general support, aero-medical evacuation, command-and-control support, and special operations support for combat operations and stability-and-support operations (U.S. Army 2010a). Training requirements that the Army meets for Black Hawk pilots are found in the *Aircrew Training Manual Utility Helicopter H-60 Series* (U.S. Army 2007a). Specifications for the UH-60 Black Hawk are as follows:

- Maximum gross weight: 23,500 lb (10,659 kg)
- Empty weight: 10,624 lb (4,819 kg)
- Height: 16 ft, 10 in. (5.1 m)
- Length: 64 ft, 10 in. (19.8 m)
- Rotor diameter: 53 ft, 8 in. (16.4 m)
- Maximum cruise speed: 159 knots (294.5 kph).

Figure 2-2. UH-60 Black Hawk.

2.1.2.3 Chinook. The CH-47 Chinook is a twin-engine, tandem-rotor helicopter designed to transport cargo, troops, and weapons during day, night, visual, and instrument conditions (Figure 2-3). The minimum crew for tactical operations is four people: two pilots, one flight engineer, and one crew chief. The Chinook has served as the prime mover for the U.S. Army and other military forces for decades. Its principal mission is transporting troops, artillery, ammunition, fuel, water, barrier materials, supplies, and equipment on the battlefield (U.S. Army 2010b). Training requirements that the Army meets for Chinook pilots are found in the *Aircrew Training Manual Cargo Helicopter, CH-47D/F* (U.S Army 2007b). Specifications for the CH-47 Chinook are as follows:

- Maximum gross weight: 50,000 lb (22,680 kg)
- Empty weight: 23,401 lb (10,615 kg)
- Height: 18 ft, 11 in. (5.8 m)
- Length: 98 ft, 10 in. (30.1 m)
- Rotor diameter: 60 ft, 0 in. (18.3 m)
- Maximum cruise speed: 170 knots (315 kph).

Figure 2-3. CH-47 Chinook.

2.1.2.4 Kiowa Warrior. The OH-58D Kiowa Warrior is the U.S. Army's fielded armed-reconnaissance helicopter (Figure 2-4). The Kiowa Warrior is a two-pilot, single-engine helicopter. The primary mission of the Kiowa Warrior is armed reconnaissance in air cavalry troops and light attack companies. The Kiowa Warrior is equipped with a mast-mounted sight with a television system, thermal imaging system, and laser rangefinder/designator. The mast-mounted sight allows the helicopter to remain masked while exposing only the optics (U.S. Army 2013c). Training requirements that the Army meets for Kiowa pilots are found in the *Aircrew Training Manual Oh-58D Kiowa Warrior* (U.S. Army 2007c). Specifications for the Kiowa Warrior are as follows:

- Maximum gross weight: 5,200 lb (2,359 kg)
- Empty weight: 3,289 lb (1,492 kg)
- Height: 12 ft, 10.6 in. (3.9 m)
- Length: 33 ft, 4 in. (10.2 m)
- Rotor diameter: 35 ft (10.7 m)
- Maximum cruise speed: 111 knots (206 kph).

Figure 2-4. OH-58D Kiowa Warrior.

2.1.2.5 ***Lakota.*** The UH-72A Lakota is the U.S. Army's multi-role light utility helicopter and is used exclusively by HIARNG (Figure 2-5). This twin-engine helicopter serves as a key element in the military service's modernization of its aviation assets, providing a highly capable helicopter for missions that include homeland security, drug interdiction, general support, logistics, and medical evacuation. Seating capacity of the Lakota is for two pilots and six passengers. Two stretchers can be installed for medical evacuation missions with a crew of four: pilot, co-pilot, and two medics. Training requirements that the Army meets for Lakota pilots are found in the *Aircrew Training Manual Light Utility Helicopter UH-72A Series* (U.S. Army 2009). Specifications for the UH-72A Lakota are as follows:

- Maximum gross weight: 7,903 lb (3,584 kg)
- Empty weight: 3,950 lb (1,792 kg)
- Height: 11 ft, 9 in. (3.45 m)
- Length: 42 ft, 7 in (13.03 m)
- Rotor diameter: 36 ft, 1 in. (11 m)
- Maximum cruise speed: 131 knots (243 kph).

Figure 2-5. UH-72A Lakota.

2.2 Description of the Proposed Action

The Proposed Action is to construct and use four aviation LZs for training within the boundaries of the PTA on the island of Hawai‘i. Training flights bound for these LZs would originate from Bradshaw Army Airfield (BAAF) at PTA. The additional LZs would increase PTA's existing LZ training areas (shown in Figure 2-6) from 31 to 35 and would be used in conjunction with regularly scheduled training exercises at PTA. The CAB uses PTA for approximately 4,500 aviation training hours each year. Training hours would not be increased under the Proposed Action.

2.2.1 Construction

The four additional LZs, an access trail (also known as the Pioneer Trail), and a trail linking the four LZs would be constructed on the northern slope of Mauna Loa (Figure 2-6). It is estimated that the construction duration for the Proposed Action is 40 days. As shown in the figure, the four LZs are located above 8,000 ft (2,438 m) to meet the following proficiency requirement found in USARPAC 350-1-7, "Proponent and Additional Training Programs" (U.S. Army 2012):

> *Section 1-13. Aviation Proficiency Proponent Program, b. HAMET: "…USARPAC units will conduct HAMET at altitudes above 6,000' with the intent of certification at altitudes 8,000' and above…"*

The substrate in the area where the action is proposed is composed of ‘a‘ā and pāhoehoe lava flows with small amounts of eolian sands. To construct the additional LZs, a single-lane access trail would be bulldozed south from Hilo Kona Highway (see Figure 2-6), and parallel the eastern boundary of PTA, to access the area near the southern PTA boundary. Here, moving east to west, the bulldozer would level the new LZs and create a trail linking them while traveling to each location. The LZs would differ in size to enable various helicopters to conduct a variety of flight and landing maneuvers of varying complexity. The LZs would be located at elevations from 8,520 to 8,800 ft (2,597 to 2,682 m). On average, the LZs are approximately 1.2 to 1.7 mi (1.9 to 2.7 km) apart. On one of the LZs, a pinnacle feature approximately 35 × 20 ft (11 × 6 m) and 15 ft (4.6 m) tall would be constructed to provide additional training opportunities. Equipment needed for construction activities is anticipated to be one four-wheel drive supervisor vehicle, one fuel truck, one water truck, and less than five pieces of heavy equipment that could include various combinations of bulldozers, graders, and excavators.

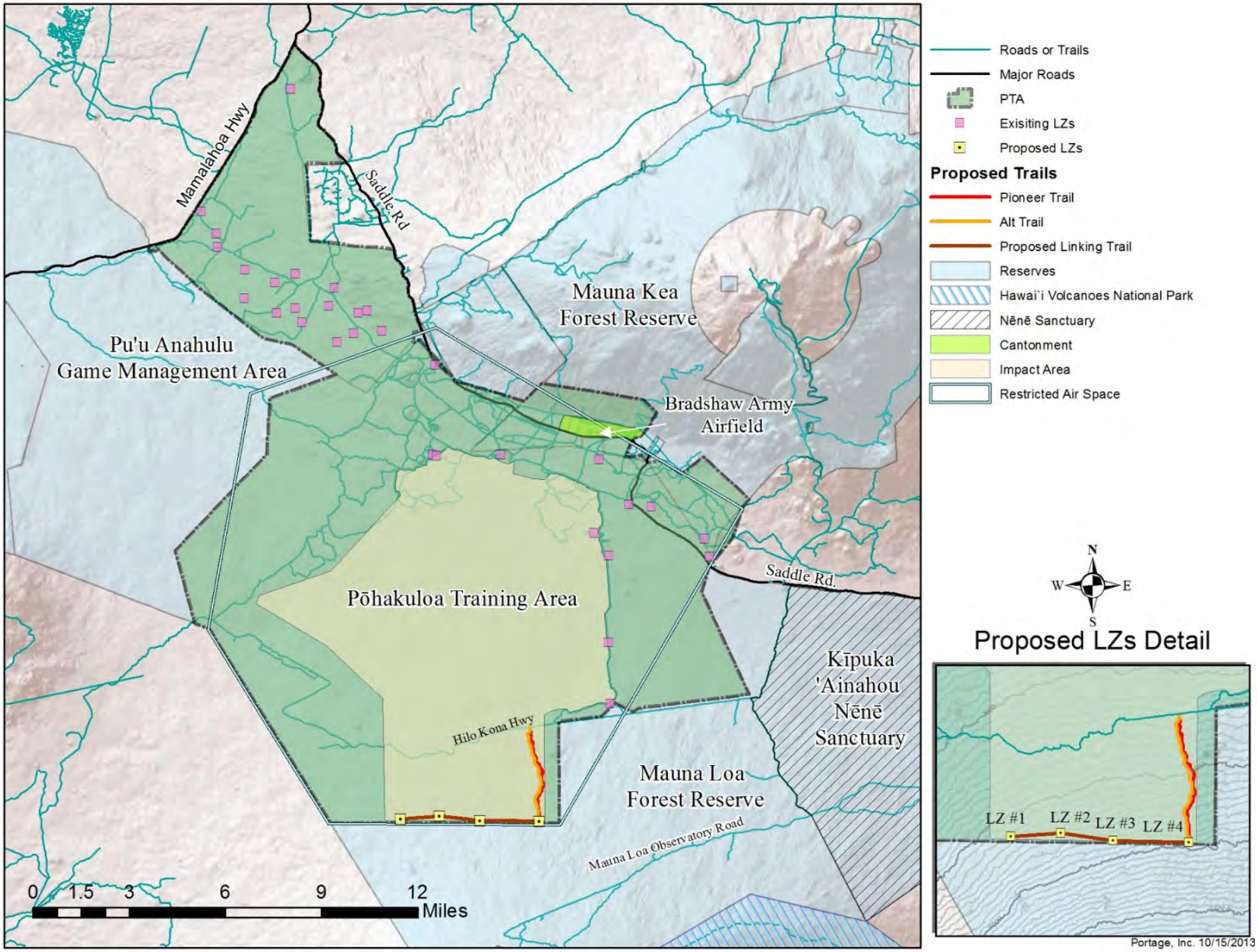

Figure 2-6. Location of existing LZs, the proposed LZs, and trails associated with the Proposed Action and alternatives.

2.2.1.1 Trail Construction. Construction of the access and linking trails would primarily involve use of a bulldozer, a grader, and an excavator. The bulldozer would soften the lava by driving over it multiple times. Once softened, the trail would then be leveled and smoothed. The softening process is estimated to take four passes with final leveling and smoothing occurring on a fifth pass. It is estimated that it would take 1 week or less to complete both access and linking trail construction. Completion of linking trail construction is estimated at 3 days.

The primary purpose of the access and linking trails constructed under the Proposed Action would only be to only provide a means to transport heavy equipment to the LZs for leveling the LZs. There are no plans or foreseeable uses for either the access or linking trails that results from the Proposed Action outside of what is being presented in this EA. However, the trail could provide a means of access for emergency and rescue personnel, if necessary, during flight and landing training.

2.2.1.2 LZ Construction. Each LZ would contain several landing points for multiple helicopters to land either all at once or in rapid succession. The number of landing points an LZ may accommodate would depend on the size of the helicopter(s) using the site, with the fixed requirement that helicopters maintain 328 ft (100 m) between each other. Figure 2-7 shows photos of the areas proposed for LZs.

The four new LZs would be constructed using the bulldozer, grader, and excavator, and no LZs would be sited on any lava tubes. The bulldozer would soften the lava by driving over it and then pushing the loose lava to the downhill area using a cut-and-fill approach. All LZs would be leveled by the bulldozer, grader, and excavator such that the aggregate would preferably be 3 in. in diameter but no more than 4 in. in diameter. On one LZ, a pinnacle feature would be constructed that would be approximately 35 × 20 ft (11 × 6 m) and 15 ft (4.6 m) tall to provide additional training opportunities. It is estimated that it would take 40 days to construct the LZs. LZs 1 and 2 would be 115 × 115 ft (35 × 35 m), LZ 3 would be 295 × 295 ft (90 × 90 m), and LZ 4 would be 525 × 525 ft (160 × 160 m) and have a final slope of 5% or less.

2.2.2 Operations

Under the Proposed Action, flights would originate at BAAF and proceed by any permissible flight path and altitude within PTA's airspace and perimeter to any of the proposed LZs. Flight and landing maneuvers would be conducted at all of the LZs. Multiple helicopters could be in the air and/or conducting maneuvers simultaneously, provided that the helicopters maintain a distance of at least 328 ft (100 m) from each other. It is estimated that approximately 10% of PTA's current total flight hours would be spent at the four proposed LZs. The Proposed Action would include flight maneuvers, landing maneuvers, and troop activities conducted under the CAB and HIARNG's training schedules.

2.2.2.1 Training Schedule and Frequency. The training schedule for CAB and HIARNG personnel specific to the Proposed Action is estimated as follows:

CAB pilot training schedule:

- Approximately 300 pilots: 65–75 pilots/quarter
- Deployment surge: 300 pilots trained within 60 days/as required.

HIARNG pilot training schedule:

- IDT (Inactive Duty Training) revolution: 2 weekends/quarter, 4 pilots/weekend

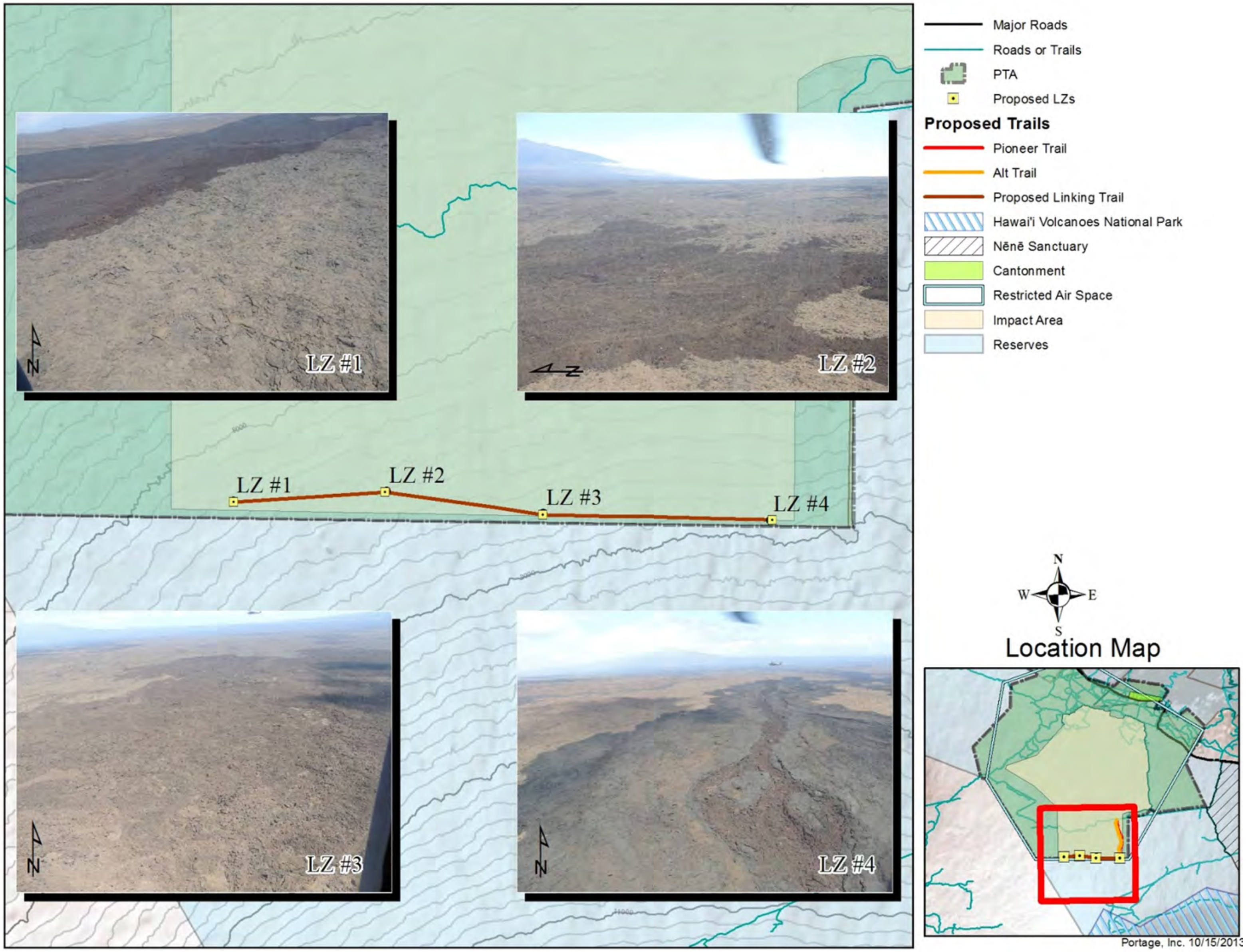

Figure 2-7. Photos and locations of proposed LZs.

Annual Training Group 1: 2 weeks, 50 pilots collective training

- Annual Training Group 2: 2 weeks, 20 pilots collective training
- Annual Training Group 3: 2 weeks, 4 pilots collective training
- Deployment surge: 75 pilots trained within 60 days/as required.

Overall flights to the proposed LZs are estimated to be a maximum of 420 flights a year and a maximum of 20 flights per day. This total is 10% of the current total training flights at PTA.

2.2.2.2 Flight and Landing Maneuvers. Approximately 10% of PTA's current total flight hours would be spent at the four proposed additional LZs as follows:

- Aircrews would fly in Restricted Airspace R-3103 and conduct flight maneuvers at the designated LZs. Army helicopters are flown in accordance with the Federal Aviation Administration (FAA) regulations and within recommended altitudes established by the FAA, the State of Hawai‘i, and restricted airspace (R-3103) over PTA.
- Flight maneuvers conducted at LZs would include, but not be limited to, visual meteorological-conditions (VMC) takeoff; VMC approach to a 3-ft (1-m) hover; go-around, slope operations; pinnacle and ridgeline operations; and elevated (100–500 ft [30–152 m]) reconnaissance over the LZs. Maneuvers would be conducted during the day and at night.
- Night flights and landing maneuvers would involve crews using night vision goggles (NVG). NVG are light intensifiers that allow the wearer to "see in the dark." Aircrews are trained, proficient, and equipped with technology using NVG.

The four LZs complement the 31 LZs currently being used on PTA. Landing maneuvers at the proposed LZs would include maneuvers conducted on the existing LZs and also maneuvers specific to higher altitudes and mountain terrain. Use of LZs would be as follows under the Proposed Action:

- Landing maneuvers conducted at LZs would include, but not be limited to, approaches, landings, takeoffs, formation flight, and loading/unloading troops.
- Pilots would conduct, but not be limited to, multiple touch-and-go, hover, short-stop approach, full-stop landing, and elevated (100–500 ft [30–152 m]) reconnaissance over the LZs.
- All hovering, take-offs, and landings of helicopters would occur inside the boundary that defines the LZ(s).
- On one LZ, a pinnacle feature approximately 35 × 20 ft (11 × 6 m) and 15 ft (4.6 m) tall would be constructed. This feature would be large enough for one helicopter at a time to practice pinnacle maneuvers.

2.2.2.3 Troop Activities. As proposed, the four additional LZs would be located within the perimeter of PTA, and troops would be allowed to conduct actions such as:

- Loading/unloading activities
- Staging activities

- Security operations
- Maintenance activities
- Pre-combat checks.

2.3 Alternatives to the Proposed Action

Alternatives to the Proposed Action (32 CFR V §§ 651 et seq.) were considered and are presented below.

2.3.1 Alternative 1 – Proposed Action with Alternate Trail Location

Alternative 1 is a modification of the Proposed Action. This alternative is the same as the Proposed Action, with the exception that the bulldozer would use the alternate path shown in Figure 2-6 to make the trail to the LZs. The estimated construction duration for this alternative is 40 days. This modified alternative is provided to evaluate whether there are differing impacts related to the placement of the trail.

2.3.2 Alternative 2 – Construction of Only One LZ

Alternative 4 is a modification of the Proposed Action. This alternative is the same as the Proposed Action, with the exception that only LZ 4 would be constructed. The estimated construction duration for this alternative is 35 days.

2.3.3 Alternative 3 – Construction of Only Two LZs

Alternative 5 is a modification of the Proposed Action. This alternative is the same as the Proposed Action, with the exception that only LZs 3 and 4 would be constructed. The estimated construction duration for this alternative is 38 days.

2.3.4 Alternative 4 – Construction of Only Three LZs

Alternative 6 is a modification of the Proposed Action. This alternative is the same as the Proposed Action, with the exception that only LZs 2, 3, and 4 would be constructed. The estimated construction duration for this alternative is 39 days.

2.3.5 Alternative 5 – Proposed Action Excluding Trails

Alternative 2 is also a modification of the Proposed Action. This alternative is the same as the Proposed Action, with the exception that a bulldozer would not make either the access or linking trails to the LZs. In this case, the bulldozer would need to be airlifted to all four of the new LZ sites to level them. The bulldozer would then be airlifted out of the area upon completion of work. This alternative was considered to evaluate the impacts of not constructing the trail. It is estimated that the construction duration for this alternative is 36 days.

2.3.6 Alternative 6 – Proposed Action Excluding Trails and without LZ Leveling

Alternative 3 is the same as the Proposed Action, with the exception that a bulldozer would not be used to either construct the access or linking trails or level the LZs. Thus, the LZs would be used by pilots as they naturally exist. This alternative was considered to evaluate the impacts of not leveling the LZs.

2.3.7 Alternative 7 – Other PTA LZ Locations

The Army considered locating LZs in configurations similar to the Proposed Action at other locations within the PTA boundary. Figure 2-8 shows the area on PTA that is above 8,000 ft (2,438 m). The Army observed that other potential LZ locations within this area would be in the Surface Danger Zone where bullets from training operations such as platoon live-fire and convoy live-fire exercises from two ranges just to the north could impact. If the LZs were moved any closer to these operations, then only one training exercise could be conducted at a time. This alternative was found to not meet the purpose and need.

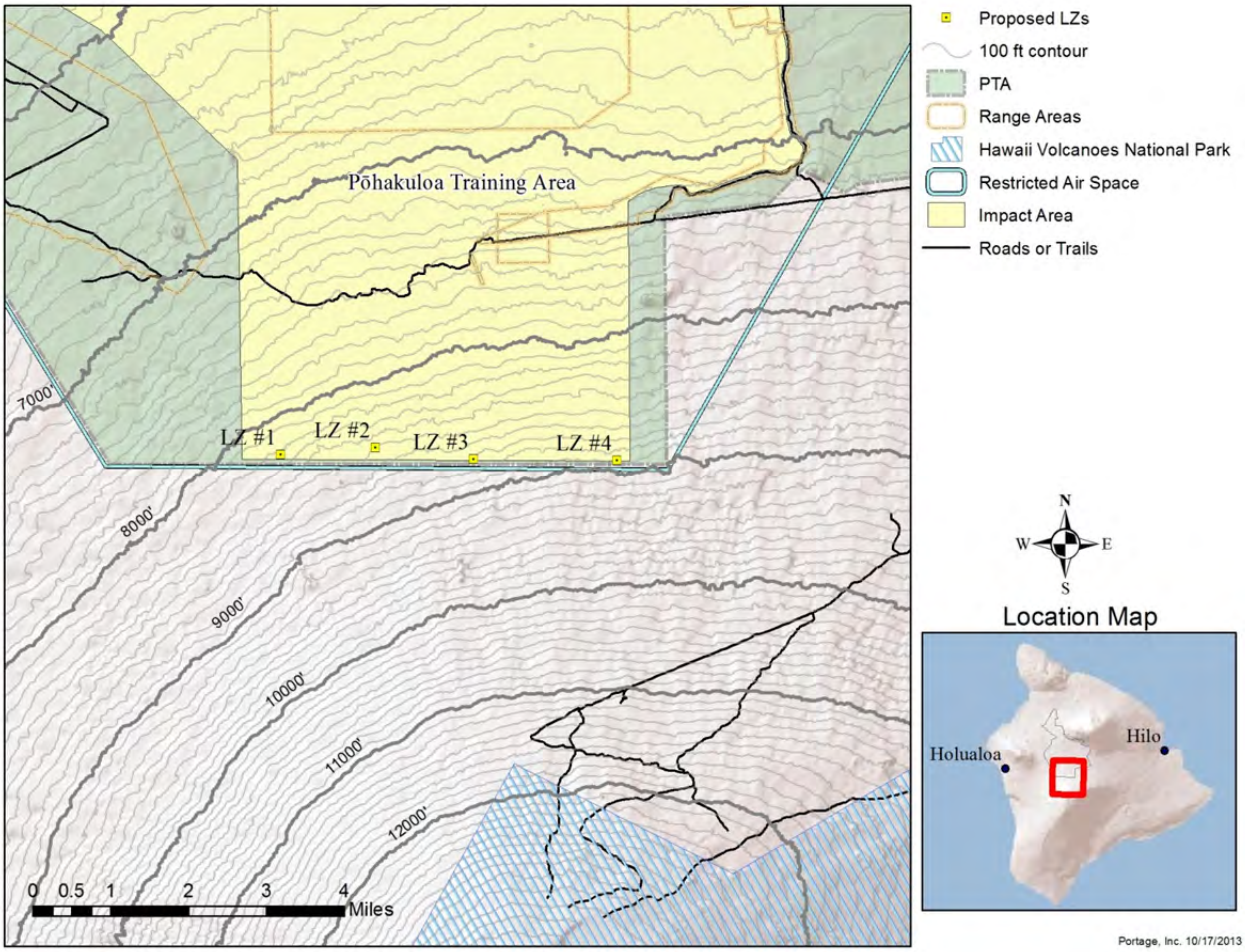

Figure 2-8. Area on PTA above 8,000 ft (2,438 m).

2.3.8 Alternative 8 – Simulator Landing Training

All aviation training programs include simulator training as part of their curriculum in addition to academic classroom instruction, individual flight technique training, and collective (group) training. However, this alternative proposes to conduct landing training with simulators rather than constructing and using the proposed LZs.

As technology advances and has an increased role in military operations (e.g., increased use of drones), it is reasonable to ask the question, Why not train exclusively on simulators? Simulators have proven to be cost effective and fuel efficient in comparison to training soldiers with real helicopters. Additionally, there is no crash risk using a simulator versus an actual helicopter, so, concurrently, human safety is increased and property loss risk is reduced.

Approximately 153 helicopter simulators are located in the United States. The Army possesses 85, the Navy has 26, the Marine Corps has 23, and the Air Force has 12. The rest are possessed by the Coast Guard and privately owned training centers that carry out military training (Greenyer 2008).

Simulators provide realistic flight training on an aircraft-type basis. For example, two CH-47F Chinook helicopter simulators are located at Wheeler Army Airfield on O‘ahu, and the Fort Carson Flight Simulation Facility provides realistic flight and academic training using the UH-60 A/L Black Hawk flight simulator.

Warrior Hall at Fort Rucker in Alabama is the largest helicopter simulation facility in the world (Computer Sciences Corporation 2012). Its simulators include those for the UH-60 A/L Blackhawk, CH-47 D Chinook, and OH-58D Kiowa Warrior. At Fort Rucker, more than 90,000 hours of simulation training are provided to more than 1,500 student pilots each year.

For the Simulator Landing Training Alternative, trainees would have to be able to acquire simulator training specific to their assigned helicopter and meet all of the specific training requirements of the aviation training program.

2.3.9 No Action Alternative

The No Action Alternative for this Proposed Action would be to not construct additional LZs.

2.4 Evaluation of the Alternatives

The USAG-HI and HIARNG evaluated the alternatives and drew the following conclusions:

- The Proposed Action. Aside from meeting the purpose and need, the Proposed Action is the Army’s preferred alternative, because the additional LZs would provide training opportunities under austere, mountainous flight and landing conditions, which are often encountered in theater but not available as training areas elsewhere on PTA.

- Alternative 1 – Proposed Action with Alternate Trail Location. This alternative was found to meet the purpose and need and was analyzed further.

- Alternative 2 – Construction of Only One LZ. This alternative was found to meet the purpose and need and was analyzed further.

- Alternative 3 – Construction of Only Two LZs. This alternative was found to meet the purpose and need and was analyzed further.

- Alternative 4 – Construction of Only Three LZs. This alternative was found to meet the purpose and need and was analyzed further.

- Alternative 5 – Proposed Action Excluding Trails. The Army considered alternate methods of transporting the equipment needed to level the LZs. The Caterpillar D8 bulldozer is the smallest of the track-type bulldozers with sufficient weight and power to do the work of leveling the LZs. The

D8 weighs 87,733 lb (39,795 kg) (Caterpillar, Inc. 2013). The Army considered transporting this bulldozer by airlifting or sling loading it to each of the LZ locations.

In considering both airlifting and sling loading, there were excessive flight weight, altitude, and associated pilot safety risks. The Chinook's maximum capacity is approximately 26,600 lb (12,065 kg) and is insufficient to transport a bulldozer. Other aircraft were also considered. After review, the Army concluded that there was no aircraft of sufficient size that could carry the bulldozer weight safely, by either transport method, to the altitude of the LZs.

This alternative also considered airlift and use of a smaller piece of construction equipment to level the LZs. It was determined that no smaller equipment had sufficient power and weight to crush and to level lava rock. The Army concluded that there was no alternative construction equipment that could be transported via air to level the LZs. This alternative was found to not meet the purpose and need.

- Alternative 6 – Proposed Action Excluding Trails and without LZ Leveling. The Army recognizes that this alternative would provide a more realistic setting for pilots in theater over leveled LZs. However, upon further consideration, several important points were raised, leading to the conclusion that this alternative would not meet the purpose and need:

    - The training feature, which cannot be simulated and is not present at any of the proposed LZs, is a pinnacle. This feature must be constructed.

    - The area, without leveling, does not provide a suitable level of safety for practicing landing because of the rough texture and the potential for unknown/unseen lava tubes.

- Alternative 7 – Other PTA LZ Locations. The Army considered locating LZs in configurations similar to the Proposed Action at other locations within the PTA boundary. Figure 2-8 shows the area on PTA that is above 8,000 ft (2,438 m) where LZs could be located. The Army observed that all other potential LZ locations would move the LZs too close to other training operations such as platoon live-fire and convoy live-fire exercises. If the LZs were moved any closer to these operations, then only one training exercise could be conducted at a time. This alternative was found to not meet the purpose and need.

- Alternative 8 – Simulator Landing Training. The CAB and HIARNG currently use the two CH-47F Chinook helicopter simulators at Wheeler Army Airfield for simulated training requirements during Phase I, the classroom and simulation phase of aviation training. To acquire landing simulator training for the other helicopters, trainees would likely be sent individually at various times of the year to available simulators across the United States—for example, to facilities like Warrior Hall at Fort Rucker in Alabama or Fort Carson in Colorado, in addition to Wheeler Army Airfield, on an annual and pre-deployment basis. Simulator training for the UH-72A Series Lakota does not exist. Trying to obtain aviation requirements and proficiencies solely on simulators, if it were possible, in this fashion would be highly disruptive to CAB trainees' regular roles and responsibilities at their home station and an impossibility for HIARNG trainees, who can only obtain their training on weekends. CAB and HIARNG pilots already train on the available simulators at Wheeler Army Airfield and reach a degree of proficiency that allows them to proceed to Phase II, individual flight training. Although military simulators are exceptionally sophisticated, there is no substitute for actual flight time and landing training. This alternative also does not meet training requirements specified in any of the helicopter training manuals. Thus, the alternative was found to not meet the purpose and need.

- No Action Alternative. This alternative would not meet the purpose and need, because the LZs would not be constructed or used; however, the No Action Alternative is required by NEPA to be fully considered and serve as the baseline to which to compare the Action Alternatives.

2.5 Alternatives Not Considered Further

After the alternative evaluation, the Army concluded the following alternatives did not meet the purpose and need and would not be considered further:

- Alternative 5 – Proposed Action Excluding Trails
- Alternative 6 – Proposed Action Excluding Trails and without LZ Leveling
- Alternative 7 – Other PTA LZ Locations
- Alternative 8 – Simulator Landing Training.

2.6 Alternatives Considered Further

After the alternative evaluation, the Army concluded that the following would be carried forward for further analysis:

- Proposed Action
- Alternative 1 – Proposed Action with Alternate Trail Location
- Alternative 2 – Construction of Only One LZ
- Alternative 3 – Construction of Only Two LZs
- Alternative 4 – Construction of Only Three LZs
- No Action Alternative.

The Proposed Action and Alternatives 1, 2, 3, and 4 may be collectively referred to as “Action Alternatives” from this point forward. The use of the generic term “alternatives” includes the No Action Alternative.

3. AFFECTED ENVIRONMENT

This section describes the existing conditions within the region of influence (ROI) for each resource area analyzed. The ROI is the area that potentially can be directly or indirectly affected by all of the alternatives.

The Army reviewed the following potentially affected resource areas: land use, recreation, airspace, visual and aesthetic resources, air quality, land-based traffic, noise, water resources, soil resources, biological resources, cultural resources, human health and safety, and socioeconomics and environmental justice.

This section identifies the environment that would be affected by the alternatives. The Proposed Action and Alternatives 1, 2, 3, and 4 occur entirely within PTA at its southeastern boundary. Thus, they involve the physical area located in and near the southeastern portion of PTA. ROIs for individual resources in this section may affect areas larger or smaller than this physical area.

Each of the following major subsections contains a description of the resource, a definition of the ROI, and an overview of the existing environment for the resource area. The assessment of these resource areas serves as a baseline against which the impact of all the alternatives may be measured.

The Army conducted field investigations to further define the affected environment for two resource areas. These investigations are fully addressed in Subsection 3.11, Biological Resources, and Subsection 3.12, Cultural Resources.

The Army prepared technical analyses for the following resource areas:

- Visual and aesthetic resources (Subsection 4.5)
- Air quality estimates (Subsection 4.6)
- Noise modeling (Subsection 4.8)
- Socioeconomic impact assessment for implementing the Proposed Action (Subsection 4.14).

Preceding this EA, the Army conducted a separate environmental analysis, *Final Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawaii* (U.S. Army 2013a). A thorough analysis of PTA was conducted in many resource areas that are also discussed in this EA. Because little time has passed between the two assessments and conditions have not changed significantly, this EA may refer to discussions and conclusions presented in the EIS (U.S. Army 2013a) that are still valid. Other information regarding the existing environment for the EA was provided from references discussed in each section.

3.1 PTA Overview

The total physical area of the island of Hawai‘i is approximately 2.5 million acres (1.1 hectares) or 4,028 mi^2 (6,482.4 km^2): 4,023 mi^2 (6,474.4 km^2) of land and 4.4 mi^2 (7 km^2) of inland water. The Hawaiian Islands, the island of Hawai‘i, and the location of PTA on the island of Hawai‘i are shown in Figure 3-1.

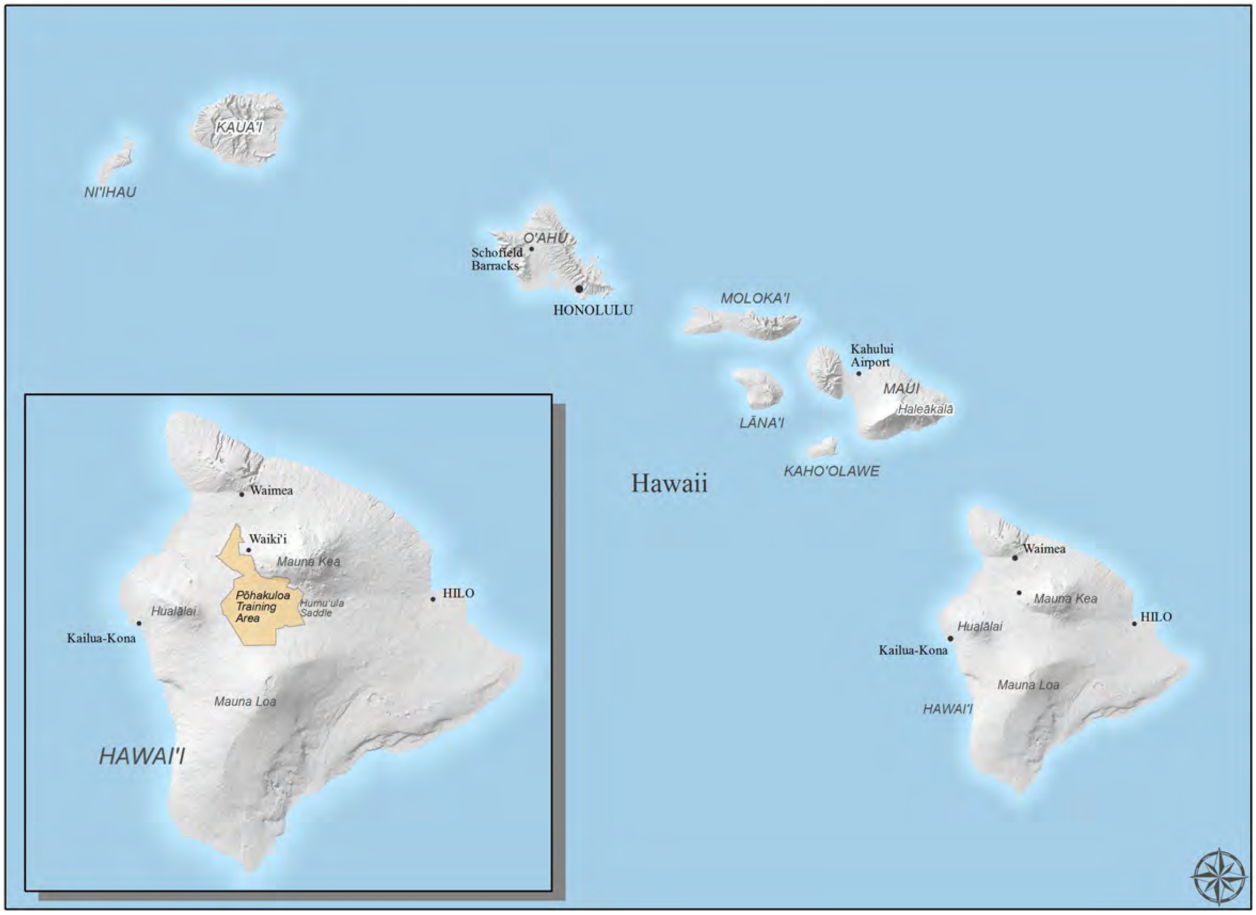

Figure 3-1. The State of Hawai‘i, including areas of interest on the island of Hawai‘i.

PTA occupies approximately 132,000 acres (53,400 hectares), 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. PTA is the largest military training area in Hawai‘i, extending up the lower slopes of Mauna Kea to approximately 6,800 ft (2,073 m) above mean sea level (amsl) and Mauna Loa to 9,000 ft (2,743 m) amsl.

Mamalahoa Highway forms the northwestern boundary, and Saddle Road forms most of the northern and northeastern boundary of PTA. Saddle Road (Route 200) connects the towns of Hilo to the east and Waimea to the north. These roads offer the only publicly accessible views of the installation, and the only reasonable access to PTA is via PTA’s main gate, which is located at Saddle Road Milepost 35. In areas where PTA is not fenced or gated to restrict public access, the area’s topography is inhospitable for public access.

Shown on Figure 3-2, PTA includes the Cantonment Area, BAAF, range areas, and the Ordnance Impact Area. The Proposed Action (Pioneer Trail) and Alternative 1 (Alternative Trail) are also shown on this figure.

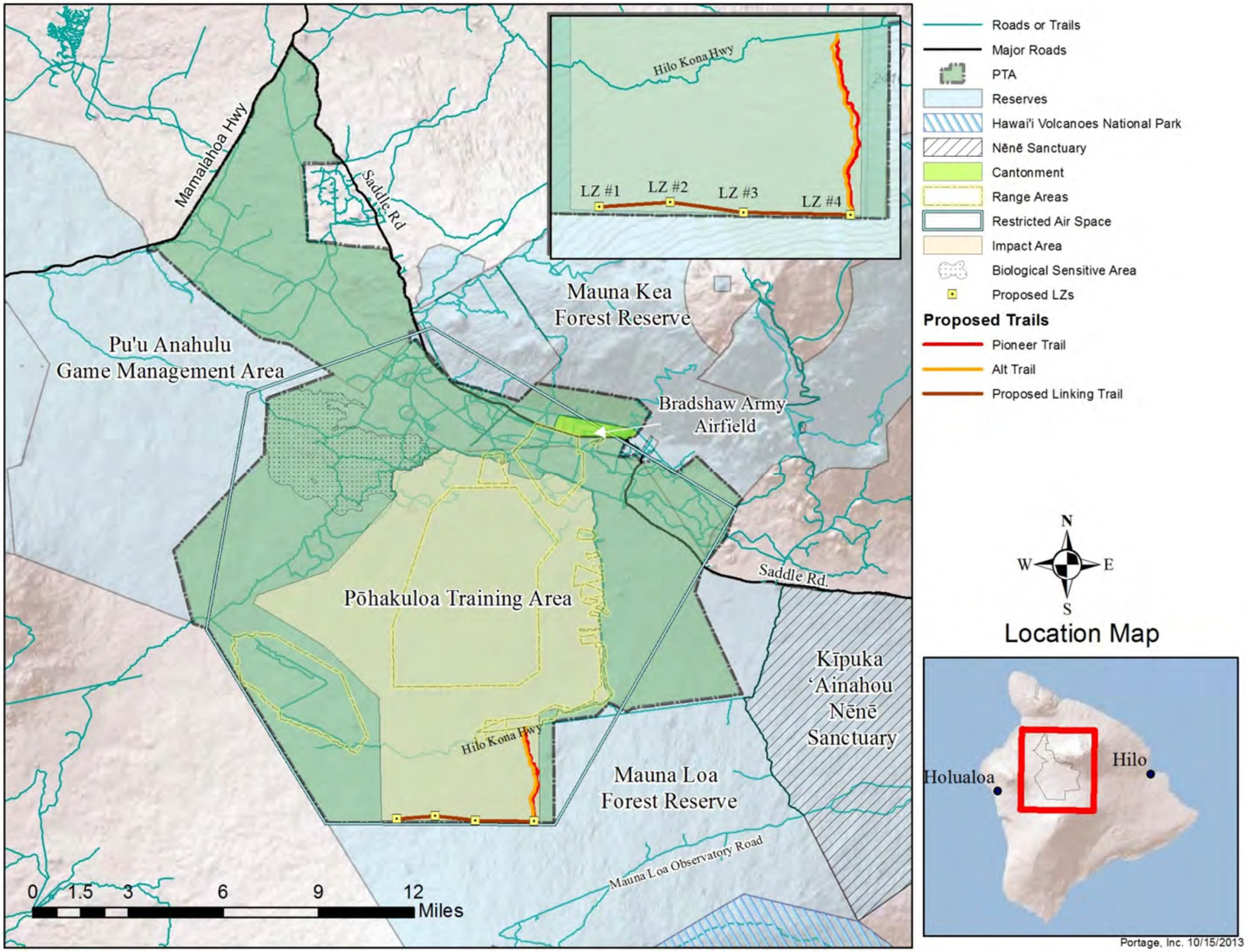

Figure 3-2. The Proposed Action and Action Alternatives at PTA.

Soldiers and pilots participate in annual training at PTA. PTA provides the space for infantry and associated support units to conduct force-on-force maneuvers, as well as space, LZs, and ranges specific to aerial training, gunnery, and maneuvers.

The types of weapon systems generally used at PTA are small arms, antitank weapons, mortars, field artillery, air defense artillery, explosives, and rockets. Depending on the type of training, live fire and/or blanks may be used.

3.2 Land Use

Land use is generally considered to be the property classifications and/or the types of human activities that occur, or are allowed, on ground parcels. Land-use planning is the long-term management of parcels and is conducted at a variety of scales—from local city government plans to state and federal regulations. Land-use plans, developed during the planning process, strive to ensure that development and activities proceed in a manner that is compatible with the specific parcel's use and its adjacent lands' uses.

A primary consideration that determines land use is the relationship between land cover and land use. Land cover is distinct from land use despite the two terms often being used interchangeably. Land cover is the physical material at the surface of the earth. Land covers include grass, asphalt, trees, bare ground, water, etc. Land use is a description of how people utilize the land and socioeconomic activity. Land use includes urban and agricultural uses, two of the most commonly known land use classes. Land cover is a primary factor in determining compatible land use.

Other considerations regarding land use and all of the alternatives are compliance and compatibility with master plans and zoning regulations. Secondary considerations include existing land use at project sites, land uses on adjacent lands and their proximities to the alternatives, the duration and longevity of an alternative, and whether or not implementing an alternative results in a change of land use.

Within PTA, at its southern boundary, where the Action Alternatives would be located, land cover is bare exposed rock, and no specific land use is identified.

Land use at, and surrounding, PTA has been described in detail in numerous documents. Summarized below is information largely from the Army's most recent documents involving land use in Hawaiʻi, *Final Environmental Assessment, High-Altitude Mountainous Environment Training* (U.S. Army 2011a) and *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawaiʻi* (U.S. Army 2013a).

3.2.1 Region of Influence

In terms of land use, the ROI for Action Alternatives consists of all of the lands within the PTA boundary and land directly adjacent to PTA, particularly at its southern boundary. Figure 3-3 shows the land cover/land use ROI.

3.2.2 Applicable Land Use Regulations

Land use within the ROI is governed by federal and state statutes and regulations. The Hawaiʻi State Land Use Law under *Hawaiʻi Revised Statutes,* Title 13, Chapter 205, "Land Use Commission," (State of Hawaiʻi 2011) places all Hawaiʻi lands under one of four land-use districts: urban, agricultural, conservation, or rural. The State Land Use Commission administers the land-use law, and the Hawaiʻi

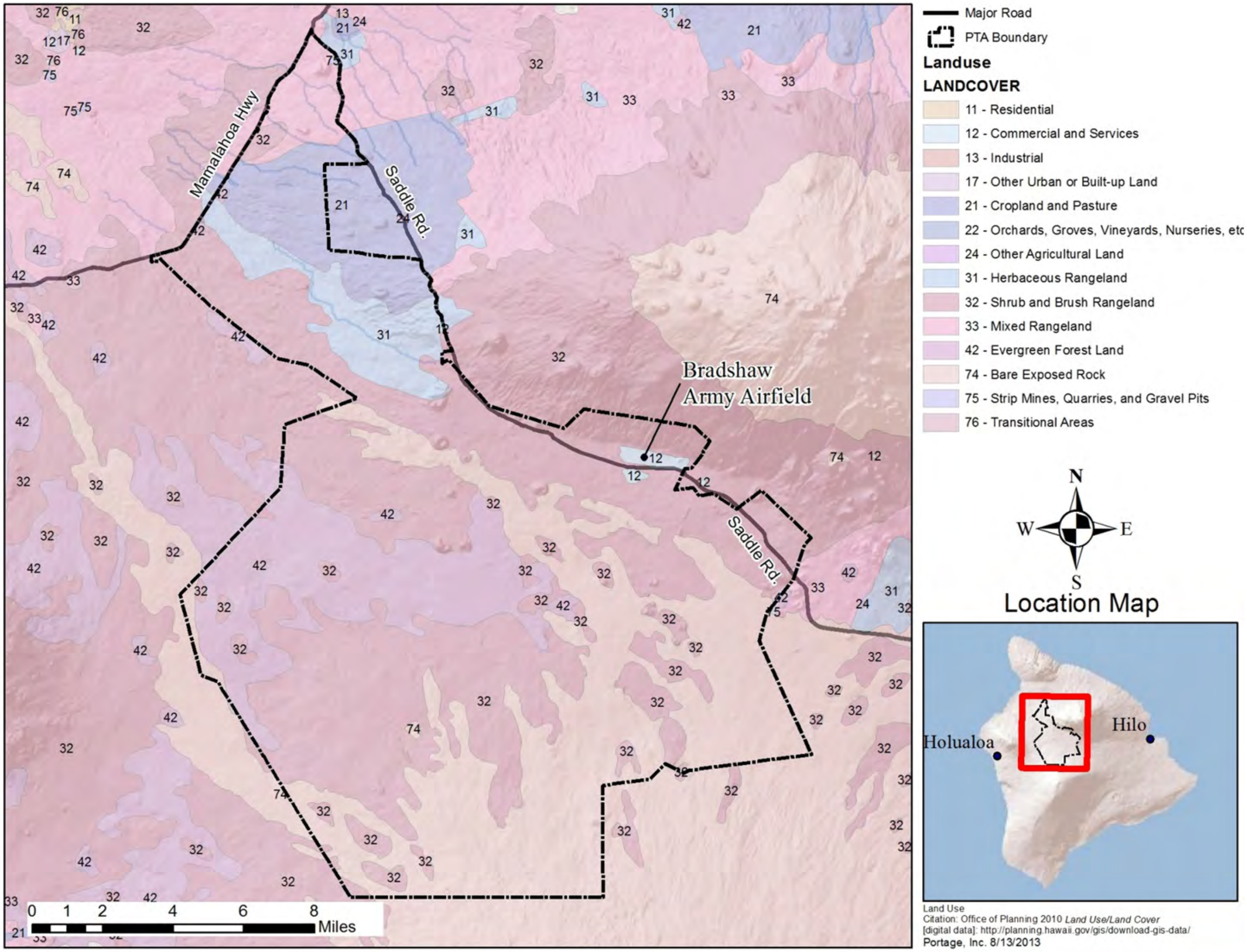

Figure 3-3. Land cover and land use within the ROI.

Department of Land and Natural Resources (DLNR) administers the law regarding land placed into conservation districts.

The entire State of Hawaiʻi is classified as being in the coastal zone. The Coastal Zone Management Act (CZMA) (16 USC 33) is administered by the Department of Commerce's Office of Coastal Resource Management and the National Oceanic and Atmospheric Administration (NOAA). 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 guiding document for the Hawaiʻi Coastal Zone Management Program is the *Hawaiʻi Ocean Resources Management Plan* (State of Hawaiʻi 2013a). Recently updated under the 2010 National Ocean Policy (75 FR 43023) and the *Hawaiʻi 2050 Sustainability Plan* (State of Hawaiʻi 2008), the management plan 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 (16 USC 33), 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.

Hawaiʻi was the first of the 50 United States to have a state land use law and a state general plan. Hawaiʻi remains unique among the 50 states with respect to the extent of control that the state exercises in land use regulation. The *County of Hawaiʻi General Plan* (County of Hawaiʻi 2005), as amended, details the history and specifics of land use on the island. The County of Hawaiʻi has no land use control over federal property.

The Sikes Act Improvement Act of 1997 (16 USC § 670a-670o) recognizes the importance and value of military lands to natural resources. It seeks to ensure that these ecosystems are protected and enhanced while allowing the military lands to continue to meet the needs of military operations, and it permits the sustainable multipurpose uses of the installation's resources such as 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. DoD Instruction 4715.03, "Natural Resources Conservation Program," (DoD 2011) further states:

> *DoD shall demonstrate stewardship of natural resources in its trust by protecting and enhancing those resources for mission support, biodiversity conservation, and maintenance of ecosystem services…and shall manage DoD lands, waters, airspace, and coastal resources or natural resources for multiple uses when appropriate, including sustainable yield of all renewable resources, scientific research, education, and recreation.*

The implementing guidance for these regulations is the *Integrated Natural Resources Management Plan 2010-2014, Island of Hawaiʻi, Pōhakuloa* (USAG-HI 2010a). The plan limits recreational activities to the hunting of birds and feral ungulates.

3.2.3 Land-Use Planning Districts

Hawaiʻi County has nine land-use districts, with PTA 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% of the Hāmākua district is classified as a conservation district. Table 3-1 shows the breakdown of nonfederal land within the Hāmākua land-use planning district, the district in which the ROI primarily lies.

Table 3-1. Land use in the Hāmākua planning district.[a]

District	Agricultural (acre)	Conservation (acre)	Rural (acre)	Urban (acre)	Total (acre)
Hāmākua	162,729	235,805	13	1,041	399,588

a. Table data from *County of Hawai'i General Plan* (County of Hawai'i 2005) for the year 2000.

The Hawai'i County zoning code is the legal method of land-use designation and regulation. The zoning code is the county's main land-use control and implements the *County of Hawai'i General Plan* (County of Hawai'i 2005). The code identifies the various types of zoning districts and the allowable uses for each district. Zoning maps establish the zoning for the island on a parcel-by-parcel basis. Rezoning is the primary method for changing the allowed uses of land. Rezoning must be consistent with the *County of Hawai'i General Plan*. Table 3-2 shows the zoning of nonfederal land in the Hāmākua district.

Table 3-2. Acres zoned within the Hāmākua planning district.

Zone Type	Hāmākua District (acre)[a]
Single Family	631
Multi-Family	4
Resort	42
Commercial	38
Industrial	15
Industrial Commercial Mixed	0
Family Agriculture	0
Residential Agriculture	0
Agriculture	165,076
Open	963
Unplanned	185

a. Table data from *County of* County of *Hawai'i General Plan* (Hawai'i 2005) for the year 2000.

3.2.4 PTA Land Ownership and Use

Lands within PTA are managed by the DoD and were ceded, purchased, and leased as shown in Table 3-3. The Ke'āmuku Maneuver Area (KMA) was acquired in July 2006, is an extension to PTA on its northwest side, and consists of 24,000 acres (9,713 hectares). This area has a quarry and is used for military maneuver training. Table 3-3 identifies lands used by the Army for PTA.

Table 3-3. Land ownership at PTA.[a]

Parcel		
Acres[b]	Hectares[b]	Acquisition Type
758	307	Ceded to Army – Governor's Executive Order No. 1719 1/26/1956
84,057	34,017	Ceded to Army – Presidential Executive Order No. 11167 8/19/1964
22,988	9,303	State of Hawaiʻi – Lease No. DA-94-626-ENG-80[c]
24,988	10,112	Parker Ranch – Purchase
16	6	Other – Purchase
6	2	Other – Purchase
1	<1	Other – Purchase
Total 132,814	53,750	

a. Source: USAEC and COE (2009).
b. Rounded to the nearest unit.
c. Lease expiration: August 16, 2029.

The Cantonment Area consists of 566 acres (229 hectares) with 154 buildings used for facility administration offices, troop billeting, and support services facilities. Most of these buildings are Quonset huts. BAAF is located directly west of the Cantonment Area, includes a 90- × 4,750-ft (27.4- × 1,448-m) paved runway and offers helicopter and limited C-130 transport airplane access. Safety zones associated with the BAAF extend 15,000 ft (4,572 m) beyond each end of the runway and 1,500 ft (457 m) to either side of the runway's center line.

PTA's primary range uses are for live-fire and maneuver training. PTA supports all types of live-fire training and can support large-scale (battalion or larger) maneuver training under uniquely realistic conditions, although the terrain limits training in certain areas. The Ordnance Impact Area consists of approximately 51,000 acres (20,648 hectares) and extends from central PTA to the southern boundary of the installation. This area allows for firing of all types of tactical weapons currently in the USAG-HI inventory.

PTA has two light-maneuver training areas totaling approximately 82,169 acres (33,253 hectares). Most of PTA's ranges border the Ordnance Impact Area and are oriented so that munitions are fired toward that area. Land suitable for field maneuvers consists of approximately 79,661 acres (22,930 hectares).

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 prohibition of off-road driving, restriction of driving to existing roads on cinder cones, restriction of fire-prone munitions based on the burning index (see Subsection 3.13.4, Wildfires), prohibition of vehicles inside the Kipuka Alala or Kīpuka Kālawamauna fence units without prior approval, required cleaning by training units of all vehicles at washrack facilities, and restrictions on live-fire activities as well as seasonal restrictions. Approximately 22.36% of the installation is subject to land-use restrictions based on the presence of critical habitat, threatened or endangered species, and cultural resources.

KMA is designated for command and control operations, dismounted nonlive fire, and helicopter and tactical-vehicle maneuver exercises only. No live-fire is permitted in the KMA to reduce fire potential, and no training activities are permitted in fenced units constructed around Puʻu Papapa and Puʻu Nohonaohae, sites of endangered plant taxa (USAG-HI 2010a,b).

The LZs, access trails, and linking trails, for all Action Alternatives, lie within the boundaries of PTA, as shown in Figure 3-2.

3.2.5 Land Ownership and Use Surrounding PTA

PTA is surrounded mainly by state-designated conservation lands and private lands (County of Hawaiʻi 2005). Uses of conservation lands include agriculture (primarily cattle grazing), hunting for big game species and upland game birds, game management, recreation, and undeveloped lands. Starting north of PTA, lands immediately surrounding PTA include the following (see Figure 3-4):

- State of Hawaiʻi lands to the north of PTA include Mauna Kea State Park and Mauna Kea Forest Reserve. Also to the north is Parker Ranch, one of the largest privately owned cattle ranches in the United States. There are no full-time residences on these lands; however, two historic homes on Parker Ranch property are open to tourists. State land to the north and northeast of PTA includes the Kīpuka ʻAinahou Nēnē Sanctuary, a designated area for nēnē populations and habitat. The sanctuary is discussed more in depth in Subsection 3.11, Biological Resources.

- Land directly east of PTA is owned by the Department of Hawaiian Home Lands (DHHL), a state agency that develops lands for homesteading by Native Hawaiians. There is currently no development on DHHL land east of PTA, and no residences are present east of PTA until just outside of Hilo. Limited cattle ranching under permits issued by the DHHL occurs on these lands. Also, on the east is a small portion of State of Hawaiʻi lands that includes Hawaiʻi Mauna Loa Forest Reserve. This reserve, and all forest reserves on the island, is managed by the DLNR, Division of Forestry and Wildlife (DOFW).

- State of Hawaiʻi lands continuing to the southeast and south include the larger section of the Mauna Loa Forest Reserve. Farther south and upslope on Mauna Loa lies the northern extent of Hawaiʻi Volcanoes National Park. Also to the south and southwest of PTA lies Bishop Estate, the largest private property owner in the State of Hawaiʻi. Created in 1884 by the will of Bernice Pauahi Bishop, the great-granddaughter of King Kamehameha, the estate's sole beneficiary is the Kamehameha Schools. There are no residences in this area south of PTA.

- State of Hawaiʻi lands to the west of PTA include the Puʻu Anahulu Game Management Area (GMA) where limited hunting is managed by the DLNR, DOFW. To the far west of the KMA section of PTA is Parker Ranch lands, which are run by the Parker Ranch Foundation and used for cattle grazing, horse raising, and natural resources and cultural conservation (Parker Ranch 2013). The nearest residents west of PTA's main gate are located at Waikoloa Village, approximately 10 mi (16 km) downslope from the westerly point of KMA; at Waikiʻi Ranch, a private residential development located on Saddle Road, approximately 14 mi (22.5 km) west; and at the town of Waimea, 13 mi northwest (20.9 km).

In addition to the area's roads and trails, Figure 3-4 shows Redleg Trail and Hilo Kona Highway. These are access roads associated with the Action Alternatives. These roads are discussed in more detail in Subsection 3.7, Land-Based Traffic.

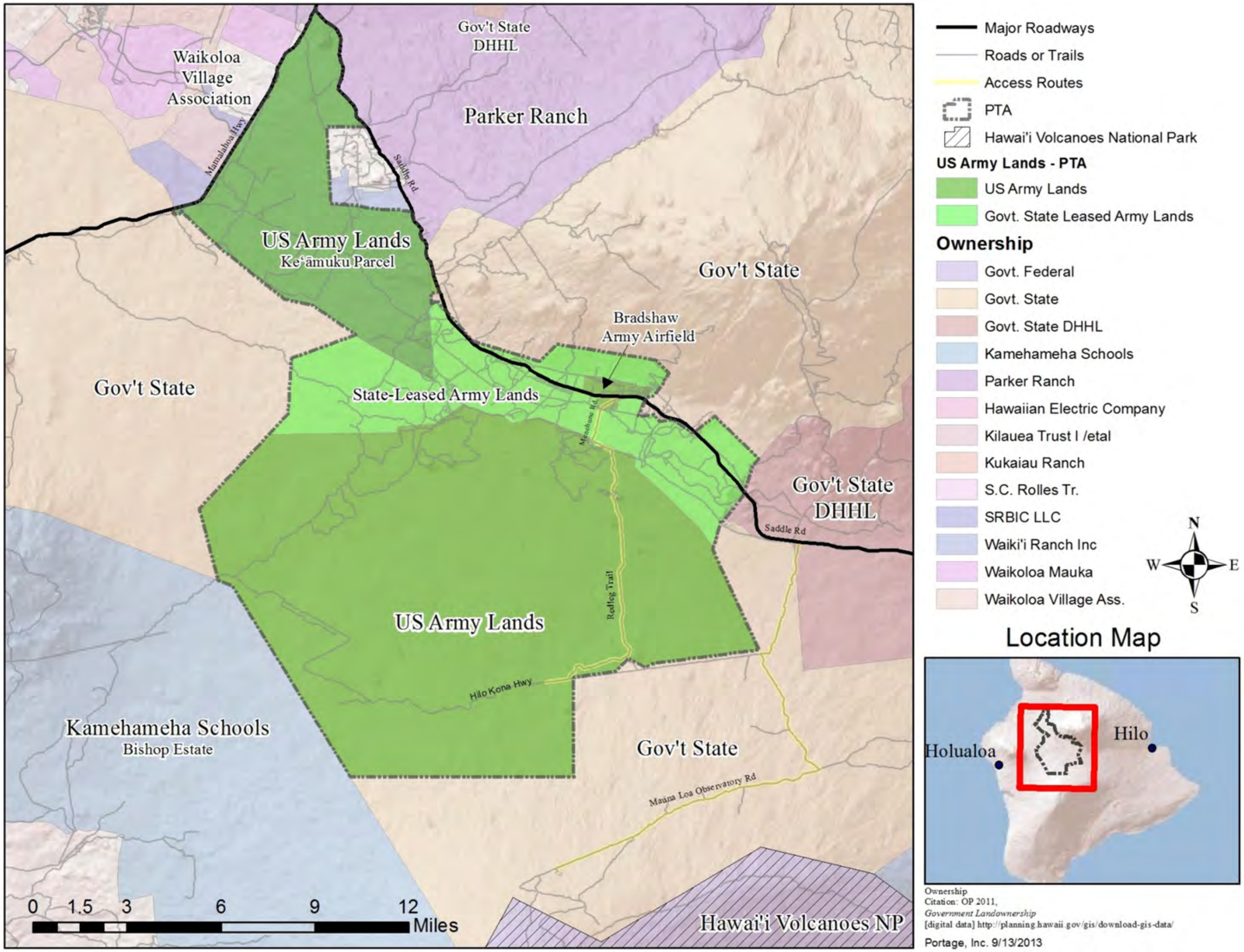

Figure 3-4. Land ownership at, and surrounding, PTA.

3.2.6 Administrative/Special Land Designations

The U.S. National Park Service National Landmarks Program designated Mauna Kea as a National Natural Landmark (NNL) in 1972 (NPS 2011). An NNL is a significant natural area that has been designated by the Secretary of the U.S. Department of the Interior. To be nationally significant, a site must be one of the best examples of a type of biotic community or geologic feature in its biophysiographic providence. The primary criterion for designation is that the area is of illustrative value and condition of the specific feature; secondary criteria include rarity, diversity, and value for science and education. Mauna Kea is listed as an NNL, because it is the highest insular mountain (rising to an elevation of 13,796 ft [4,200 m] above sea level) in the United States, containing the highest lake (Lake Waiau at 13,030 ft [3,972 m] above sea level) in the country and evidence of glaciations above 11,000 ft (3,353 m). Mauna Kea is also recognized as the “most majestic expression of shield volcanism in the Hawaiian Archipelago, if not the world” (NPS 2011). Mauna Kea is located north and northeast of PTA’s northern boundary.

3.3 Recreation

Hunting is an exceptionally popular activity on the island of Hawai‘i and within areas of the ROI. Public hunting areas are the lands where the public may hunt game birds and mammals; these areas include GMAs; forest reserves and surrendered lands; natural area reserves; restricted watersheds; cooperative GMAs; military training areas; unencumbered state lands; designated sanctuaries; and other lands designated by the DLNR, DOFW (State of Hawai‘i 1999a,b).

Hunted species in these areas include feral pig (*Sus scrofa*); axis deer (*Axis axis, an illegally introduced species that is being hunted to remove it from the island*); feral goat (*Capra hircus*); wild sheep, including mouflon sheep (*Ovis musimon*), feral sheep (*Ovis aries*), and mouflon-feral hybrid sheep (*Ovis musimon* × *Ovis aries*); ring-necked pheasant (*Phasianus colchicus*); white-winged pheasant (*Phasianus colchicus principalis*); green pheasant (*Phasianus versicolor*); Kalij pheasant (*Lophura leucomelanos*); California quail (*Callipepla californica*); Gambel’s quail (*Callipepla gambelii*); Japanese quail (*Coturnix japonica*); spotted dove (*Spilopelia chinensis*); barred dove (*Geopelia maugei*); mourning dove (*Zenaida macroura*); chestnut-bellied sandgrouse (*Pterocles exustus*); chukar (*Alectoris chukar*); gray francolin (*Francolinus pondicerianus*); black francolin (*Francolinus francolinus*); Erckel’s francolin (*Francolinus erckelii*); wild turkey (*Meleagris gallopavo*); and other game mammals and birds as may be designated by the U.S. Department of Fish and Wildlife (State of Hawai‘i 1999a,b).

All hunters are required to obtain the appropriate hunting tag, permit, and/or land owner permission as the individual circumstance dictates and report their hunting results on standard field forms located at hunter check-in stations at the end of every hunt.

3.3.1 Region of Influence

In terms of recreation, the ROI for all of the alternatives consists of the recreation lands/opportunities within the PTA boundary and recreational lands/opportunities directly adjacent to PTA, particularly at its southern boundary associated with Mauna Loa Forest Reserve GMA/Forest Reserve.

3.3.2 PTA Recreation

Hunting on PTA is limited to Training Areas 1–4 and Training Areas 9–16. Available hunting periods are intermittent, and the schedule is variable at PTA. While the state hunting requirements provide for daily mammal hunting at PTA, the reality is that hunting is superseded in priority by training activities and weather conditions, such as drought. All hunting on PTA is archery only; no live-fire is allowed. The only exception is during upland bird season (November through mid-January), which allows for the use of firearms with bird-shot. Bird hunting is usually conducted on Saturdays, Sundays, and state holidays. Game harvested in these training areas is primarily feral sheep and goats.

Hunting availability is announced via the PTA Hunting Hotline (808-969-3474) and is updated on an "as needed" basis by the PTA Range Control Supervisor and the PTA Garrison Commander (U.S. Army 2011a). Recreational hunting on PTA must follow hunting restrictions and bag limits as designated by State of Hawaiʻi rules (State of Hawaiʻi 1999a,b) and administered by the Hawaiʻi DOFW (U.S. Army 2011a).

Dispersed recreational activities do not occur within PTA but may occur immediately adjacent to PTA. In an isolated case, an annual motocross race actually crosses a small portion of PTA Training Area 2.

3.3.3 Recreation in Surrounding Areas

The southern boundary of PTA borders the Mauna Loa Forest Reserve. Hunting does occur within the reserve, which lies south and east of PTA. Mammal hunting occurs primarily on Saturdays, Sundays, and state holidays year-round. Hunting during upland bird season (November through mid-January) occurs primarily on Saturdays, Sundays, and state holidays. The reserve is accessed via an existing, but exceptionally rugged, trail that starts across from the Mauna Loa Observatory parking lot. A high-clearance four-wheel-drive vehicle is a necessity when driving the trail.

Dispersed recreational activities may occur throughout surrounding lands of the ROI, particularly at and near the southern PTA boundary. Data are limited to quantifiably describe which activities occur and the frequency of their occurrence. In addition to hunting, recreational activities in this area may include hiking and camping. However, this area is not considered a recreational destination area on the island.

Most destination recreational activities at the southern end of PTA take place much farther south on the island, away from the ROI, and are associated with Hawaiʻi Volcanoes National Park and the summit of Mauna Loa, which is approximately 7 mi (11 km) away from PTA's southern boundary. The park itself is normally accessed from the southern side of Mauna Loa; however, Mauna Loa Observatory Road is used to access the northern side of Mauna Loa's summit via a four-wheel-drive trail from a public parking lot at the observatory to the North Pit, the northern-most edge of the summit crater. A four-wheel-drive vehicle can reach within 0.25 mi (0.4 km) of the North Pit via this approach.

To the north of PTA, most recreational activities occur in association with opportunities offered on Mauna Kea and include hiking, biking, hunting, snow play, stargazing, bird watching, and sightseeing. Recreation destinations on Mauna Kea include the Mauna Kea State Park and areas more distant from the ROI such as the Visitor Information Station at the Onizuka Center for International Astronomy, Hale Pōhaku, the Mauna Kea Trail, and Mauna Kea Ice Age Natural Area Reserve.

Recreational opportunities exist within Parker Ranch, located just outside KMA, but most of these opportunities serve the Waimea area. Private hunting and other dispersed recreational opportunities occur within the ranch property (Parker Ranch 2013). Figure 3-5 shows the recreation areas surrounding PTA.

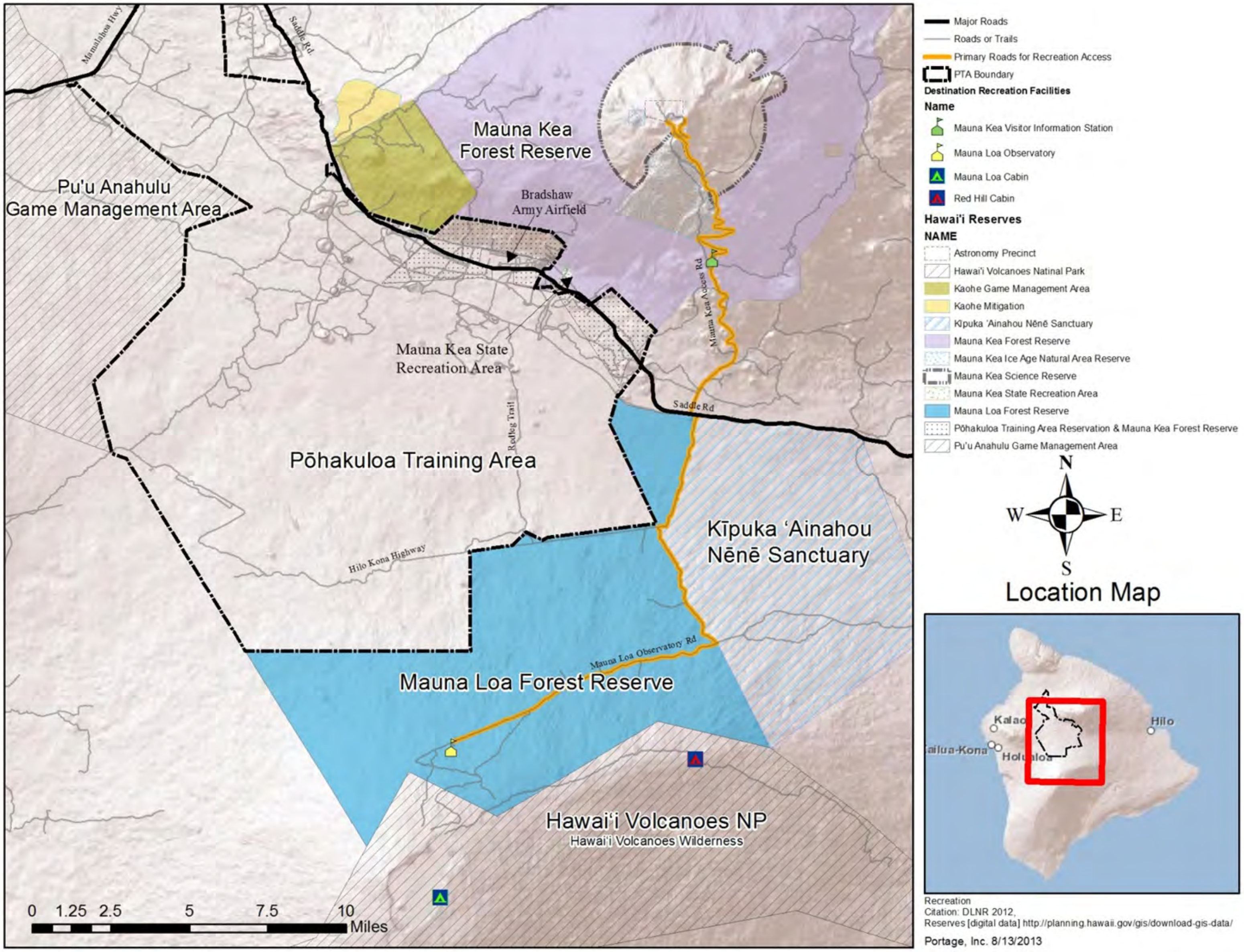

Figure 3-5. Recreation areas around PTA.

3.4 Airspace

The FAA is responsible for the control and use of navigable airspace in the United States. Airspace includes vertical and horizontal boundaries and time of use. The FAA also 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, and government agencies, including the U.S. military.

Pilots operate under two categories of operational flight rules that are tied to weather conditions. VMC exist during generally fair to good weather. During VMC, pilots may operate under visual flight rules, with the pilot being primarily responsible for seeing other aircraft and maintaining safe separation. Instrument meteorological conditions (IMC) exist during times of rain, low clouds, or reduced visibility. During IMC, pilots operate under instrument flight rules, and air traffic control is primarily responsible for aircraft separation.

Navigable airspace over the United States 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 I § 91 et seq.). By contrast, uncontrolled airspace is outside the parameters of controlled airspace where pilots are not subject to those operating and flight rules.

The FAA has designated six classes of airspace. Class A, B, C, D, and E airspace is controlled, and Class G airspace is uncontrolled. Within controlled airspace, air traffic control service is provided to pilots in accordance with the airspace classification. Within uncontrolled airspace, air traffic control service to pilots is not generally 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 pilots using instrument-flight rules from pilots using visual-flight rules during IMC conditions and when pilots are flying in close proximity to busy airports.

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.

Activities within restricted airspace must be confined from other airspaces because of their nature. Restricted areas denote the existence of unusual, often invisible, hazards to pilots such as artillery firing, aerial gunnery, or guided missiles. Entering restricted airspace without authorization may be extremely hazardous to pilots, crew, and passengers.

3.4.1 Region of Influence

The ROI for airspace is the Class D airspace around BAAF and the restricted airspace over PTA (R3103), which extends from the surface to 30,000 ft (9,144 m). Both airspaces are to be used for military operations only. 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. Honolulu Combined Center Radar Approach Control controls this airspace (U.S. Army 2013a).

The pilots conducting flights at PTA follow standard FAA procedures for flights conducted in and out of controlled airspace. To conserve fuel costs and to make training away from home efficient, flight training conducted under the Action Alternatives is conducted in tandem with other required training at PTA. Thus, flight from other locations to PTA is not a part of the Action Alternatives.

3.4.2 25th CAB Safety Record

From 2000 to 2010, the 25th CAB flew more than 480,000 hours in training and in support of contingency operations throughout the world. This figure includes more than 26,000 flight hours operating at high altitudes and in mountainous terrain in support of Operation Enduring Freedom in Afghanistan.

The 25th CAB has had two Class A accidents involving helicopters on the island of Oʻahu—one in February 2001 and another in May 2009. The 2001 incident was during an air-assault training operation in the Kahuku Training Area, and the 2009 incident was during a general maintenance test flight on Wheeler Army Airfield.

The CAB had zero accidents related to flight at high altitude, both in theater and in and around Hawaiʻi until 2012. During 2012, the 25th CAB was deployed to Kandahar and Zabul provinces of Afghanistan. The CAB experienced four Class A accidents and 10 Class C accidents, all resulting from environmental elements (dust landings, power management, operating in high attitudes, operating in high temperatures, and heavy helicopter operating weight).

Class A and C accidents are defined as follows (U.S. Army Combat Readiness/Safety Center 2013):

- Class A – Accident resulting in $2 million or more in damage; an Army aircraft is destroyed; injury and/or occupational illness that results in a fatality or permanent total disability
- Class C – An accident that results in total property damage of $500,000 or more, but less than $1 million; a non-fatal injury and/or occupational illness resulting in permanent partial disability, or when three or more personnel are hospitalized as in-patients as the result of a single occurrence.

3.4.3 Surrounding Area Air Traffic

Most of the airspace above the northern half of the island of Hawaiʻi 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, which are surrounded by Class D airspace, which extends from the surface to 2,500 ft (800 m) above the airport elevation. Hilo International Airport serves most of East Hawaiʻi, including the districts of Hilo and Puna, as well as portions of the districts of Hāmākua and Kaʻū. Most flights to the airport are from Honolulu International Airport by three airlines: Hawaiian, Go!, and Mokulele. Passenger count has remained relatively constant over the past 30 years in part because of the lack of tourism within the airport's service area. In contrast, Kona International Airport, which serves western Hawaiʻi Island, including Kailua-Kona and the major resorts of the North Kona and South Kohala districts, has undergone increased use such that planners are pursuing options for an additional runway and extension of the current runway.

Approximately 60 commercial helicopter flights per day (approximately 22,200 flights per year) fly just to the north of PTA (Munger 2010). Commercial vendors include, but are not limited to, Paradise/Tropical Helicopter, Sunshine Helicopters, and Blue Hawaiian Helicopters, all of which are based in Hilo. Flights usually originate from the west side of Hawaiʻi and fly along the south slope of Mauna Kea directly above the palila critical habitat (PCH) to reach various parts of the island as part of scenic tours.

More in-depth information related to PTA and airspace can be found in the *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa*

Training Area, Hawai'i (U.S. Army 2013a). Additional information about flight regulations and air traffic control can be obtained at www.faa.gov.

3.5 Visual and Aesthetic Resources

The visual character of an area is defined in terms of four primary components: 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 2008).

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.

The visual quality of an area also is 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, 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 features
- Quality (i.e., parks, preserves, and private recreation areas)
- Important historic or archaeological locations.

The natural beauty of the island of Hawai'i includes not just lush tropical forests, waterfalls, and sandy beaches framed by turquoise waters but also active and dormant volcanoes and towering mountains.

3.5.1 Region of Influence

The *County of Hawai'i General Plan* (County of Hawai'i 2005) 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 the island of Hawai'i 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
- Maximize opportunities for current and future generations to appreciate and enjoy natural and scenic beauty.

The proposed LZs, access trails, and linking trails related to the Action Alternatives lie within the Hāmākua planning district described in 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 features:

- Distinctive and identifiable landforms distinguished as landmarks
- Coastline areas of striking contrast
- Vistas of distinctive features
- Natural or native vegetation that makes a particular area attractive (USAEC and COE 2009).

The ROI for visual resources includes areas surrounding the PTA that can be classified as sites and vistas of extraordinary natural beauty per the standards described in the *County of Hawai'i General Plan* (County of Hawai'i 2005). These sites include areas on Mauna Kea, Mauna Loa, Hualālai, Mauna Kea State Park, and other areas of sensitive views near the PTA boundary.

3.5.2 Landscape Description

The landscape of the region from PTA to the proposed LZs 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 vicinity of PTA is gently sloping and open, periodically interrupted by remnant pu'u (volcanic cones). 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. Few human-made features are in the area except roads and support facilities within the training area and structures, roads, and an airfield within the Cantonment Area of PTA. The Cantonment Area is a visually distinct element of the landscape. Visible cultural features include walls, platforms, and many rock shelters.

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

The *County of Hawai'i General Plan* identifies areas of unique natural beauty that are a principal asset of the island, and the plan encourages programs for their conservation, preservation, and integration with other elements. Within the Hāmākua planning district, in which the Action Alternatives would take place, the general plan lists the Mauna Kea State Park (and area) as an example of natural beauty sites the plan protects (County of Hawai'i 2005).

Within this visual landscape, aviation training currently occurs within PTA, and commercial and private aircraft operate outside of PTA. The latter topics are discussed in Subsection 3.4.3, Surrounding Area Air Traffic. A view plane analysis is presented in Subsection 4.5, Visual and Aesthetic Resources.

3.5.3 Sensitive Views

The *County of Hawai'i General Plan* (County of Hawai'i 2005) lists island locations as examples of natural beauty and includes the scenic countryside around Waiki'i; the mauka and makai (mountain and sea) view plane from various locations along Queen Ka'ahumanu Highway in South Kohala and North Kona; the Mauna Kea State Park area; and the Pu'ukoholā 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, the Puʻukoholā Heiau National Historic Site, and adjacent roadways (U.S. Army 2013a). 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. This scenic byway is outside the ROI.

The primary public viewing areas near PTA are along, or accessed by, Saddle Road. Public traffic through the area is generally light but is increasing as the road is being improved. While many travelers typically drive through without stopping, others use Saddle Road to access Mauna Kea State Park and the observatories and recreational areas associated with both Mauna Kea and Mauna Loa. The typical public view of the PTA is from a vehicle traveling at normal speed, but some hikers, photographers, and artists pause along Saddle Road to observe the views. Scenic views can be experienced from Mauna Kea State Park, and areas within PTA are also visible from the summit of Mauna Kea. The public is allowed general access to much of Mauna Kea summit, including at the Science Reserve. Puʻu Poliahu is a location of particular interest; because it is on the southwestern side of the summit, it provides views of the PTA. 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 (U.S. Army 2013a).

3.6 Air Quality

Air quality is dependent on the type and amount of pollutants emitted into the atmosphere, those that currently exist in the atmosphere, the size and topography of the airshed, and the prevailing meteorological and weather conditions. This subsection addresses air quality resources and describes federal and state air quality standards and regulations, weather and meteorology of the area, and existing air quality conditions at PTA.

3.6.1 Region of Influence

The ROI for air quality depends on the specific pollutant(s) and emissions source(s) involved, as well as weather patterns, terrain, and prevailing winds. Primary pollutants are emitted directly; secondary pollutants are formed through chemical reactions in the atmosphere from precursor pollutants. The ROI for a primary pollutant depends 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 primary pollutants is an area potentially subject to measureable air quality impacts under unfavorable dispersion conditions. The primary pollutant ROI generally involves a relatively small area—for example, from 1 mi (1.6 km) to less than a few miles from the source. The ROI for a secondary pollutant generally has a larger ROI. For example, ozone is a secondary pollutant that could have an ROI that reaches island-wide.

In practice, the specific ROI for air quality is better understood after emission sources are determined, pollutants are identified, meteorological information is obtained and this information is evaluated/modeled under varying conditions. Construction activities, construction vehicle use, and 10% of the current volume of training flights that would use the proposed LZs are the anticipated emission sources under all of the Action Alternatives. The rest of this subsection discusses meteorological information, air quality standards, air quality programs, and the existing environment.

3.6.2 Climate and Meteorology

Western Regional Climate Center (WRCC) data from the past 5 years were reviewed for the PTA Kipuka Alala, PTA Range 17, and PTA East Remote automatic weather stations. The PTA East Station was offline from 2005 until the beginning of 2013. Data from the other two stations, limited additional data from BAAF, the official Climate of Hawai‘i narrative written by the state’s climatologists (as reported by WRCC), and information from the NOAA MLO were consulted to describe the climate and meteorology of the area most likely encompassing the ROI. These stations are shown on Figure 3-6.

3.6.2.1 Temperature. The climate at PTA is relatively cool and dry and, like the rest of the island, is characterized by a two-season year. Winter runs approximately from October through April, and the summer season extends from May through September. Summer is the warmer season with an overwhelming dominance of trade winds, and widespread rainstorms are rare. August and September are the warmest months of the year. Mild and fairly uniform temperatures are found everywhere except at higher elevations, where frost or snow occur periodically. Most major storms occur during the winter season. Cloudy, humid conditions occur along the east coast with drier conditions on the west coast. In the lower elevations around PTA, the annual mean temperature is about 60°F (15.6°C) and 50° F (10°C) at higher elevations (WRCC 2013).

3.6.2.2 Wind. PTA 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 island’s mountains and valleys. Additionally, local wind regimes may either reinforce or oppose the general flow of air depending on the local circumstances. Finally, in some weather situations, the trade winds are replaced by other general winds, some of which are not nearly as uniform in direction or speed. Thus, average wind speed values are informative only in a broad descriptive sense.

Wind data for the past 5 years were reviewed and are pictorially shown on three wind roses, Figures 3-7 through 3-9, for weather stations at PTA East, PTA Range 17, and PTA Kipuka Alala. According to the WRCC, average wind speed at these stations during the 5 years was 7.5 miles per hour (mph) (12.1 kph) and generally varied from 5.33 to 10.53 mph (8.53 to 16.94 kph). Figure 3-10 is a wind rose from MLO for the year 2012. These four wind roses all show that winds on PTA generally flow from the north-northwest to the east-southeast. At the same time, wind also flows from the summit area of Mauna Loa downslope to the north and northeast toward PTA. The usual daily patterns of winds are upslope during the day and downslope at night (WRCC 2013).

The average annual wind speed at BAAF from 1996 to 2006 (the most recent period that data were available) was reported to be 11.9 mph (19.2 kph) (WRCC 2013). The area is subject to occasional fog and frost, with frequent light rains in the winter months.

Meteorological conditions that typically impact the island, and PTA, on a daily basis are the effects of the diurnal wind patterns and temperature inversions. Diurnal wind patterns consist of localized winds that tend to move inland from the coast during the day and then reverse direction and flow offshore at night and in the early morning. Temperature inversions occur when hot air, which normally rises without restriction, is trapped by cooler air above. This situation happens at the 5,000- to 7,000-ft (1,524- to 2,133-m) elevations and above land masses. Temperature inversions develop most frequently in the summer when the air above the island becomes warmer. The formation of the inversion layer may result in moist air in the form of clouds or fog being trapped at the inversion layer, causing restricted visibility. Moisture is forced from the rising trade winds at the inversion layer, where it is trapped below the inversion zone. Orographic rainfall may result below, while the area above the inversion zone may experience desert-like conditions when dryer air released from below rises.

As shown in Figure 3-11, clouds or fog trapped at the inversion layer will generally rise as daytime ambient temperatures rise and the daytime diurnal wind pattern flow is up the mountain. Conversely, clouds or fog trapped at the inversion layer will drop in elevation as nighttime temperatures fall and the diurnal wind pattern is down the mountain. The result is that during inversion conditions, cloud cover or fog may lift or fall to cover sections of PTA.

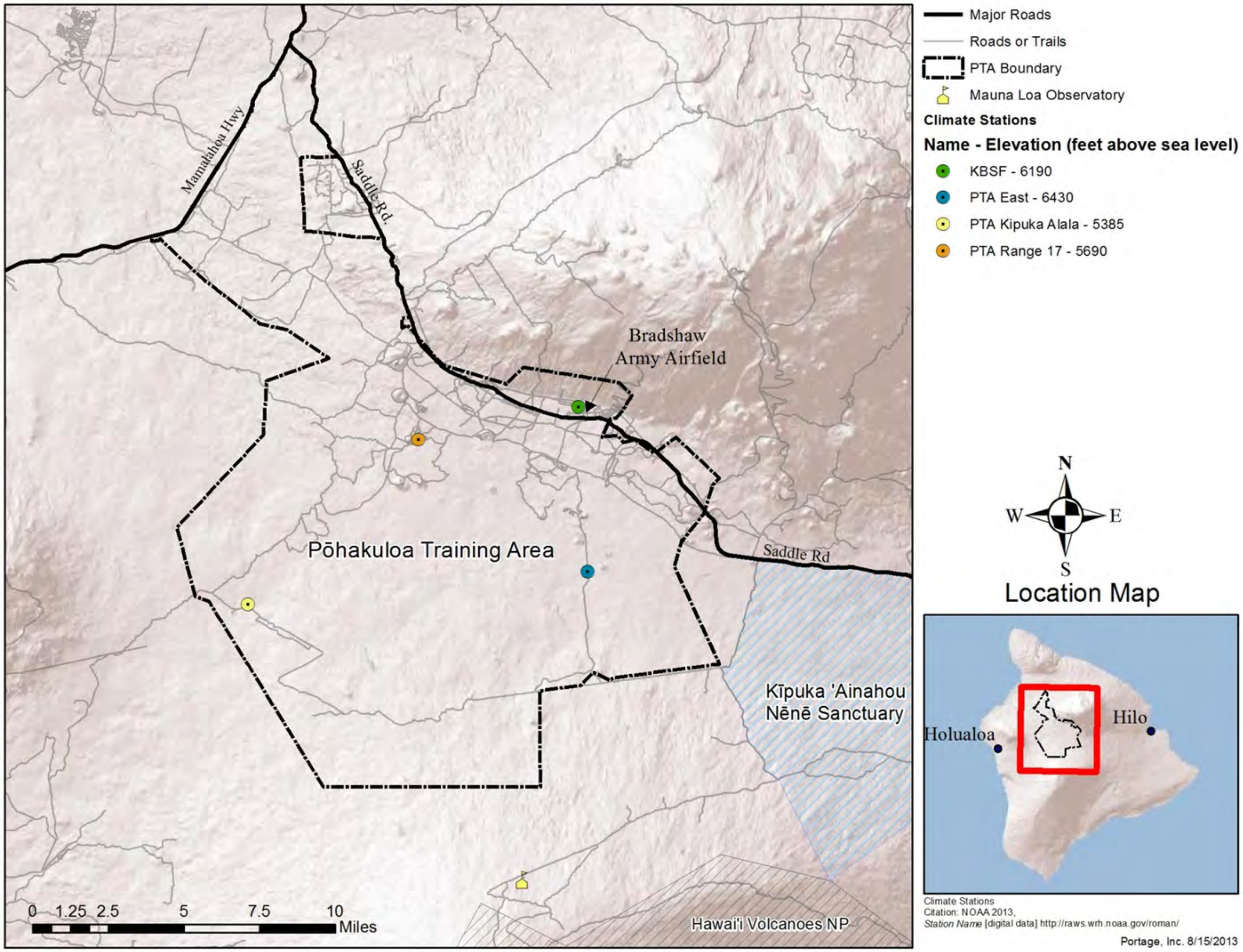

Figure 3-6. Weather stations within the ROI.

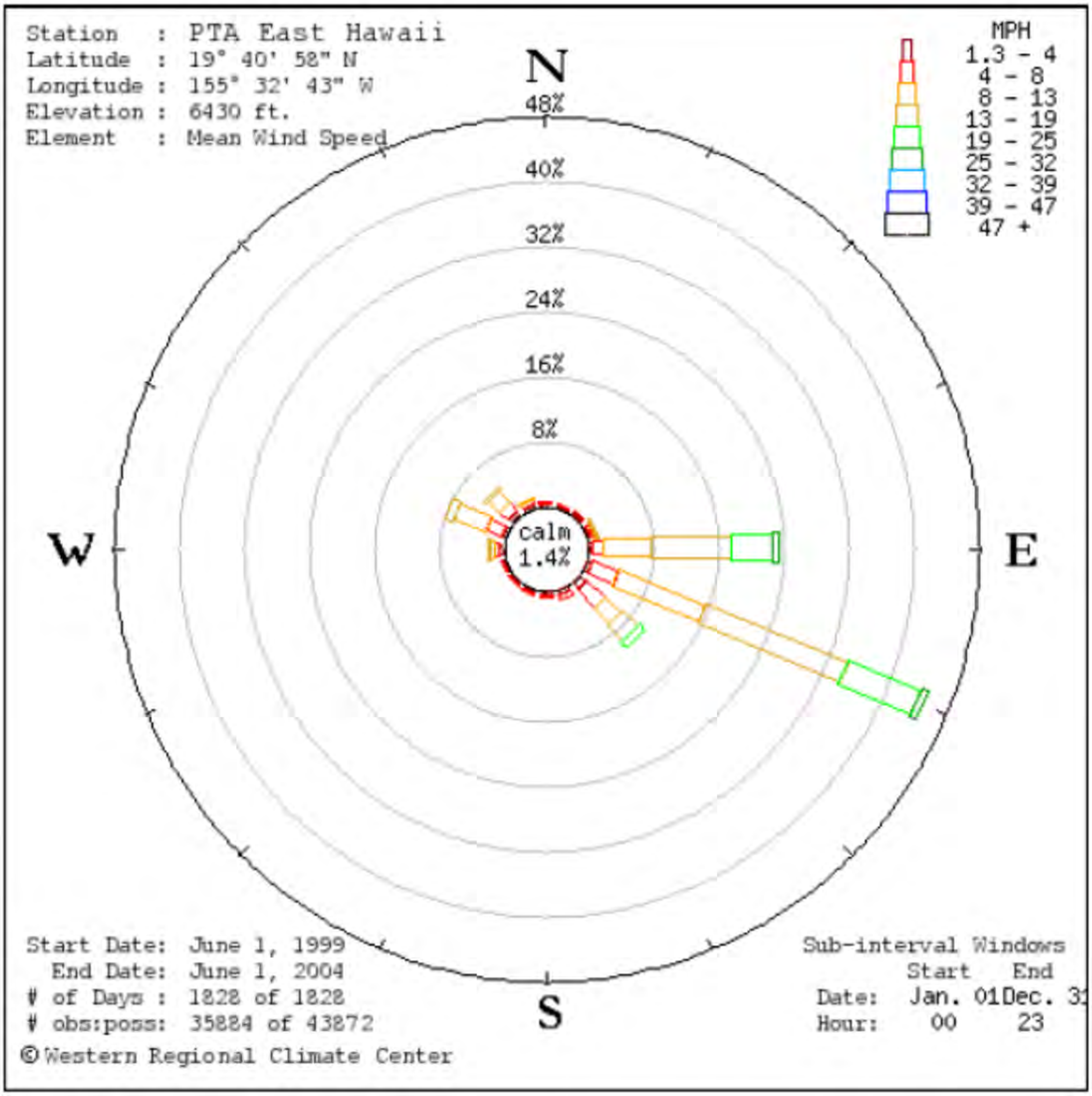

Figure 3-7. Wind rose for PTA East weather station (shows data for 1999 to 2004, the last 5-year period available) (WRCC 2013).

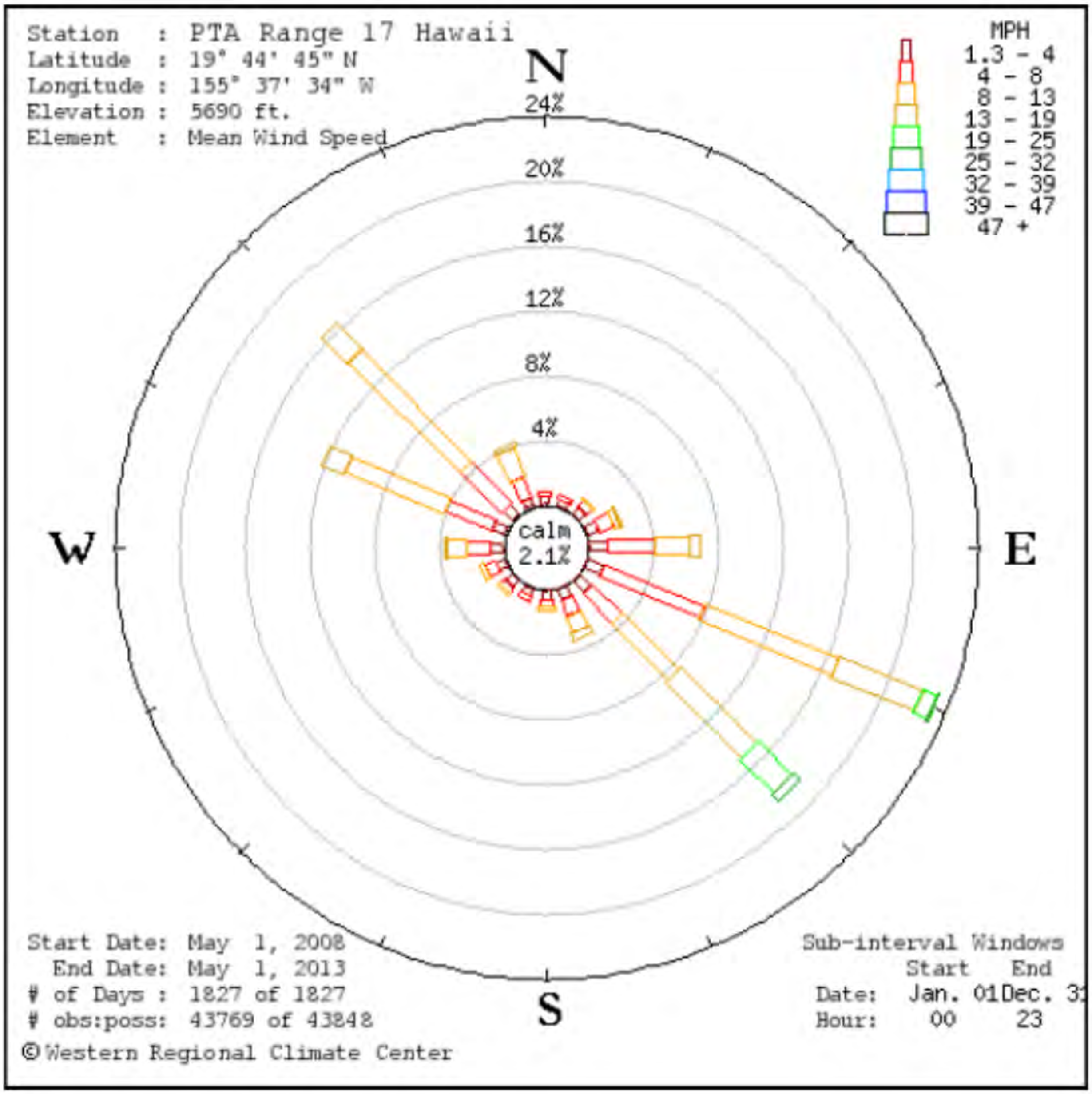

Figure 3-8. Wind rose for PTA Range 17 weather station (WRCC 2013).

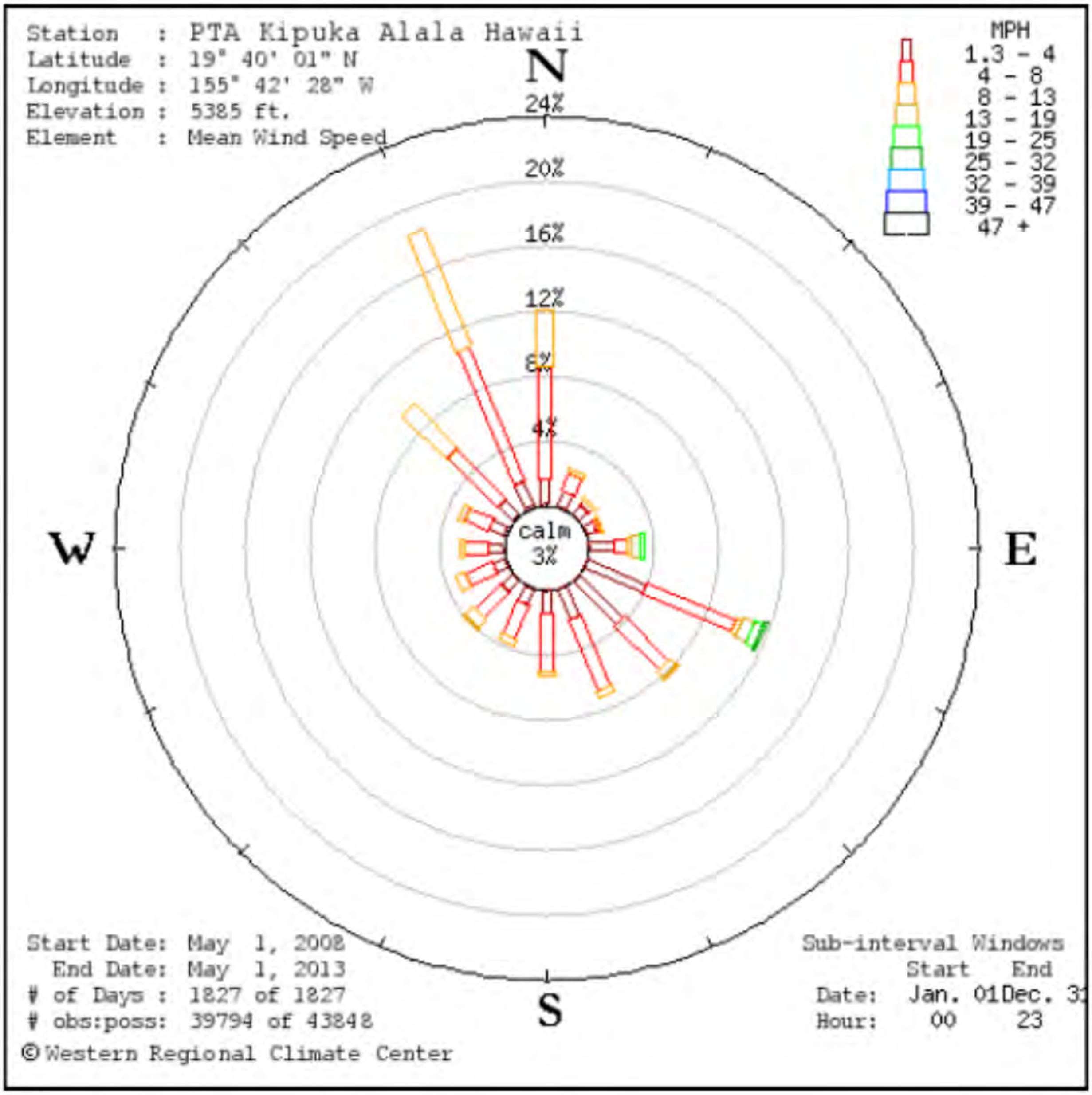

Figure 3-9. Wind rose for PTA Kipuka Alala weather station (WRCC 2013).

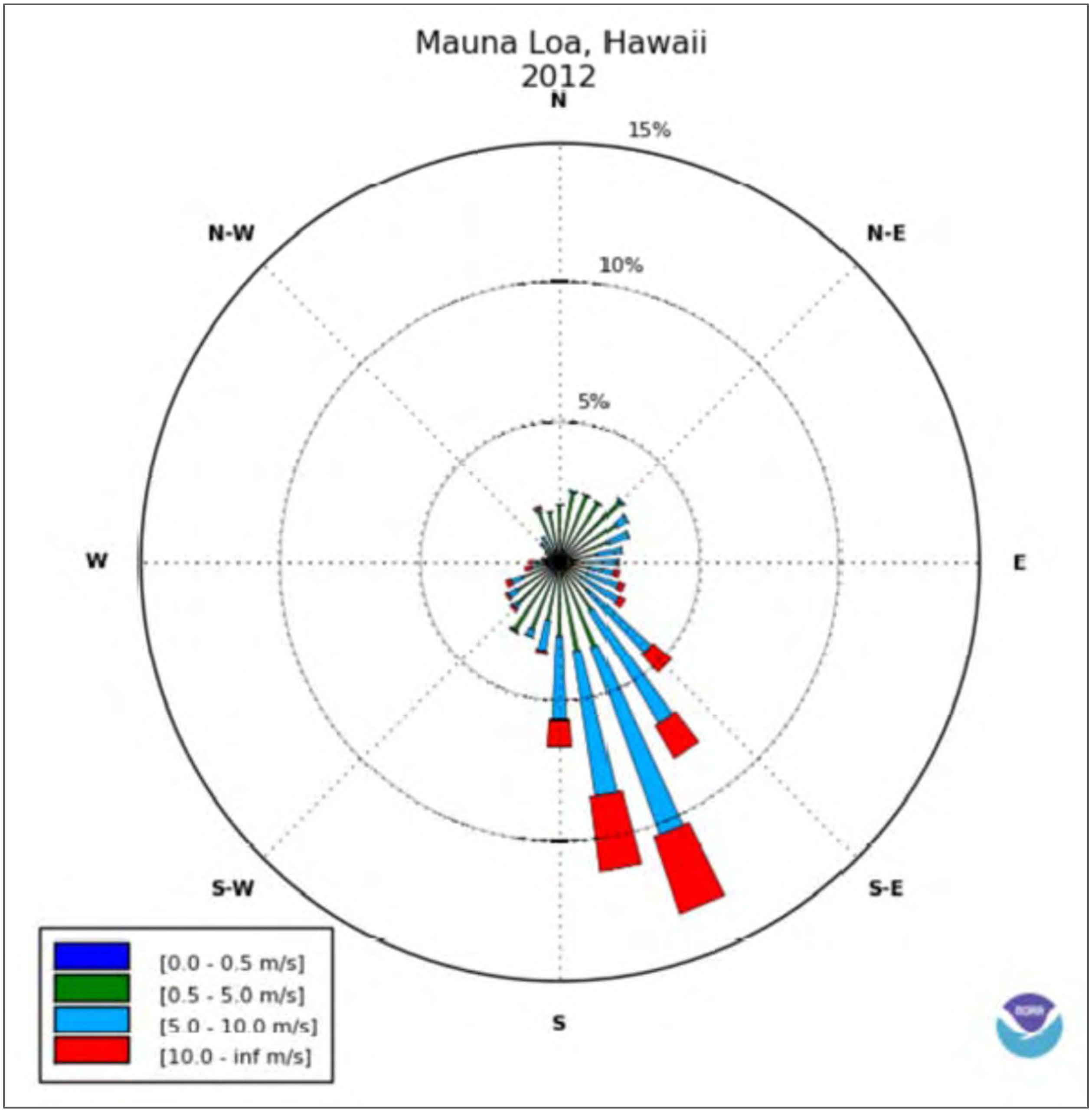

Figure 3-10. Wind rose for MLO, 2012 (NOAA 2013b). (Note: The rose center lies near the summit of Mauna Loa, and the longest wind bar terminates in the ocean by Pahala.)

Figure 3-11. Clouds trapped in the inversion layer in the valley between Mauna Kea and Mauna Loa (seen in the distance; photo taken March 21, 2010).

3.6.2.3 Precipitation. PTA and the surrounding area experience 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 (WRCC 2013). Rainfall decreases above 3,000 ft (914 m) on Mauna Kea and Mauna Loa. Annual rainfall averages 21 in. (51 cm) and less in leeward coastal areas and near the summits of the high mountains. At the other extreme, annual rainfall average exceeds 23 ft (7 m) along the lower windward slopes of these mountains. BAAF reported a yearly average of 8.94 in. (23 cm) in 2008 (WRCC 2013). Kulani Mauka is a rain-collection site at the 9-mi (14.5-km) marker (at elevation 8,294 ft [2,527 m]) along Mauna Loa Road and is checked once a week by MLO staff. Average precipitation at Kulani Mauka is approximately 40 in. (100 cm) per year (NOAA 2013a).

Mountain slopes and crests within the cloud belt and inversion layer are frequently exposed to fog or cloud mists. Although measurable precipitation may not be recorded by rain gages, experiments on other islands indicate that “fog drip” may contribute two-thirds as much water to vegetation and soil in an area as does rainfall itself (WRCC 2013).

3.6.2.4 Storms. Intense local storms other than under trade-wind conditions are small features that seldom cover more than a few square miles and most often occur in late afternoon or early evening. An average of 20 water spouts and other funnel clouds are reported each year. Major storms mainly occur in winter and may bring high winds from any direction. Extreme wind speeds may vary radically from one place to another based on the storm type and the effect of the terrain. It is not unusual to have maximum speeds of only 35 to 40 mph (56 to 64 kph) in one place and much higher speeds in a more limited area only a few miles away. Storm types most common that affect the island are cold front storms with cool spotty rains and gusty winds mainly from the north and northwest. Kona storms, which bring winds from leeward directions and more widespread and prolonged rains, sometimes last several days. Hurricanes are rare in Hawaiʻi. Only four have occurred in a 63-year period, but tropical storms are more frequent. Upper-level low storms are similar to Kona storms but develop in the upper atmosphere rather than at sea level. Several times a year between October and May, major storms may drop 1 ft (0.3 m) or more of snow on the upper slopes of Mauna Kea and Mauna Loa. Snow may extend down to 7,000 to 8,000 ft (2,134 to 2,438 m) but melts within a couple days.

3.6.3 Air Quality Standards

This subsection presents the air quality standards applicable for the ROI.

3.6.3.1 Ambient Air Quality Standards for Criteria Pollutants. The U.S. Environmental Protection Agency (EPA) has established ambient air quality standards (AAQSs) for several different pollutants that often are referred to as criteria pollutants (ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, suspended particulate matter, and lead). The term "criteria pollutants" is derived from the requirement that the EPA must describe the characteristics and potential health and welfare effects of these pollutants. Suspended particulate matter is any solid or liquid that can remain suspended in the atmosphere for more than a few minutes. Standards for suspended particulate matter have been set for two size fractions—inhalable particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$). Federal (i.e., national) AAQSs are based primarily on evidence of acute and chronic (or short- and long-term) health effects. Federal AAQSs apply to outdoor locations to which the general public has access.

Hawaiʻi has promulgated additional ambient state air quality standards that are in some cases more stringent than the comparable federal standards. As a result of volcanic activity in Hawaiʻi, an AAQS for hydrogen sulfide is included, which is not covered by federal ambient air quality standards. The state AAQSs 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). Table 3-4 summarizes the federal and state AAQSs applicable in Hawaiʻi.

3.6.3.2 Hazardous Air Pollutants. Federal air quality management programs for hazardous air pollutants focus on setting emission limits for particular industrial processes rather than setting ambient exposure standards. Some states have established ambient exposure guidelines for various hazardous air pollutants and use those guidelines as part of the permit review process for industrial emission sources.

Hawaiʻi has adopted ambient concentration guidelines for hazardous air pollutants. Those guidelines are used as part of the permit review process for emission sources that require state or federal air quality permits. The Hawaiʻi ambient exposure guidelines for hazardous air pollutants include the following (State of Hawaiʻi 2003):

- For noncarcinogenic compounds, an 8-hour average concentration equal to 1% of the corresponding 8-hour threshold level value (TLV) adopted by the Occupational Safety and Health Administration (OSHA)

- For noncarcinogenic compounds, an annual average concentration equal to 1/420 (0.238%) of the 8-hour TLV adopted by OSHA

Table 3-4. State and national AAQSs applicable in Hawai‘i.

Air Pollutant	Measure	Hawai‘i AAQS	Federal Primary Standard[a]	Federal Secondary Standard[b]
Carbon monoxide	1-hr average	9 ppm	35 ppm[c]	None
	8-hr average	4.4 ppm	9 ppm[c]	None
Nitrogen dioxide	1-hr average	None	100 ppb	None
	Annual average	40 ppb	53 ppb	Same as primary
PM_{10}	24-hr block average	150 $\mu g/m^3$	150 $\mu g/m^3$[d]	Same as primary
	Annual average[e]	50 $\mu g/m^3$	None	None
$PM_{2.5}$	24-hr block average	None	35 $\mu g/m^3$	Same as primary
	Annual average	None	12 $\mu g/m^3$[f]	15 $\mu g/m^3$[f]
Ozone	8-hr rolling average	0.08 ppm	0.075 ppm	Same as primary
Sulfur dioxide	1-hr average	None	75 ppb	None
	3-hr block average	0.5 ppm	—	0.5 ppm[g]
	24-hr block average	0.14 ppm	0.14 ppm	—
	Annual average	0.03 ppm	0.03 ppm	—
Lead	Rolling 3-month average	1.5 $\mu g/m^3$	0.15 $\mu g/m^3$	Same as primary
Hydrogen sulfide	1 hr	0.025 ppm	None	None

Table Notes:

a. Primary standards set limits to protect public health, including the health of “sensitive” populations such as asthmatics, children, and the elderly.

b. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

c. Not to be exceeded more than once per year.

d. Not to be exceeded more than once per year on average over 3 years.

e. Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard effective December 17, 2006. However, the state still has an annual standard.

f. Annual mean averaged over 3 years.

g. Not to be exceeded more than once per year.

General Notes:

ppb = parts per billion, ppm = parts per million

All standards except the national PM_{10} and $PM_{2.5}$ standards are based on measurements corrected to 77°F (25°C) and 1 atmosphere pressure.

The national PM_{10} and $PM_{2.5}$ standards are based on direct flow volume data without correction to standard temperature and pressure.

The “10” in PM_{10} and the “2.5” in $PM_{2.5}$ are not particle size limits; these numbers identify the particle size class (aerodynamic diameter in microns) collected with 50% mass efficiency by certified sampling equipment. The maximum particle size collected by PM_{10} samplers is about 50 microns. The maximum particle size collected by $PM_{2.5}$ samplers is about 6 microns.

Data Sources:

40 CFR § 50, 2013, “National Primary and Secondary Ambient Air Quality Standards,” *Code of Federal Regulations*, Office of the Federal Register, June 13, 2013.

State of Hawai‘i, 2013b, *Federal and State Ambient Air Quality Standards*, Clean Air Branch, Hawai‘i Department of Health, Honolulu, Hawai‘i, online via: http://health.hawaii.gov/cab/files/2013/05/naaqs_jan_2013.pdf.

- For noncarcinogenic compounds for which there is no OSHA-adopted TLV, ambient air concentration standards set by the Director of Health on a case-by-case basis so as to avoid unreasonable endangerment of public health with an adequate margin of safety

- 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.

While these guidelines exist, they apply only to point sources and do not apply to mobile sources such as aircraft, automobiles, and trucks (State of Hawai‘i 2003).

3.6.3.3 Emissions. Emissions generally come from seven major source categories:

- Point sources or stationary sources, such as refineries, power plants, and other types of production facilities.

- Area sources, such as gasoline-dispensing facilities, construction dust, architectural surface coatings, industrial surface coatings, degreasing, and consumer solvents.

- Emissions associated with area source ammonia emissions, windblown dust, road dust, agricultural tilling dust, and fires.

- On-road mobile sources, including emissions from vehicles certified for highway use—cars, trucks, and motorcycles.

- Off-road mobile sources, which may encompass a wide variety of equipment types that either move under their own power or are capable of being moved from site to site and are not certified for highway use. Off-road mobile source categories include commercial marine, locomotive, aircraft, and other off-road equipment.

- Dust sources, including windblown dust, road dust, and agricultural tillage.

- Fires, including agricultural, prescribed, and wildland fires.

- Biogenic and geogenic emission sources are those occurring naturally from biological and physical processes of the Earth. Biogenic/geogenic emissions sources included are vegetation, volcanoes, and sea spray.

PTA is situated between three volcanoes on the island of Hawai‘i: Mauna Kea, Mauna Loa, and the much smaller peak of Hualālai. Volcanoes emit sulfur dioxide, as well as other gases, including hydrogen sulfide, hydrogen chloride, hydrogen fluoride, and trace metals like mercury. The Kīlauea Volcano on Hawai‘i Island is the single largest emission source in the state, usually producing more than 2,000 tons of sulfur dioxide per day.

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. 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.

Overall, air pollution levels at PTA and on the island generally are low due to the small size and isolated location of the state itself. The state's small size limits opportunities for locally generated air pollutants to accumulate or recirculate before being transported offshore and away from land areas.

3.6.3.4 Visibility. The scenic vistas of the nation's national parks and wilderness areas are protected under amendments of the Clean Air Act (42 USC 85 § 7401 et seq.). Protected areas are known as Federal Class I areas, and Hawai‘i Volcanoes National Park is a Class I area near the ROI.

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 and result in regional haze.

The EPA adopted regulations (known as the Regional Haze Rule) to address visibility impairment caused by one or a small group of manmade sources generally located in close proximity to a specific Class I area. States are required to improve visibility in these areas incrementally over the next 60 years. The first milestone is to develop regional haze plans to reduce causes of haze to make reasonable progress by 2018.

The EPA has evaluated six particulate pollutants (ammonium sulfate, ammonium nitrate, organic carbon, elemental carbon, fine soil, and coarse mass) that contribute to visibility impairment at Hawai‘i Volcanoes National Park, and sulfate was found to be the primary cause of visibility impairment. The EPA proposed that improving visibility should focus primarily on significant sources of sulfur dioxide (EPA 2012a). Additionally, sulfur dioxide reacts with sunlight, oxygen, dust particles, and water in the air to form “vog” (i.e., a combination of fog, smog, and volcanic gases). When hot lava reaches sea water and vaporizes, misty clouds called laze are formed. Laze contains a mixture of hydrochloric acid and seawater vapor. Laze clouds can drop rainwater that is often more acidic than lemon juice, with a pH of 1.5 to 2.5, but it is more corrosive than lemon juice to the skin and clothing, and it can cause irritation to the throat, lungs, eyes, and nose. Both vog and laze impact visibility and contribute to development of acid rain. Because of the potential health and welfare impacts, monitoring of volcanic emissions continues to be a priority for the state.

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 mi (64 km) straight-line distance from PTA, via the Interagency Monitoring of Protected Visual Environments (IMPROVE) station on the other side of Mauna Loa inside the national park. During the period of 2007 to 2011, the baseline visibility for the Hawai‘i Volcanoes National Park was calculated at 3.71 deciviews[b] for the 20% best days and 24.25 deciviews for the 20% worst days (Federal Land Manager Environmental Database 2012).

3.6.3.5 Air Quality Designations. The federal Clean Air Act (42 USC 85 § 7401 et seq.) requires each state to identify areas that have ambient air quality in violation of the national AAQSs. The status of areas with respect to the national AAQSs 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

b. A deciview is the unit of measure for evaluating visibility under regional haze regulations.

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 to achieve, maintain, and enforce the national AAQSs in nonattainment areas. The plans are submitted to, and must be approved by, the EPA. Deadlines for achieving the national AAQSs 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 AAQSs presented in Subsection 3.6.3.2, Hazardous Air Pollutants. Criteria pollutant levels remain below state and federal ambient air quality standards at all state and local monitoring stations in the state (State of Hawai‘i 2012a).

3.6.3.6 Air Quality Planning Programs. The federal Clean Air Act (42 USC 85 § 7401 et seq.) requires each state to identify areas that have ambient air quality in violation of federal standards. States are required to develop, adopt, and implement a state implementation plan to achieve, maintain, and enforce federal ambient air quality standards.

Hawai‘i has established its own air quality agency, the Hawai‘i Department of Health’s Clean Air Branch, to regulate emission 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 status of areas with respect to federal ambient air quality standards is categorized as nonattainment, attainment (better than national standards), unclassifiable, or attainment/cannot be classified. Unclassifiable areas are treated as attainment areas for most regulatory purposes. All of Hawai‘i is categorized as attainment or unclassifiable for each of the federal ambient air quality standards.

3.6.3.7 Clean Air Act Conformity. The Clean Air Act requires federal agencies to ensure that actions they undertake in nonattainment and maintenance areas are consistent with federally enforceable air quality management plans for those areas. No portions of Hawai‘i are classified as nonattainment or maintenance areas. Consequently, Clean Air Act conformity analysis procedures do not apply to Army actions in Hawai‘i.

3.6.3.8 Climate Change/Greenhouse Gas Emissions. The EPA defines climate change as major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer (EPA 2013a). 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 changes to circulation patterns of oceans); or human activities. The Intergovernmental Panel on Climate Change scientists believe that most of the warming experienced since the 1950s is from human activities resulting in an increase in carbon dioxide and other greenhouse gas (GHG) emissions (EPA 2009).

GHGs are compounds found naturally within the Earth’s atmosphere that 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 carbon dioxide, methane, and nitrous oxide. Carbon dioxide is the primary GHG emitted by human activities in the United States, with the largest source from fossil fuel combustion. Increasing GHGs are associated with changing Earth’s climate, resulting in unintended effects to human health and the environment.

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 Regulations (40 CFR §§ 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 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 (CEQ 2010). The guidance recommends that 25,000 tons of carbon dioxide equivalent of direct emissions be used as an indicator—but not a significance threshold—to determine whether or not to include a quantitative GHG analysis.

3.6.4 Air Quality Monitoring

Hawai‘i currently operates six monitoring stations on the island of Hawai‘i (Figure 3-12). All of the monitoring stations are in coastal regions, and many are in or near urban areas. None of these monitoring stations is sited at or near PTA. The monitoring stations on the island of Hawai‘i have been located primarily to monitor the impacts of emissions from volcanic eruptions and geothermal development.

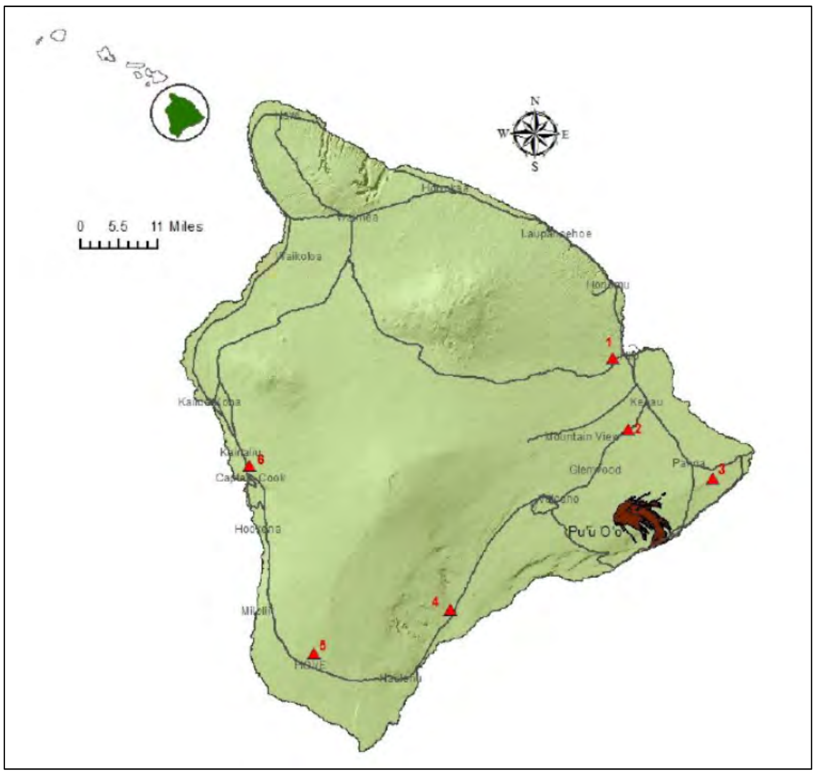

Figure 3-12. State of Hawai‘i air monitoring stations on the island of Hawai‘i (State of Hawai‘i 2012a).

The Hawai‘i State Department of Health is required to notify the public whenever the national AAQSs are exceeded. As presented in Table 3-4, the $PM_{2.5}$ annual standard is 15 μg/m^3; the 3-year average concentration must not exceed the standard. In 2012, sulfur dioxide was exceeded all year as a result of the Kīlauea Volcano. The 2012 annual average at the Kona station was 16 μg/m^3; the 3-year average from 2010 to 2012 was 15.5 μg/m^3, which exceeded the standard. A new standard of 12 μg/m^3 went into effect on December 14, 2012. However, these exceedances are considered a result of an exceptional or natural event (State of Hawai‘i 2012b).

A short-term air monitoring program was conducted at PTA beginning in January 2006. The primary purpose of this monitoring effort was to collect data to determine the impact of fugitive dust from training activities at PTA. Seven monitoring stations were located at remote sites around the installation as close to the boundaries as possible. Between January 29, 2006, and June 30, 2007, the monitors sampled particulate matter following the EPA's schedule of once every 6 days. Almost all of the monitoring data collected in recent years for the area show that ambient air quality levels remain well below the values of the relevant state and national AAQSs.

MLO is located on the north flank of Mauna Loa Volcano at an elevation of 11,135 ft (3,394 m). MLO is best known for its measurements of rising anthropogenic carbon dioxide concentrations in the atmosphere. MLO also measures ozone, solar radiation, and both tropospheric and stratospheric aerosols. Data from MLO are also used to calibrate and verify data from satellites and stations around the world.

3.7 Land-Based Traffic

This subsection describes the traffic and transportation resources related to the alternatives. Use of the proposed LZs would be in addition to current training activities occurring at PTA; thus, the Action Alternatives would require no increase in current military traffic to PTA. However, the Action Alternatives do require the transport and use of a few construction vehicles to PTA. Anticipated vehicles for construction activities include a fuel truck, water truck, supervisor vehicle, and fewer than five pieces of heavy equipment that could include a combination of bulldozers, graders, and excavators.

For travel to PTA, the heavy equipment, such as bulldozers, graders, and excavators, would be loaded onto a transport truck, such as a flatbed truck. The flatbed truck and the fuel truck, water truck, and supervisor vehicle would likely be driven from their point of origin, which is assumed to be from either Hilo or Kona although they could originate from many locations across the island.

Traffic and circulation refers to the movement of vehicles and pedestrians along and adjacent to roadways. Major roads in Hawaiʻi are under the jurisdiction of the state through the Hawaiʻi Department of Transportation; however, none of the roads proposed for use is under this agency's jurisdiction at this time (State of Hawaiʻi 2013b). The roads within PTA are under the jurisdiction of the Army. Roads external to PTA and not under state jurisdiction are under the jurisdiction of the counties in which they lie. The roads involved range from double-lane roads with asphalt surfaces to unpaved roads to discernible tracks over lava rock. During peak hours, significant traffic delays can result on any roadway, including double-lane roads in urban areas and along popular commuter routes.

3.7.1 Region of Influence

The ROI for land-based traffic consists of the roads used for transport of construction vehicles. For all Action Alternatives, Saddle Road (Route 200) and roads within PTA are used. These roads are shown on Figure 3-5.

3.7.2 Roads Exterior to PTA

The road outside PTA related to the Action Alternatives is Saddle Road. This road is shown on the recreation map, Figure 3-5.

Saddle Road is the only paved 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). Saddle Road is the main roadway providing access to PTA, the Mauna Kea Visitor Center and astronomical observatory complex, the Mauna Loa atmospheric observatory complex, the ranching and residential areas of Waikiʻi Ranch and Kaumana City, Mauna Kea State Park, and other recreational areas. Built by the military to access PTA during World War II, Saddle Road was not originally designed to state highway standards. Planning began in 1992 for realignments and reconstruction along its 47 mi (75.6 km). Several sections have been improved since 2007. Currently, posted speed limits vary from 45 mph (72 kph) in unimproved sections to 55 mph (89 kph) in improved sections. Some advisory limits are as low as 25 mph (40 kph).

Saddle Road is considered to be at its full travel volume capacity (County of Hawai‘i and State of Hawai‘i 2010). The average daily traffic is approximately 1,400 vehicles per day and was expected to triple to approximately 4,058 in 2013 resulting from improvements to the road. Future improvements currently being decided could result in an increase of anywhere from 4,400 to more than 8,000 vehicles by 2034 (County of Hawai‘i and State of Hawai‘i 2010).

3.7.3 Roads on PTA

The main entranceway from Saddle Road to PTA handles one vehicle at a time. After clearance is granted based on requirements specific to employees, contractors, and visitors, vehicles enter the Cantonment Area and proceed by various routes depending on the destination.

To access the area of the proposed access trail and LZs, starting from the main gate at the Cantonment Area, vehicles would likely proceed on Old Saddle Road/Lighting Trail, travel west to Menehune Road, exit east onto Lava Road, turn south onto Redleg Trail, and turn west onto Hilo Kona Road, which becomes Hilo Kona Highway/Range Road.

The surfaces of the access roads in PTA to Hilo Kona Highway can best be described as either gravel or crushed lava. Hilo Kona Highway is approximately a 10-mi-long, boulevard-sized bulldozed roadway with a crushed gravel surface. The road is off limits to the public and gated at the PTA boundary.

3.7.4 Governing Requirements

Hawai‘i Department of Transportation Policy, Section 19-104-14 (State of Hawai‘i 1981a) provides guidance on requirements for vehicles needing an escort as a result of being oversized or overweight, which would be applicable to the travel of some construction equipment. According to the policy, these vehicles are not allowed to travel in convoy on two-lane highways, and a separate escort must be provided for each vehicle moved under escort.

3.8 Noise

Noise is generally unwanted sound. It can interfere with communications or other human activity, may be intense enough to cause hearing damage, or may be otherwise annoying. Human responses to noise vary, depending on the type and characteristics of the noise, distance between the source and receptor, receptor sensitivity, and time of day.

The typical human response to noise is annoyance, a response that is complex and displays wide variability for any given noise level. Although individual annoyance is sometimes measured in the laboratory, field evaluations of community annoyance are most useful for predicting the consequences of actions involving various noise sources, including various helicopters. A person’s expectation of appropriate sound levels associated with an activity has a direct bearing on the level of annoyance. Effects from noise may include communication interference, sleep disturbance, disruption of one’s peace of mind, enjoyment of one’s property, and the enjoyment of solitude. The consequences of noise-induced annoyance are personal irritation that is often expressed as complaints to the installation or authorities.

The five factors identified as indicators for estimating community-complaint reaction to noise are the following:

- Type of noise
- Amount of repetition
- Type of neighborhood
- Time of day
- Amount of previous exposure (USAEC and COE 2009).

3.8.1 Region of Influence

The ROI assessed in the noise analysis includes areas within a 0.5-mi (0.8-km) radius of each of the proposed LZs, the linking trails, and the proposed access trails from Hilo Kona Highway to the proposed LZs.

3.8.2 Noise Standards and Guidelines

Noise is regulated under various federal and state guidelines. The federal government is required to set and enforce uniform noise-control standards for aircraft and airports, interstate motor carriers and railroads, workplace activities, trucks, motorcycles, and portable air compressors, as well as for federally assisted housing projects located in noise-exposed areas. Among the laws governing these requirements are the Noise Control Act of 1972 (42 USC 65 § 4901), the Aviation Safety and Noise Abatement Act of 1979 (49 USC 475 § 47501), and the Control and Abatement of Aircraft Noise and Sonic Boom Act of 1968 (49 USC 447 § 44715). According to the FAA's 2000 Aviation Noise Abatement Policy (49 USC 401 § 40101), "[N]oise relief continues to be a shared responsibility… The FAA and the aviation industry have the primary responsibility to address aircraft source noise… Airport proprietors, state and local governments, and citizens have the primary responsibility to address airport noise compatibility planning and local land use planning and zoning."

The EPA is the agency in charge of enforcing the Noise Control Act. The EPA recommends using the day-night average sound level (DNL) for environmental noise to quantify the intrusiveness of nighttime noise. The DNL represents a 24-hour average sound level and incorporates an additional 10 A-weighted decibels (dBA) weighting to noise occurring between the hours of 10 p.m. and 7 a.m. (Berger et al., 2003).

In addition to federal regulations, the State of Hawaiʻi has adopted statewide noise regulations. The standards outlined in Title 11, Chapter 46, of the Hawaiʻi Administrative Rules (State of Hawaiʻi 1996a) apply to fixed stationary noise sources, agricultural equipment, and construction equipment. These noise regulations apply to construction activities associated with construction of the LZs. The Hawaiʻi Administrative Rules outline zoning districts based on land use and list maximum permissible sound levels in dBA associated with each zone for both daytime and nighttime hours (State of Hawaiʻi 1996a). Land use zones in the vicinity of PTA are discussed in further detail in Subsection 3.2, Land Use.

The State of Hawaiʻi Department of Transportation Airports Division outlines noise abatement areas for each island in the *Hawaiʻi Airports and Flying Safety Guide 2010–2011* (DOT 2010a) that apply to all aviation activities in Hawaiʻi. Figure 3-13 shows designated noise abatement areas on the island of

Hawaiʻi. The proposed LZs and access trails do not infringe on any voluntary noise abatement areas or recommended avoidance areas, as shown on Figure 3-13.

The DoD began developing noise evaluation programs in the early 1970s. Initial program development involved the Air Installation Compatible Use Zone Program for military airfields. Early application of that program emphasized Air Force and Navy airfields. The Army implemented the program by addressing both airfield noise issues and other major noise sources such as weapons testing programs and firing ranges. Joint Air Force, Army, and Navy planning guidelines use annual average DNL values to categorize noise exposure conditions on military installations.

The Army uses three noise zones referred to as Land Use Planning Zones (LUPZs). These LUPZs are outlined in Army Regulation 200-1 (U.S. Army 2007d) and are intended to minimize the impact of environmental noise on the public without impairing the mission of the installation. Under Army policy:

- Zone I is compatible with noise-sensitive land use (residences, schools, medical facilities, and cultural activities)

- Zone II should generally be limited to industrial activities (such as manufacturing, transportation, and resource protection)

- Zone III is incompatible with noise-sensitive land use.

The U.S. Army Public Health Command has developed the *U.S. Army Hawaiʻi Statewide Operational Noise Management Plan* (SONMP) (U.S. Army 2010c) to provide guidelines to foster positive relations between the Army and the public. The SONMP uses the LUPZs to provide more detailed information to surrounding communities on potential effects of increased noise resulting from Army operations. In addition to the three zones listed in Table 3-5, the Hawaiʻi SONMP includes an informal land-use planning zone, which is at the lower boundary of Zone I. This additional zone is intended to account for seasonable variability in increased operations that may dilute noise impacts averaged over a 1-year period.

3.8.3 Existing Conditions

BAAF and PTA lie in the saddle between Mauna Kea and Mauna Loa. The existing noise conditions and noise-abatement procedures for BAAF and PTA are outlined in the U.S. Army Hawaiʻi SONMP (U.S. Army 2010c). The current number of military aircraft using established flight corridors near BAAF and PTA do not generate 24-hour average noise levels greater than 65 dBA (DNL), because both are limited use with regard to aircraft (U.S. Army 2010c).

Noise conditions at PTA vary depending on location and time of day. The main source of noise at PTA is small-arms and large-caliber weapons firing, which occurs throughout the year, as well as aircraft and vehicles (USAEC and COE 2009). Average noise levels as a result of small-arms and large-caliber weapons firing are shown in Subsection 11.4 of the Hawaiʻi SONMP (U.S. Army 2010c). Zone III noise contours extend slightly north of the PTA boundary approximately 650 ft (200 m) onto forest reserve land. Zone II noise contours also extent onto forest reserve land north of PTA, but all land uses within the contour are compatible with Zone II land uses. These noise contours represent a cumulative effect of all firing training activities at PTA and therefore represent worst-case noise levels. When firing activities are not occurring, ambient noise levels may vary from 40 dBA during quiet nighttime hours to 70 dBA during windy daytime hours or when traffic is present on Saddle Road (U.S. Army 2010c).

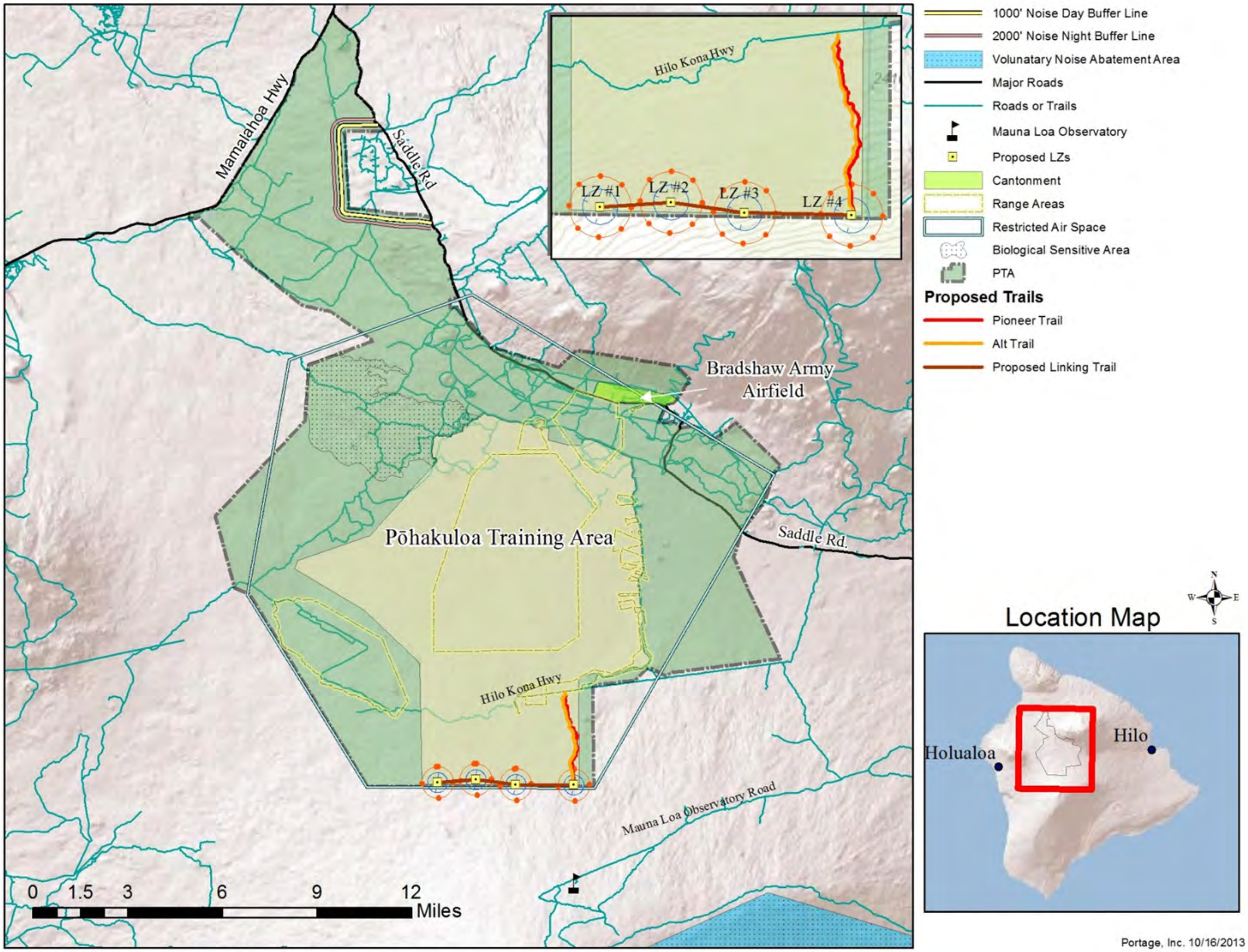

Figure 3-13. Island of Hawai‘i noise abatement areas.

Table 3-5. Army land use planning guidelines.[a]

Noise Zone	Aviation ADNL (dBA)	Impulsive CDNL (dBC)	Small Arms PK 15 (met)
Land Use Planning	60–65	57–62	Not applicable
I	Less than 65	Less than 62	Less than 87
II	65–75	62–70	87–104
III	Greater than 75	Greater than 70	Greater than 104

a. Source: U.S. Army (2010c).

ADNL = A-weighted day-night average sound level.

CDNL = C-weighted day-night level.

dBA = A-weighted decibel.

dBC = C-weighted decibel.

PK 15 (met) = Peak noise exceeded by 15% of firing events.

Although the airfield only averages one flight per day, the main source of noise at BAAF is aircraft, usually rotary-wing AH-64, CH-47, OH-58, UH-60, and UH-72 or fixed-wing C-12 and C-130 (U.S. Army 2010c). As previously stated, the low number of flights at BAAF does not generate average noise levels greater than 65 dBA (DNL).

The LZs, linking trails, Pioneer Trail, and alternate trail lie within the boundary of PTA at its southern extent. Noise levels in this area are low. Ambient noise sources consist of birds, insects, and wind. Noise sources that generate noise above background levels are generally associated with recreational use of the Hawai‘i Volcanoes National Park, including tourists and vehicular traffic. The Manual Loa Forest Reserve is classified by the State of Hawai‘i Land Use Commission as conservation land. Conservation lands fall into the Class A zoning district defined Title 11, Chapter 46, of the Hawai‘i Administrative Rules, with maximum permissible sound levels of 55 dBA for daytime hours and 45 dBA for nighttime hours. Permits and variances to permissible sound levels are outlined in Sections 11-46-7 and 11-46-8, respectively, of the Hawai‘i Administrative Rules (State of Hawai‘i 1996b).

3.9 Water Resources

Water resources are streams, lakes, rivers, wetlands, groundwater, floodplains, coastal resources, and wild and scenic rivers. Water resources such as lakes, rivers, streams, and canals make up the surface hydrology of a watershed (U.S. Army 2013a).

3.9.1 Region of Influence

The ROI for water resources consists of all water resources in the vicinity of the project-related activities at the proposed LZs and the access and linking trails.

3.9.2 Precipitation

Precipitation is the main source of fresh water on the island. As discussed in Section 3.6.2.3, most precipitation is in the form of rain, though at high elevations snow falls occasionally and melts quickly. The ocean surrounding the Hawaiian Islands receives 25 to 30 in. (63.5 to 76.2 cm) of rainfall per year. The islands receive 10 to 15 times as much in some places (Lau and Mink 2006). The maximum rainfall occurs at elevations between 2,000 and 3,000 ft (610 and 914 m) and on the windward (eastern) sides of the islands due to the northeasterly trade winds. Rainfall decreases rapidly at elevations higher than 3,000 ft (914 m). Precipitation is discussed in more detail in the Section 3.6.2.3.

3.9.3 Surface Water

Surface water is defined as waters in rivers, lakes, streams, or wetlands. Surface water is replenished by precipitation and is lost through discharge to oceans, evaporation, and subsurface seepage. The quantity of surface water is dependent on the amount of precipitation in its watershed, storage capacity, soil permeability, and evaporation rates (U.S. Army 2013a).

There are no surface streams, including perennial streams, lakes, or other water bodies, within the ROI. Figure 3-14 shows the perennial streams on the island of Hawaiʻi. All of them are located on the northeast side of the island. However, approximately seven intermittent streams are within the same drainage area of the PTA (U.S. Army 2013a). An intermittent stream carries surface water occasionally or seasonally, and the flow is dependent on the available water supply. No perennial or intermittent streams are on or near the proposed LZs or trails.

3.9.4 Watersheds

Watersheds are defined by the EPA as an area of land where all of the water that is under it or drains off it goes into the same place (EPA 2012b). Watersheds of the island of Hawaiʻi are small and characterized by fast-flowing streams with permeable volcanic rock and soils (U.S. Army 2013a). The ROI lies within the Northwest Mauna Loa and the West Mauna Kea watersheds which drain to the northern Kona and southern Kohala coasts (Mink, Murabayashi, and Lau 1993).

3.9.5 Groundwater

Groundwater is any water that is located beneath the ground surface and is located in soil-pore spaces and in fractures of rock formations. Precipitation is the primary source for groundwater on the Hawaiian Islands and accounts for the majority of groundwater recharge on the island of Hawaiʻi (USAEC 2008).

The high permeability of the lava flows allows little to no erosion to occur (Lau and Mink 2006). Instead of running off, water sinks through porous rock. Most of the water found on the island is groundwater. Generally, the order of potential yield for basalts is (1) interstitial spaces in ʻaʻā, (2) cavities between lava flow beds, (3) shrinkage cracks, (4) lava tubes, (5) gas vesicles, (6) cracks produced by mechanical forces after the flow has come to rest, and (7) tree mold holes (Lau and Mink 2006). Some lava tubes are 30 ft (9 m) in diameter and capable of transmitting vast quantities of water.

An aquifer is groundwater that is stored in an underground layer of permeable rock or unconsolidated material. Aquifers in Hawaiʻi consist of either volcanic rock or sedimentary rock (Lau and Mink 2006). Volcanic aquifers are much larger and more extensive than sedimentary aquifers and constitute the only aquifers capable of supplying potable water. The yield of sedimentary aquifers is almost always brackish water, and usage is restricted to irrigation without further treatment. "High-level" and "basal" are the two fundamental varieties of groundwater on Hawaiʻi (University of Hawaiʻi 2010). High-level groundwater is either isolated from, or beyond the reach of, seawater intrusions. Basal groundwater rests on, and is hydraulically continuous with, underlying seawater. Several aquifers meet below the larger area of PTA (Figure 3-15). The sustainable yield for each aquifer is listed on Figure 3-15 in MGD (million gallons per day). The ROI lies within the Northwest Mauna Loa Aquifer sector, with a sustainable yield of 30 MGD (U.S. Army 2013a). Groundwater in these aquifers occurs primarily within older Pleistocene age basalts at subsurface elevations for approximately 3,000 ft (914 m) above sea level or greater than 1,000 ft (305 m) below the surface (U.S. Army 2013a).

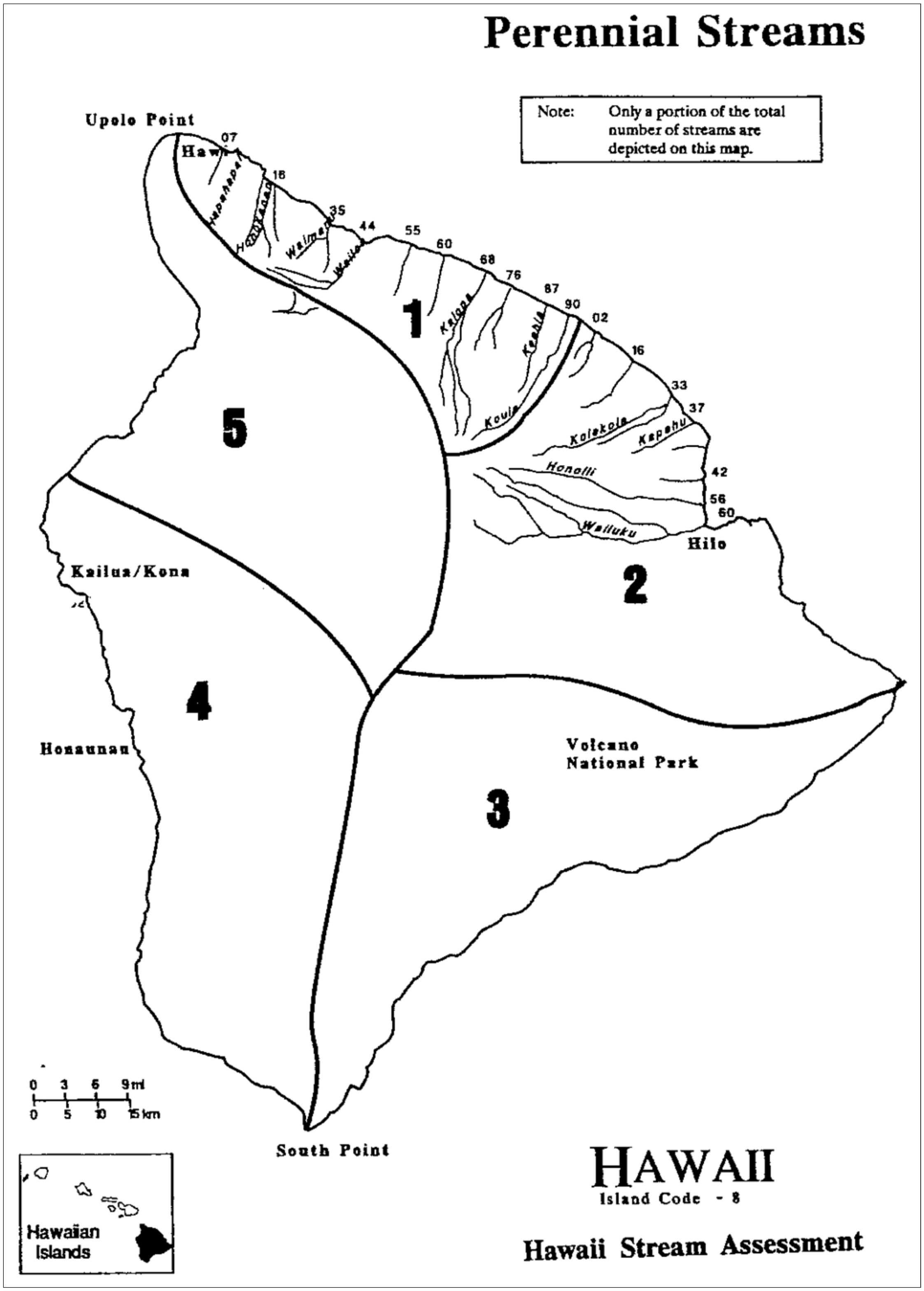

Figure 3-14. Perennial streams on Hawai‘i from Hawai‘i Cooperative Park Service Unit (1990).

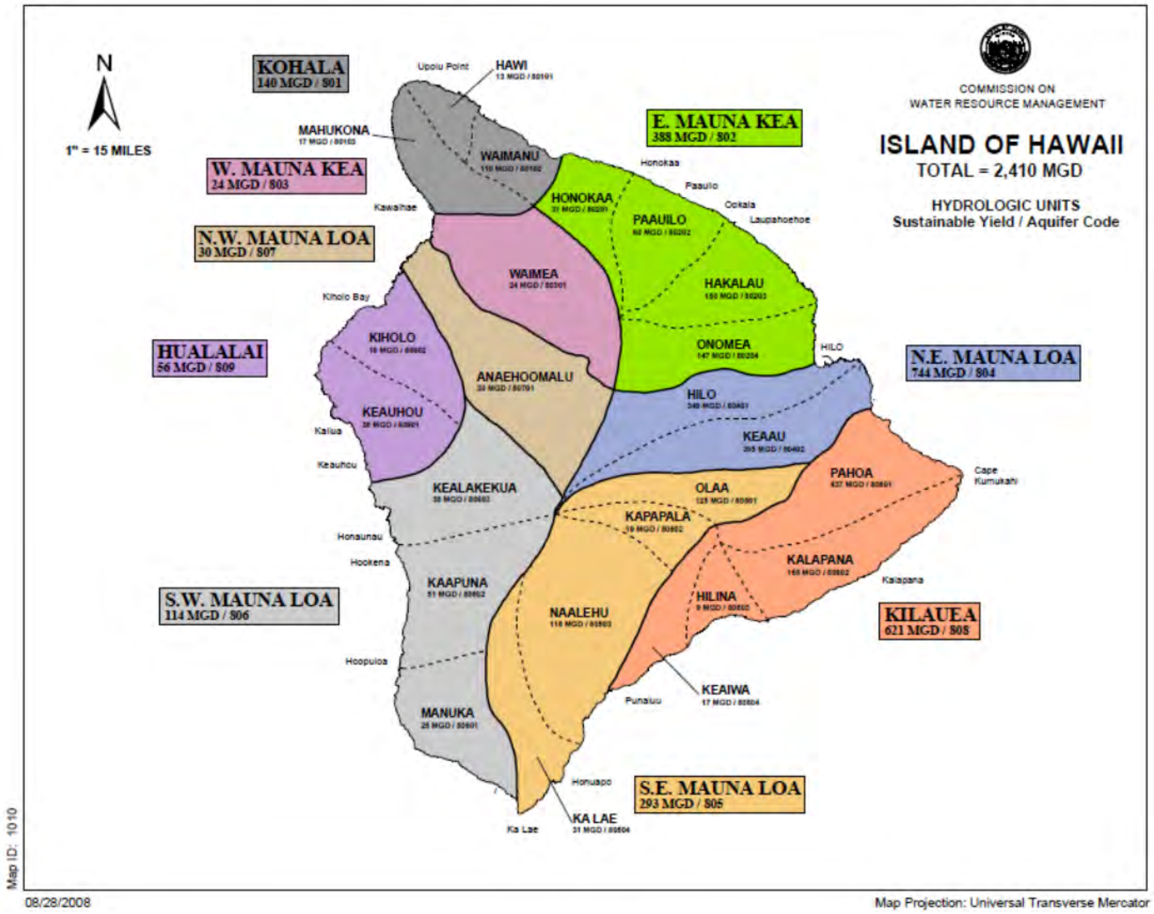

Figure 3-15. Groundwater aquifers on Hawai‘i from Commission on Water Resource Management (2008).

3.9.6 Water Supply

Because of the depth of groundwater, the PTA water supply is trucked in from outside the saddle region. Other water supply sources occur as rainfall, fog drip, and mist (U.S. Army 2013a).

3.9.7 Wastewater

There is no wastewater system at PTA. All wastewater is treated through a septic system, discharged into an underground injection control well, or disposed of offsite at a permitted facility (U.S. Army 2013a).

3.9.8 Water Resources Surrounding the Region of Influence

The nearest known surface water to the ROI is Lake Waiau, which is located near the summit of Mauna Kea. There are several intermittent streams immediately surrounding the PTA near the southwestern flank of Mauna Kea (U.S. Army 2013a).

3.10 Soil Resources

This subsection describes the physical characteristics, geologic setting and the soils of the affected environment.

3.10.1 Region of Influence

The ROI for the soils resource consists of all areas in which project-related activities would occur, including the proposed LZs, and the access and linking trails. The ROI also includes areas immediately adjacent to the project areas, such as downslope areas adjacent to roadcuts or embankments that might be affected by slope failure. In general, these adjacent areas extend approximately 120 to 150 ft (37 to 46 m) away from project-related activities.

3.10.2 Geologic Setting

The Hawaiian Islands formed as the Pacific Plate moved over a relatively permanent hot spot in the mantle beneath the Pacific Plate (USAEC 2008), which is currently under the island of Hawaiʻi. The Hawaiian Islands are seismically active. Earthquakes on the islands are caused by molten rock rising through the Earth's crust or the Earth's crust settling under the weight of accumulated lava.

The island of Hawaiʻi consists of five volcanic mountains: Kohala Mountain, Mauna Kea, Mauna Loa, Hualālai, and Kīlauea (MacDonald and Abbott 1970). All five of these volcanic mountains are considered young. Kohala Mountain is the oldest and is now extinct. It dates approximately 700,000 years old by potassium-argon dating. Mauna Kea is younger as its eruptions bury parts of the Kohala Volcano. Mauna Kea is considered dormant. Hualālai is located on the west side of the island and is younger than Mauna Kea but older than Mauna Loa, as evidenced by magmatic evolution stages. Kīlauea is located to the southeast of Mauna Loa. Both Kīlauea and Mauna Loa are considered active. Differing magmatic stages between Mauna Loa and Kīlauea indicate separate magma bodies feeding each, so it is believed that Kīlauea is a completely independent volcano. This is also supported by the difference in their eruptive centers, one at 13,000 ft (3,962 m) amsl and the other at less than 4,000 ft (1,219 m) amsl.

The principal features of each volcano are listed in Table 3-6. Mauna Loa takes up the bulk of the island at 50.5%; Mauna Kea follows as the second largest area on the island at 22.8%. Mauna Kea and Mauna Loa are also the two highest peaks on the island, with their summits reaching 13,796 and 13,680 ft (4,200 and 4,169 m) amsl, respectively (Stearns 1985).

The stratigraphy of Hawaiʻi is outlined in Table 3-7, and the geologic map is shown in Figure 3-16. Paleomagnetism studies on the island have indicated none of the rocks on the island has reversed magnetism (Stearns 1985). The last reversal of magnetism occurred 750,000 years ago. This concludes that all rocks on the island of Hawaiʻi must be Pleistocene in age or younger.

Pahala ash is found on many parts of the island (MacDonald and Abbot 1970). It is named for the town of Pahala, which contains the remnants of the Ninole Volcano. The ash is more than 50 ft (15 m) thick and is yellowish. It contains vitric ash and fragments of pumice. The thickness of the ash varies across the island. The ash is often altered by weathering, which disguises the original composition of the material, making its source uncertain. However, as shown in Figure 3-16, it is the only rock formation that is found on more than one of the volcanic mountains, making this unit quite noteworthy (Stearns 1985). The ash provides a means of correlating volcanic activity, though it is not certain the Pahala ash is of the same age everywhere across the island.

PTA and the ROI are located on the Humuʻula Saddle area, which is the large area located between the island's two largest volcanoes, Mauna Kea to the northeast and Mauna Loa to the southwest. The lava flows in this area consist of ʻaʻā flows and pāhoehoe flows.

Pāhoehoe lava is characterized by a smooth, billowy, and folded or ropy surface. Subsurface voids and channeling tubes are common in pāhoehoe lava. The roofs of lava tubes, which range from a few inches to several feet thick, develop fractures with cooling and aging. These tubes 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 ʻaʻā 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). Lava tubes do not occur in ʻaʻā; they are a characteristic of pāhoehoe.

The ROI is located on the northern slope of Mauna Loa, which is a shield volcano comprising at least three separate shield volcanoes built around three separate eruptive centers (MacDonald and Abbott 1970). Mauna Loa is about 75 mi (121 km) long and about 64 mi (103 km) wide (Table 3-6), and its summit reaches 13,680 ft (4,169 m) amsl. Mauna Loa is one of the most productive volcanoes on Earth. Since 1832, Mauna Loa has averaged one caldera outbreak every 4 years and a lava flow every 7 years, though the latest eruption was in 1984 (Table 3-7) (Stearns 1985). Mauna Loa contains a caldera named Mokuʻaweoweo at its summit.

Mauna Loa has well-defined, southwest-northeast rift zones and a weak northerly rift zone (Stearns 1985). Most eruptions from Mauna Loa start in the caldera as high, short-lived lava fountains and then change to lava pouring out from vents along the rifts. The rift zones are marked by scores of open cracks that range from just inches to 10 ft (3 m) wide. More than 160 fissures and cinder-and-spatter cones have been found on Mauna Loa.

The stratigraphy of Mauna Loa is composed of tholeiitic basalts, olivine basalts, and oceanites. There are three stratigraphic series on Mauna Loa (Table 3-7): the Ninole Volcanic Series is the oldest, followed by the Kahuku Volcanic Series, and the youngest is the Kaʻu Volcanic Series (Stearns 1985). The Ninole Volcanic Series has thin layers of pāhoehoe and ʻaʻā exposed in the sides of the Ninole shield. This series forms the core of the mountain. A steep, angular, erosional unconformity separates the Ninole Series from the overlying Kahuku Series. The Kahuku Series is approximately 600 ft (182 m) thick and is overlain by 5 to 15 ft (1.5 to 4.5 m) of Pahala ash. Overlying the Pahala ash is the Kaʻu Series, which consists of fairly fresh lavas and contains the most recent eruptions. The rocks in the Kaʻu Series are rarely more than 25 ft (7.6 m) thick, except in the upper part of Mauna Loa, where they are more than 800 ft (243 m) thick.

3.10.3 Soils Characteristics

The soil within the ROI, and in the majority of PTA, can be described as thin and poorly developed (U.S. Army 2013a). This is due to the high elevation, young geologic age of the island, low precipitation, and rapid runoff (U.S. Army 2013a). The soil is composed of ʻaʻā and pāhoehoe lava flows with small amounts of eolian sands. The soils found in the ROI and PTA are shown on Figure 3-17.

Table 3-6. Principal features of the volcanoes on the island of Hawai‘i from Stearns (1985).

Name	Length (mi)	Width (mi)	Area (mi^2)	Percentage of Hawai‘i Island	Summit Elevation (ft amsl)
Mauna Loa	75	64	2,035	50.5	13,680
Kīlauea	51	14	552	13.7	4,090
Hualālai	24	20	290	7.2	8,251
Mauna Kea	51	25	919	22.8	13,796
Kohala	22	15	234	5.8	5,505

Table 3-7. Stratigraphic units from Stearns (1985).

Stratigraphic Rock Units in the Island of Hawaii

(The volcanic rocks of Mauna Loa, Mauna Kea, and Hualalai, those of Mauna Kea and Kohala, and those of Mauna Loa and Kilauea interfinger)

Age	Hualalai	Kohala Mountain	Mauna Loa	Kilauea	Mauna Kea
Historic	Historic member of the Hualalai volcanic series (1800–01)	Unconsolidated alluvium, dunes and landslides	Historic member of volcanic series (1832–1950); Mud flow of 1868	Historic member of the Puna volcanic series (1790–1965)	Ribbons of gravel and small alluvial fans
Holocene	Prehistoric member of the Hualalai volcanic series	Unconsolidated alluvium, dunes and landslides	Dunes; Prehistoric member of the Kau volcanic series	Dunes; Prehistoric member of the Puna volcanic series	Upper member of the Laupahoehoe volcanic series; Ribbons of gravel and small alluvial fans
Late Pleistocene	Prehistoric member of the Hualalai volcanic series; Pahala ash (exposed on Waawaa volcanics only)	Fluvial conglomerates; Pahala ash (not differentiated)	Prehistoric member of the Kau volcanic series; Pahala ash	Prehistoric member of the Puna volcanic series; Pahala ash	Glacial debris and fluvial conglomerates; Lower member of the Laupahoehoe volcanic series; Local erosional unconformity; Pahala ash
Early and middle Pleistocene	Waawaa volcanics and lower unexposed part of Hualalai volcanic series	Fluvial conglomerates; Hawi volcanic series	Kahuku volcanic series	Hilina volcanic series	Hamakua volcanic series
Early Pleistocene	Waawaa volcanics and lower unexposed part of Hualalai volcanic series	Great erosional unconformity; Pololu volcanic series	unconformity; Ninole volcanic series	Hilina volcanic series	Hamakua volcanic series

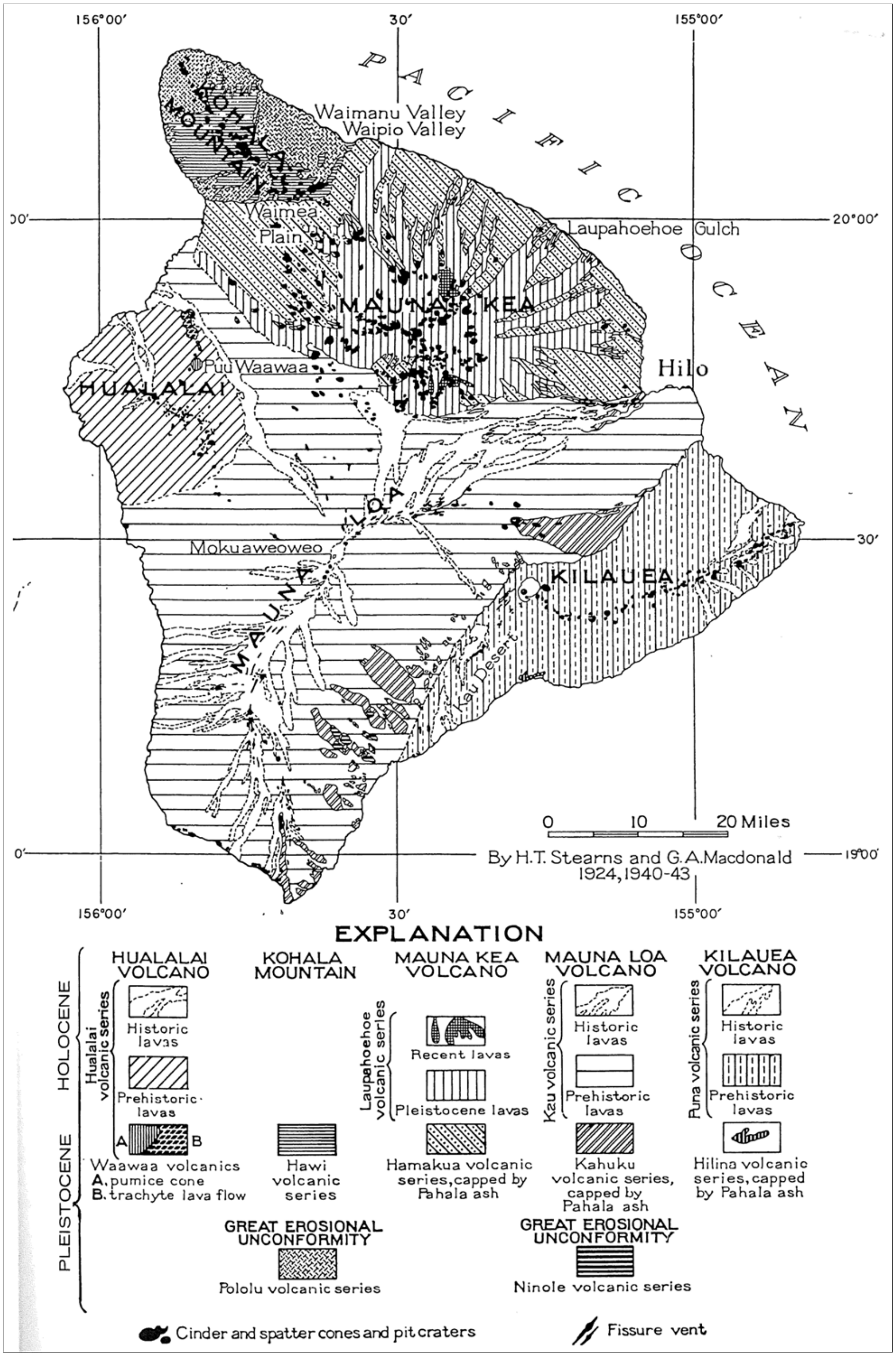

Figure 3-16. Geologic map of the island of Hawaiʻi from Stearns (1985).

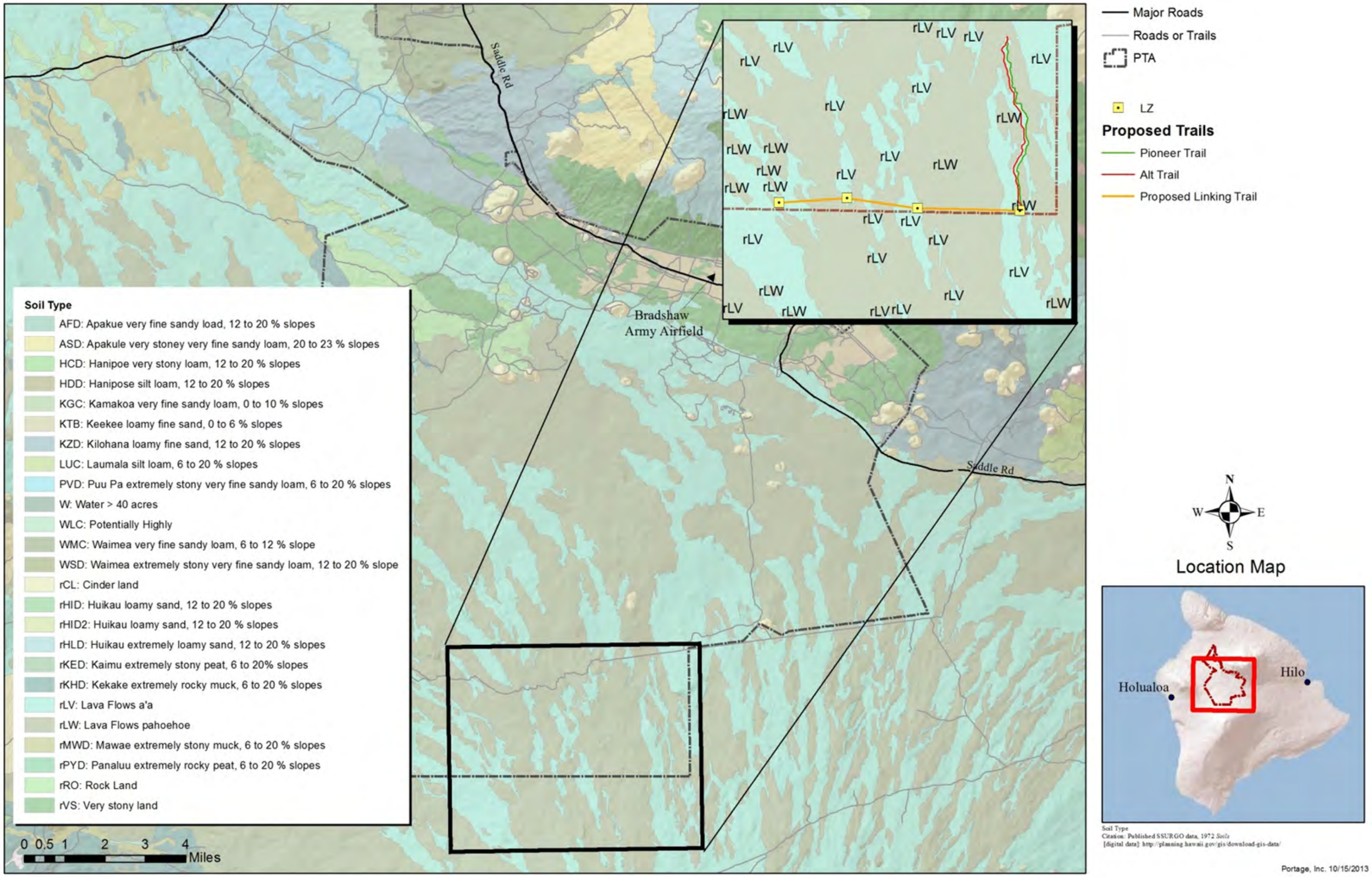

Figure 3-17. Soil types found within and near the ROI.

The values of porosity and water-retentive properties are high for virtually all of the soil groups on the island. Total porosity in Hawai'i soils ranges from 68 to 74%, and macroporosity ranges from 10 to 18%. Field capacity is within a narrow range of 56 to 58%, wilting point from 28 to 38%, and available water from 19 to 28%. These values differ from other typical values found in the continental United States due to the strongly aggregated structure and the typically non-swelling clay minerals of Hawai'i soils (Lau and Mink 2006).

The values of saturated hydraulic conductivity (i.e., water movement), K_s, in Hawai'i soils are typically a few meters per day. However, they are about three orders of magnitude smaller than that for unweathered basalts, the parent rock. Surface crusting and sealing are not common in Hawai'i soils (Lau and Mink 2006).

3.10.3.1 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 (U.S. Army 2013a). The slope within the ROI is gentle and does not exceed the 30% slope that is associated with slope failure (U.S. Army 2013a).

3.10.3.2 Soil Erosion. Soil erosion within the ROI is low because of the area's gentle slope, low intensity rainfall, low soil erosivity potential, and less developed soils (U.S. Army 2013a). Soil erosion is most likely to occur in areas with well-developed soil.

3.10.4 Soil Resources Surrounding the Region of Influence

The region surrounding the ROI to the south and outside of PTA has been designated as a conservation district (see Subsection 3.2.2). Here, lands at low elevations are used for cattle grazing and few other agricultural products because of the limited amount of developed soils. PTA, and other nearby areas, is dominated by soils similar to the ROI with lava flows and thin soils (U.S. Army 2013a). Figure 3-17 shows the soil types of PTA and immediately surrounding areas.

3.11 Biological Resources

Biological resources include plant and animal species and the habitats or communities in which species occur. This subsection describes the biological resources that have the potential to occur within the ROI for activities associated with the construction and use of the proposed LZs within the PTA. Biological resources consist of terrestrial biological species (i.e., plants and wildlife) and their associated habitats and communities. Of these terrestrial biological species, threatened and endangered vegetation and wildlife species and their associated habitats that have been recorded in, or that have the potential to be found within, the ROI are discussed in this subsection.

3.11.1 Region of Influence

The ROI for biological resources consists of regions that support terrestrial biological resources that may be directly or indirectly affected by the Action Alternatives. Vegetation, wildlife, listed species, and their associated habitats that have the potential to be impacted by the construction of the proposed trails and LZs and the associated operational activities are considered to be part of the ROI. For the most part, the ROI is contained within the boundaries of the PTA, specifically the southern end in the area of the proposed construction. See Figure 2-6 for locations of trails and LZs.

3.11.2 Regulatory Framework

The analysis of impacts from the proposed activities focuses on the biological resources that are protected under federal, state, or local laws and statutes. These laws and statutes include NEPA (42 USC 55 § 4321 et seq.), ESA (16 USC 35 § 1531 et seq.), Migratory Bird Treaty Act (MBTA) (16 USC 7 § 703-712 et seq.); Sikes Act Improvement Act (16 USC § 670a-670o), DoD Instruction 4715.03 (DoD 2011); Army Regulation 200-1 (U.S. Army 2007d), ESA Section 7 consultations under the ESA with the U.S. Fish and Wildlife Service (USFWS); and/or memoranda of agreements/memoranda of understandings (MOUs) with cooperating agencies or groups (U.S. Army 2013a).

The ESA (16 USC 35 § 1531 et seq.) is administered by the USFWS and requires federal agencies to conserve terrestrial endangered species. Under the ESA, vegetation and wildlife species may be listed as either threatened or endangered with the purpose of protecting and recovering those species and the habitat on which they depend. A species may be listed as endangered when the "species is in danger of extinction throughout all or a significant portion of its range" (16 USC 35 § 1531 et seq.). A species may be listed as threatened when the species "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (16 USC 35 § 1531 et seq.). 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 listed species or to result in any modification or destruction of critical habitat.

Critical habitat areas are defined by the ESA as "(1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation." These areas may require special management considerations or protection. The *Final Environmental Impact Statement, Permanent Stationing of the 2/25th Stryker Brigade Combat Team* (USAEC 2008) states, "Critical habitat may be designated on private or government lands, activities on these lands are not restricted unless there is federal involvement in the activities or direct harm to listed wildlife." In addition, USAEC (2008) states, "Federal agencies are required to conduct 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." Critical habitat has been designated for the palila and is located in the northern end of the PTA. There is no designated critical habitat within the immediate vicinity of the Proposed Action.

Under the MBTA (16 USC 7 § 703-712 et seq.) and pursuant to Executive Order 13186 (66 FR 3853), the DoD has direction to evaluate actions and agency plans on migratory birds, initiate actions to minimize the take of birds, and contribute to the conservation of migratory birds. Unless permitted by regulation (i.e. waterfowl hunting or incidental take during DoD training and testing) the MBTA prohibits the take, capture, or killing of any migratory birds, and any parts, nest, or eggs of any such bird. 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 their conservation of migratory birds that was developed pursuant to Executive Order 13186 (66 FR 3853) addresses both the 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. The MOU does not authorize the take of migratory birds (USAEC 2008).

The 2003 National Defense Authorization Act provided for regulations to allow members of armed services to incidentally take migratory birds during approved military readiness activities without violating the MBTA. On 28 February 2007, the USFWS published the final rule on the take of migratory birds by the Armed Forces (50 CFR § 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 (Peshut et al. 2013). If the Armed Forces determine that a proposed or ongoing military readiness activity may result in a significant adverse effect on a population of 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 (USAEC 2008).

The Sikes Act (16 USC § 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 Agriculture and Interior to develop cooperative plans for conservation and rehabilitation programs on public lands under their jurisdiction.

Invasive species consist of non-indigenous species (e.g. plants, wildlife, and invertebrates) that adversely affect the habitats they invade economically, environmentally, or ecologically. Executive Order 13112, "Invasive Species," (64 FR 6183) 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 are addressed in *Army Policy Guidance for Management and Control of Invasive Species* distributed in June 2001 (U.S. Army 2001). The need to implement invasive species management is identified in the U.S. Army Environmental Program Requirements under the Sikes Act for natural resources stewardship, the ESA when protecting or managing listed species and critical habitat, and the Clean Water Act (33 USC §1251 et seq.) when invasive species are involved in erosion control and wetlands. Consequently, installations are required to monitor invasive species populations. Installations are required to 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 (U.S. Army 2001). Invasive species are defined as introduced 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 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 2010b).

3.11.3 Descriptions of Biological Resources in the Region of Influence

The following biological resources are found within the Proposed Action's ROI.

3.11.3.1 Vegetation and Habitat Community. The proposed LZs and access trails would be located in what are essentially alpine stone deserts, with sparse vegetation scattered over lava, barren rock, and cinders. These plant communities consist mostly of the perennial native grasses Hawaiian bentgrass (*Agrostis sandwicensis*) and pili uka (*Trisetum glomeratum*) and the perennial native fern ‘iwa‘iwa (*Asplenium adiantum-nigrum*). The lack of available resources (i.e., food, water, and cover) within an alpine stone desert limits the amount of wildlife occurring within this environment. Therefore, wildlife inhabiting the alpine stone deserts consists mainly of (a) arthropods, such as the Mauna Loa bug (*Nysius aa*) and (b) a few vertebrates that include several species of birds, rodents, and a few ungulates (such as feral sheep [*Ovis aries*], goats [*Capra hircus*], and the mouflon sheep [*Ovis musmon*]) (University of Hawai‘i 2009). Detailed information and methods on the vegetation, bird, bat, and arthropod surveys conducted at the proposed LZs are found in a memorandum for the record (Peshut et al. 2013), which is provided in Appendix A. The flight paths from BAAF over PTA to the proposed LZs are above subalpine dry forests and shrublands. These vegetation communities include, but are not limited to, fountain grass (*Pennisetum setaceum*), ‘a‘ali‘i (*Dononaea viscosa*), naio (*Myoprum sandwicense*), ‘ulei (*Osteomeles anthyllidifolia*), and māmane (*Sophora chrysophylla*). The wildlife in the subalpine dry forests and shrublands include birds, rodents, and feral ungulates (such as feral sheep [*Ovis aries*], goats [*Capra hircus*], and mouflon sheep [*Ovis mismon*]) (University of Hawai‘i 2009).

3.11.3.2 ***Wildlife.*** The following subsections discuss the wildlife species that occur on PTA.

3.11.3.2.1 ***Invertebrates—***According to the *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawai‘i* (U.S. Army 2013a), approximately 96 species of arthropods and invertebrates occur on PTA, the majority of which are nonnative species.

3.11.3.2.2 ***Amphibians, Reptiles, and Fish—***There are no surface water bodies on PTA that can support fish species; therefore, no fish species occur within the ROI. No reptiles or amphibians are native to the Hawaiian Islands; therefore potential reptile or amphibian species that may be encountered within the ROI would be considered an invasive species

3.11.3.2.3 ***Mammals—***The ‘ope‘ape‘a or Hawaiian hoary bat (*Lasiurus cinereus semotus*) is the only native land mammal at PTA and is discussed further in Subsection 3.11.5, Endangered, Threatened, and Sensitive Species. Other mammals that occur on PTA consist of introduced game animals, including the feral sheep (*Ovis aries*), goats (*Capra hircus*), and mouflon sheep (*Ovis mismon*), and other introduced species, including rat species (*Rattus rattus*), mongoose (*Herpestes auropunctatus*), mice (*Mus domesticus*), feral dogs (*Canis familiaris*), and feral cats (*Felis catus*). On the PTA, these species are considered a nuisance, and mitigation efforts, such as fences, trapping, and eradication, are in place to control their populations (U.S. Army 2013a).

3.11.3.2.4 ***Birds—***Thirty-eight bird species are known to occur on PTA. These include native, introduced, and visitor species. Seventeen of these bird species are considered protected by the MTBA and ESA (U.S. Army 2013a). Avifauna surveys (Appendix A) were conducted in April 2013 to determine the presence and habitat uses in the general vicinity of the proposed LZs (Peshut et al. 2013). The avifauna presence and habitat surveys identified two native bird species (‘apapane and ‘ōma‘o) and one introduced species (chukar) (Peshut et al. 2013). The native bird species are not listed as ESA species but are protect by the MTBA. The ESA listed species are discussed in the sensitive species section. Several of the introduced bird species (chukar [*Alectoris chukar*], California quail [*Callipela californica*], wild turkey [*Meleagris gallopavo*], etc.) are considered game birds. Table 3-8 lists bird species known to occur on PTA and their origin statuses.

Table 3-8. Bird species known to occur on PTA.[a]

Scientific Name	Common Name	Origin Status
Lonchura malabarica	African silverbill	Introduced
Hemignathus munroi	‘Akiapōlā‘au[b]	Native
Himatione sanguinea	Apapane[b,c]	Native
Tyto alba	Barn owl[b]	Introduced
Oceanodroma castro	Band-rumped storm petrel (‘ake‘ake)[b]	Native

Table 3-8. (continued.)

Scientific Name	Common Name	Origin Status
Francolinus francolinus	Black francolin	Introduced
Callipela californica	California quail	Introduced
Alectoris chukar	Chukar[c]	Introduced
Acridotheres tristis	Common myna	Introduced
Francolinus erckelli	Erckel's francolin	Introduced
Francolinus pondicerianus	Gray francolin	Introduced
Hemignathus virens	Hawai'i 'amakihi[b]	Native
Chasiempis sandwichensis	Hawai'i 'elepaio	Native
Branta sandvicensis	Hawaiian goose (nēnē)[b]	Native
Buteo solitarius	Hawaiian hawk ('io)[b]	Native
Pterodroma sandwichensis	Hawaiian dark-rumped petrel[b] ('ua'u)	Native
Asio flammeus sandwichensis	Hawaiian short-eared owl (pueo)[b]	Native
Myadestes obscurus	Hawaiian thrush ('ōma'o)[b,c]	Native
Carpodacus mexicanus	House finch[b]	Introduced
Passer domesticus	House sparrow	Introduced
Zosterops japonicus	Japanese white-eye	Introduced
Vestiaria coccinea	Iiwi[b]	Native
Lophura leucomelana	Kalij pheasant	Introduced
Estrilda caerulescens	Lavender waxbill	Introduced
Garrulax canorus	Melodious laughing thrush	Introduced
Cardinalis cardinalis	Northern cardinal[b]	Introduced
Mimus polyglottus	Northern mockingbird[b]	Introduced
Lonchura Malacca	Nutmeg mannikin	Introduced
Pluvialis fulva	Pacific golden-plover [b]	Visitor
Loxioide bailleui	Palila (honeycreeper)[b]	Native
Leiothrix lutea	Red-billed leiothrix	Introduced
Columbra livia	Rock pigeon	Introduced
Sicalis flveola	Saffron finch	Introduced
Alauda arvensis	Skylark[b]	Introduced
Streptopelia chinensis	Spotted dove	Introduced
Meleagris gallopavo	Wild turkey	Introduced

Table 3-8. (continued.)

Scientific Name	Common Name	Origin Status
Serinus mozambicus	Yellow-fronted canary	Introduced
Geopelia striata	Zebra dove	Introduced

a. Sources: USAG-HI (2010b) and Peshut et al. (2013).
b. MTBA and ESA listed species.
c. Observed species during the April 2013 surveys (see Appendix A [Peshut et al. 2013]).

3.11.4 Invasive Species

Invasive species are found throughout the ROI but mostly occur in areas that have experienced heavy disturbance or where sufficient resources are available to them. Invasive species consist of plant, wildlife, and invertebrates. These species are damaging to the local ecosystems, because they displace and remove resources needed by native species.

Major invasive plant species known to occur include fountain grass (*Pennisetum setacium*), fireweed (*Senecio madagascariensis*), chandelier plant (*Kalanchöe tubiflora*), banana poka (*Passiflora mollissina*), German ivy (*Senecio likanioides*), and Russian thistle (*Salsola kali*) (U.S. Army 2013a). Invasive plant species are managed on PTA by U.S. Army Garrison-Pōhakuloa Natural Resources staff through weed control programs that include hand pulling, spraying, and regular cleaning of equipment (U.S. Army 2013a).

Major invasive wildlife species occurring within the ROI include ungulates such as feral pigs, sheep, and goats in addition to predatory mammals such as rodents, mongoose, and feral dogs and cats (U.S. Army 2013a). Ungulate control is maintained through recreational hunting, fencing, and trapping. Predator mammal control is maintained through trapping, rodent control programs, and fencing.

Major invasive invertebrate species occurring in the ROI include wasps, ants, termites, bees, and yellow jackets (U.S. Army 2013a). Invasive invertebrate specie populations are controlled through eradication when colonies are discovered, controlling invertebrate access points (i.e., when new equipment is brought onto PTA), and documenting locations of known populations (U.S. Army 2013a).

Due to the lack of habitat and resources at the location of the proposed trails and LZs, it is not expected that any invasive species occur. A survey conducted in June 2013 (Appendix A) specifically targeted at ant species did not observe any species at these locations (Peshut et al. 2013).

3.11.5 Endangered, Threatened, and Sensitive Species

Sensitive species include those that have been designated as threatened, endangered, or having the possibility of becoming such by federal or state agencies. This subsection describes sensitive vegetation and wildlife species having the potential to occur within or near the proposed trails or LZs. Information presented in this subsection includes findings from vegetation and wildlife surveys conducted in conjunction with other assessments and in the vicinity of the LZs and proposed trails. Table 3-9 lists sensitive species, including wildlife and vegetation potentially occurring within the ROI but not occurring within the proposed trail and LZ survey area.

During April to June 2013, presence and potential habitat surveys for plants and animals protected under the ESA and MBTA were conducted at the proposed trail and LZs locations. The surveys were conducted by the Army and the Center of Environmental Management of Military Lands. The focus of the surveys included avifauna, plants, invasive ants, the Hawaiian hoary bat, the Hawaiian petrel, and the band-rumped storm petrel that may occur within the vicinity of the Proposed Action. Details of these surveys are found in Peshut et al. (2013) provided in Appendix A.

An assessment of the likelihood of a species occurring was made based on the habitat requirements of the species, geographic distribution of the species, and biological surveys (USAEC 2008; Peshut et al. 2013). Endangered and threatened species of vegetation and wildlife that could potentially occur within or near the LZs, associated connecting trails, or flight paths are provided below, and specific locations, if known, are described in this subsection.

Table 3-9. Federal- and state-listed endangered, threatened, and candidate species and species of concern (sensitive species) potentially occurring on PTA below potential flight paths to the proposed LZs on Mauna Loa but not occurring within the trails and LZ survey area (Peshut et al. 2013).

Species	Federal Status[a]	State Status[b]	Potential for Occurrence under Flight Path[c]
Plants			
Mauna Loa silversword (*Argyroxiphium kauense*)	1	1	5
Fragile fern (*Asplenium peruvianum* ssp. *insulare*)	1	1	2
Honohono/Hawaiian mint (*Haplostachys haplostachya*)	1	1	4
Kioele/leather leaf sweet ear (*Hedyotis coriacea*)	1	1	3
Ma‘aloa/spotted nettle bush (*Neraudia ovata*)	1	1	4
Kiponapona (*Phyllostegia racemosa* var. *racemosa*)	1	1	3
Po‘e, ‘ihi, ‘ihi makole (*Portulaca sclerocarpa*)	1	1	2
Lanceleaf catchfly (*Silene lanceolata*)	1	1	3
Poplo, popolo ku mai (*Solaum incompletum*)	1	1	3
Hawaiian parsley (*Spermolepis hawaiiensis*)	1	1	3
Creeping mint (*Stenogyne angustifolia*)	1	1	1
Tetramolopium arenarium var. *arenarium*	1	1	4
Hawaiian vetch (*Vicia menziesii*)	1	1	3
Ae/Hawaiian yellow wood (*Zanthoxylum hawaiiense*)	1	1	3
Hawaiian catchfly (*Silene hawaiiensis*)	2	2	2
Makou (*Ranunculus hawaiiensis*)	3	5	6
‘Akoko (*Chamaesyce olowaluana*)	5	5	1
Douglas bladderfern (*Cystopteris douglasii*)	–	5	1
Mauna Kea dubautia or na‘ena‘e (*Dubautia arborea*)	5	5	1
Hawai‘i black snakeroot (*Sanicula sandwicensis*)	–	5	1

Table 3-9. (continued.)

Species	Federal Status[a]	State Status[b]	Potential for Occurrence under Flight Path[c]
Invertebrates			
Blackburn’s sphinx moth (*Manduca blackburni*)	1	–	3
Koa bug (*Coleotichus blackburniae*)	5	–	4
Yellow-faced bee (*Hylaeus difficilis*)	5	5	4
Succineid snail (*Succinea konaensis*)	5	–	3
Zonitid snail (*Vitrina tenella*)	5	–	4
Picture-wing fly (*Drosophilia heteroneura*)	1	3	4
Picture-wing fly (*Drosophilia mulli*)	1	3	4
Picture-wing fly (*Drosophilia ochrobasis*)	1	–	4
Flying earwig Hawaiian damselfly (*Megalagrion nesiotes*)	4	3	4
Pacific Hawaiian damselfly (*Megalagrion pacificum*)	4	3	4
Black-veined agrotis noctuid moth (*Agrotis melanoneura*)	–	5	4
Yellow-faced bee (*Hylaeus flavipes*)	–	5	4
Birds			
Nēnē or Hawaiian goose (*Branta sandvicensis*)	1*	1	2
Hawaiian hawk or ‘io (*Buteo solitarus*)	1*	1	2
Hammerhead or ‘akiapola‘au (*Hemignathus munroi*)	1*	1	2
Palila (*Loxioides bailleui*)	1*	1	2
Hawaiian petrel or ‘ua‘u (*Pterodroma sandwichensis*)	1*	1	1
Band-rumped storm petrel or ‘ake‘ake (*Oceancodroma castro*)	3*	1	1
Hawai‘i ‘elepaio (*Chasiempis sandwichensis*)	5	–	3
‘Amakihi (*Hemignathus virens virens*)	5*	–	4
‘Apapane (*Himatione sanquinea*)	5*	–	4
Kolea (*Pluvialis fulva*)	5	–	4
Barn owl (*Tyto alba*)	*	-	1
Pueo (*Asio flammeus sandwichensis*)	*	-	1
House finch (*Carpodacus mexicanus*)	*	-	2
‘I‘iwi (*Vestiaria coccinea*)	*	-	1
Northern cardinal (*Cardinalis cardinalis*)	*	-	1
Northern mockingbird (*Mimus polyglottus*)	*	-	1

Table 3-9. (continued.)

Species	Federal Status[a]	State Status[b]	Potential for Occurrence under Flight Path[c]
Pacific golden-plover (*Pluvialis fulva*)	*	-	1
Skylark (*Alauda arvenius*)	*	-	1
Mammals			
Hawaiian hoary bat or ‘ope‘ape‘a (*Lasiurus cinereus semotus*)	1	1	2

a. Federal status definitions:	b. State status definitions:	c. Occurrence status:
1. Endangered	1. Endangered	1. Species may occur
2. Threatened	2. Threatened	2. Species confirmed
3. Candidate	3. Candidate	3. Species unlikely
4. Proposed	4. Proposed	4. Potential habitat, but species not known to occur
5. Species of Special Concern	5. Species of Special Concern	5. Potential habitat; species may have occurred historically; species is not known to occur
* MBTA-protected species		6. No potential habitat, and species is not known to occur

Sources: The *Mauna Kea Comprehensive Management Plan* (University of Hawai‘i 2009), PTA EA (U.S. Army 2004), Mākua EIS (USAEC and COE 2009), *Hawai‘i’s Comprehensive Wildlife Conservation Strategy* (Mitchell et al. 2005), *Hawaiian Islands Plants* (USFWS 2010a), *Hawai‘i Islands Animals* (USFWS 2010b), Stryker Brigade Combat Team final EIS (USAEC 2008), and the final EIS for the construction and operations of an infantry platoon battle course at PTA (U.S. Army 2013a)

3.11.5.1 Listed Plant Species. Fifteen threatened and endangered plant species occur on PTA. See Figure 3-18 for locations of known listed plant species prior to the April 2013 survey and protected areas on the PTA. No listed critical habitat for plants is present on the PTA. As part of the conservation program at PTA, the military monitors these plant populations and protects their respective habitats (U.S. Army 2013a). Protected plant habitats for listed species are located mostly in the northern and western portions of PTA.

In April of 2013, botanical surveys were conducted to determine the presence and potential habitat of ESA-listed species within or near the proposed LZs, access trails, or connecting trails. The survey area incorporates a buffer around each of the LZs that is based on an area potentially impacted by helicopter rotorwash, approximately 330 ft (100 m) from the LZ perimeter (Peshut et al. 2013). Access trails and connecting trails had a buffer of 66 ft (20 m) from the proposed routes (Peshut et al. 2013). In total, approximately 230 acres (93 hectares) of the proposed LZ and trail areas was surveyed for botanical ESA species. Specific details of the botanical survey methodology are found in Peshut et al. (2013) located in Appendix A.

Based on the results of the botanical surveys, one ESA listed threaten species, Hawaiian catchfly (*Silene hawaiiensis*), was observed at several locations within the connecting trails buffers, near LZ 2 and LZ 4. Refer to Peshut et al. (2013) in Appendix A for specific locations of the observed species. The locations of Hawaiian catchfly would be marked with flagging so that construction activities could easily avoid them. It is anticipated that construction of the LZs and the equipment moving between the LZ locations would avoid the marked plants. The following are descriptions of the Hawaiian catchfly and other listed plant species that occur on ROI.

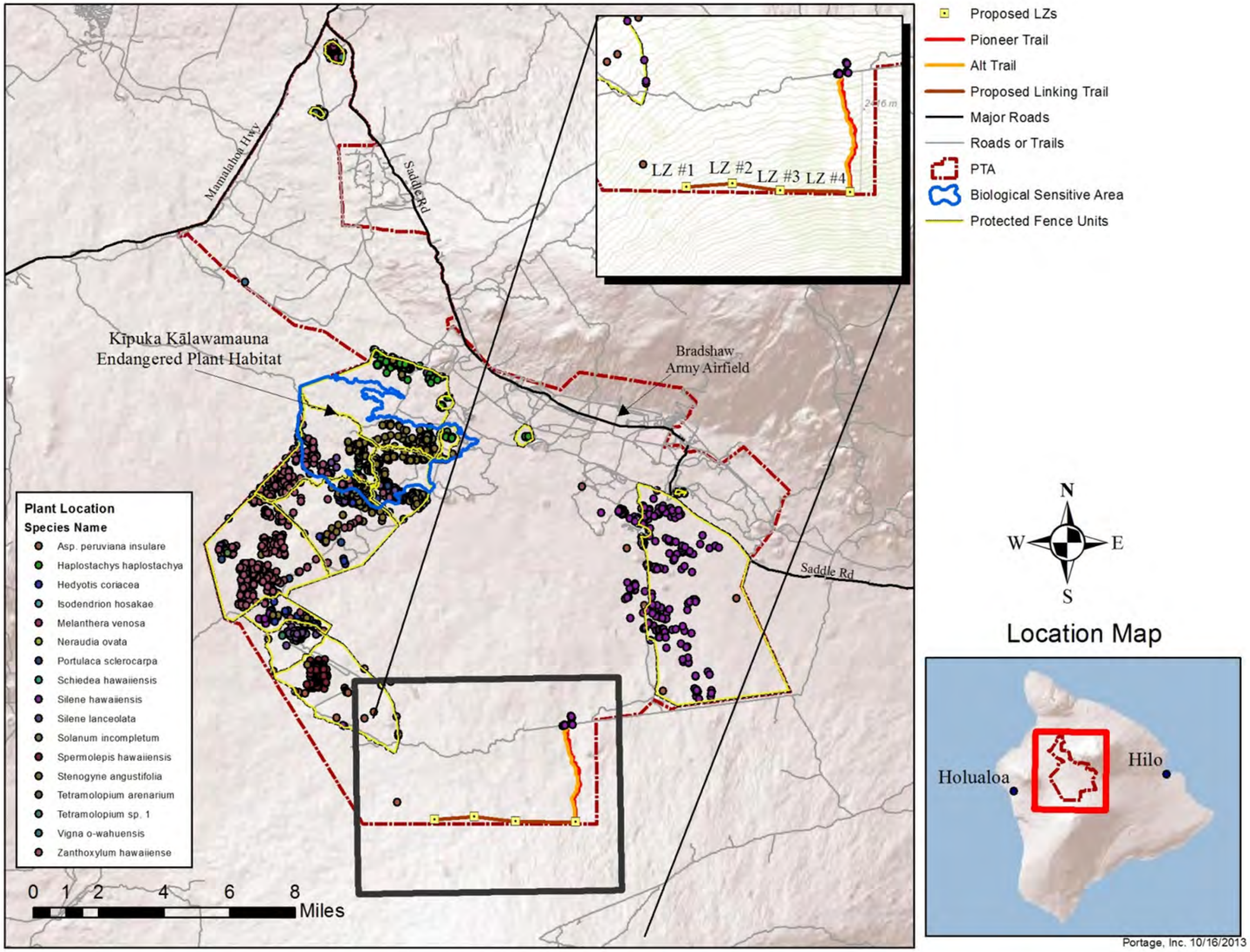

Figure 3-18. Known locations of protected plant species and habitat at PTA.

3.11.5.1.1 Hawaiian Catchfly (**Silene hawaiiensis*****)—**The Hawaiian catchfly is a federally listed threatened species that is found at several locations on PTA (USFWS 2010a). The Hawaiian catchfly (*Silene hawaiiensis*) is a sprawling shrub with slender leaves and greenish-white flowers. This plant is native to the Big Island of Hawaiʻi and is usually found in dry forests, shrublands, and grasslands on lava flows and ash deposits at elevations from 3,000 to 4,300 ft (900 to 1,300 m) (Mitchell et al. 2005). Several Hawaiian catchfly were identified within the proposed connecting trails. Known locations of the Hawaiian catchfly are shown on Figure 3-18 and in Peshut et al. (2013) in Appendix A.

3.11.5.1.2 Fragile Fern (**Asplenium peruvianum ssp. insulare*****)—**Fragile fern (*Asplenium peruvianum* ssp. *insulare*) is a federally listed endangered species that is found on PTA (USFWS 2010a). Fragile fern has been identified in montane wet, mesic, and dry forest habitats as well as subalpine dry forests and shrubland. There are several populations on PTA, and fragile fern can occur at elevations from 5,250 to 7,800 ft (1,600 to 2,377 m) (Belfield and Pratt 2002). No fragile fern were identified within the proposed connecting trails or LZs. Known locations of fragile fern are shown in Figure 3-18.

3.11.5.1.3 Poʻe (**Portulaca sclerocarpa*****)—**The poʻe (*Portulaca sclerocarpa*) is a federally listed endangered species that is found on PTA (USFWS 2010a). The poʻe is a perennial herb with long stems and grayish-green leaves and white or pink flowers. The poʻe is found in dry habitats at elevations from 3,300 to 5,300 ft (1,006 to 1,615 m) (University of Hawaiʻi 2000a). No poʻe were identified within the proposed connecting trails or LZs. Known locations of the poʻe are shown in Figure 3-18.

3.11.5.1.4 Honohono (**Haplostachys haplostachya*****).** The honohono (*Haplostachys haplostachya*) is a listed endangered species found on PTA (USFWS 2010a). The honohono is native to the Hawaiian Islands. It has long stems, broad leaves, and white flowers (USBG 2010). The honohono is particularly sensitive to the effects of grazing and invasive species (USBG 2010). No honohono were identified within the proposed connecting trails or LZs. Known locations of honohono are shown in Figure 3-18.

3.11.5.2 Listed Wildlife Species. The following subsections describe the listed wildlife species found on PTA.

3.11.5.2.1 Listed Bird Species—As discussed earlier, 17 bird species at PTA are listed as protected by either the MBTA or the ESA. The species listed as endangered or threatened by the ESA that are located within the PTA boundary include the ʻakiapōlāʻau (*Hemignathus munroi*), nēnē or Hawaiian goose (*Branta sandvicensis*), ʻio (*Buteo solitarius*), palila (*Loxioides bailleui*), uaʻa or Hawaiian dark-rumped petrel (*Pterodroma sanwichensis*), and the ʻakeʻake or band-rumped storm petrel (*Oceanodroma castro*). See Figure 3-19 for the range and occurrences of federally listed birds and the Hawaiian hoary bat at PTA. As part of the conservation program at PTA, the Army conducts regular surveys of listed bird species. Protected vegetation communities throughout PTA provide areas of protected habitat for these species. Further specific protections for the nēnē are outlined in the January 2013 biological opinion in Appendix G of the Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawaiʻi (U.S. Army 2013a). Some of these protections include dedicated enclosures and feeding and watering programs.

The following are descriptions of listed bird species that occur within the ROI.

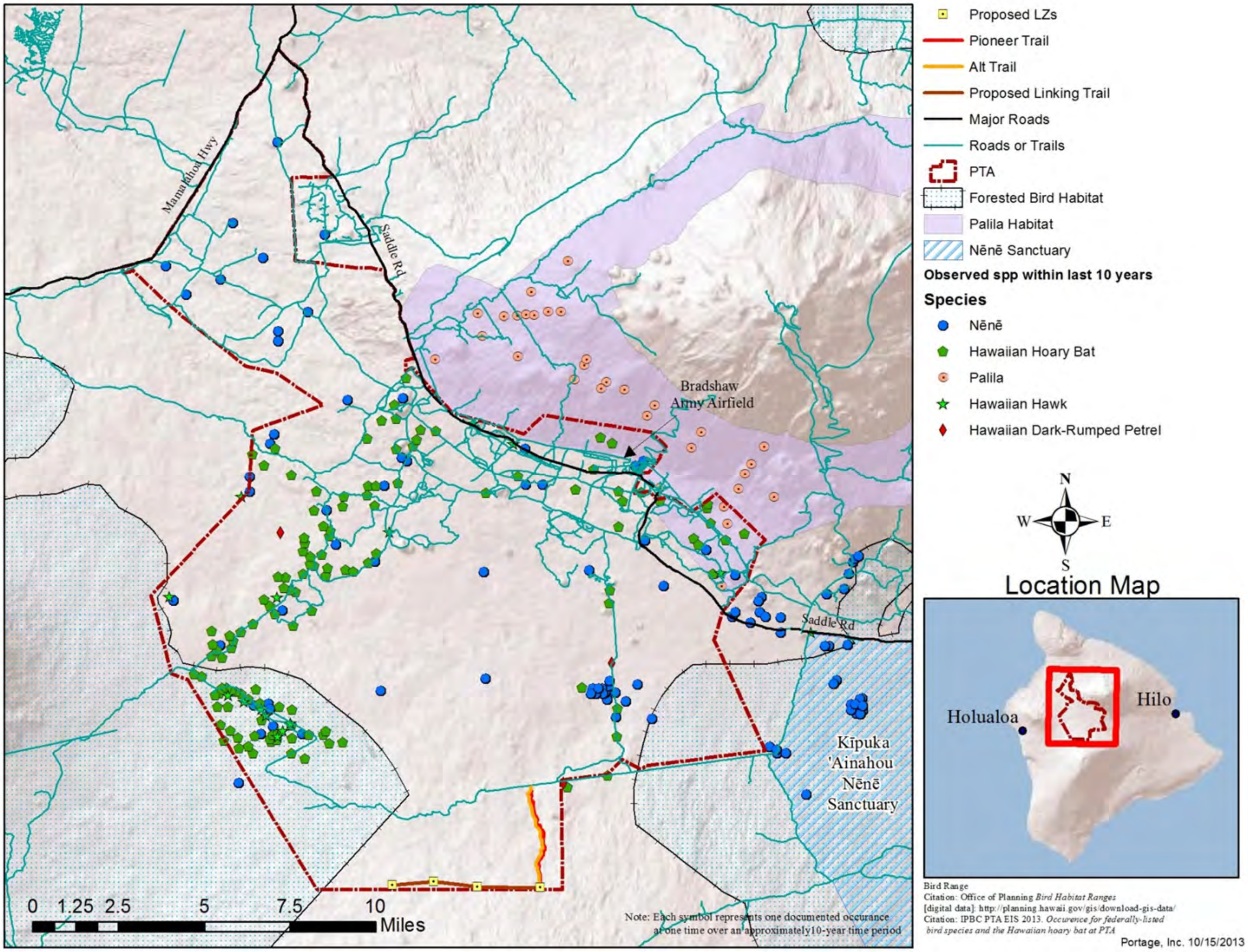

Figure 3-19. Range and observed sightings of listed bird and mammal species.

Hawaiian Hawk or ʻIo (*Buteo solitarius*). The Hawaiian hawk or the ʻio (*Buteo solitarius*) is an endangered species that is a small, broad-winged hawk and native to the Hawaiian Islands, but it occurs mostly on the island of Hawaiʻi. This solitary hawk is a territorial bird that remains in areas where it is nesting in native forests. Being opportunistic predators, however, these hawks have been known to use broad ranges to forage for foods (USFWS 2010c). The ʻio is listed as a federal and state endangered species, but, as of 2008, the USFWS was proposing to remove the bird from the list of endangered and threatened wildlife because of stable populations for the past 20 years (USFWS 2008). The ʻio was not observed during the April 2013 survey (Peshut et al. 2013), which is provided in Appendix A. With the lack of vegetation and wildlife resources within the ROI and near the LZs, the ʻio would not likely frequent the area, and it is anticipated that the population densities of ʻio at the LZs on Mauna Loa is zero (Peshut et al. 2013). Furthermore, the USFWS biological opinion dated January 2013 states that surveys for the ʻio can be discontinued (U.S. Army 2013a, Appendix G). The range of the Hawaiian hawk or the ʻio is shown as forest bird habitat in Figure 3-19. No further analysis of the Hawaiian hawk and impacts from the proposed activities will be conducted.

Palila (*Loxioides bailleui*). The palila (*Loxioides bailleui*) is a listed endangered species, is native to Hawaiʻi, and is found in habitats at elevations from 6,000 to 9,000 ft (1,829 to 2,743 m). The palila has a golden-yellow head and breast, with a gray back and gray/white belly (USFWS 2010d). The palila is concentrated on the west slope of Mauna Kea, where the palila is dependent on the māmane tree as a food source in the subalpine māmane dry forest (USGS 2006; Peshut and Schnell 2011a). As part of the recovery plan, the USFWS established the PCH in 1977 with 60,187 acres (24,356 hectares) (USAEC 2008). In August 2010, a wildfire burned approximately 1,387 acres (561 hectares) of PCH prior to containment. The *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawaiʻi* (U.S. Army 2013a) states that the palila is no longer included in any management actions. The range and the designated critical habitat for the palila are shown on Figure 3-19. No further analysis of the palila and impacts from the proposed activities will be conducted.

Hammerhead or ʻAkiapolaʻau (*Hemignathus munroi*). The hammerhead or ʻakiapolaʻau (*Hemignathus munroi*) is a listed federal and state endangered species, is native to Hawaiʻi, and only lives in the high-elevation forests near the tree line on the island of Hawaiʻi (USFWS 2010e). The hammerhead has a curved bill with a yellow head and olive-green upper body. Currently, there is no USFWS-designated critical habitat for the hammerhead. The proposed operations within the ROI are above the hammerhead range and should have no effect. No further analysis of the hammerhead and impacts from the proposed activities will be conducted.

ʻUaʻu or Hawaiian Dark-Rumped Petrel (*Pterodroma sandwichensis*). The Hawaiian dark-rumped petrel or Hawaiian petrel (*Pterodroma sandwichensis*) is a federal endangered bird species that could potentially occur within the proposed flight path and near the LZs on Mauna Loa. The Hawaiian petrel has a dark-gray head, wings, and tail with a white forehead (USFWS 2010f). The Hawaiian petrel is a nocturnal seabird that nests in burrows in areas of sparse vegetation at elevations above 7,200 ft (2,195 m) (USFWS 1983). The Hawaiian petrel feeds on crustaceans, squids, and other marine wildlife during the day and returns to the nests at night (Peshut and Schnell 2011b).

Breeding colonies of the Hawaiian petrel have been documented within the Hawaiʻi Volcanoes National Park, south of the proposed LZs on Mauna Loa (Swift and Burt-Toland 2009). No active petrel breeding colonies were observed near the proposed LZs (Peshut et al. 2013). No Hawaiian petrel calls were recorded during the survey period (Appendix A), signifying that no Hawaiian petrels are anticipated to be using the survey area as habitat or flyway (Peshut et al. 2013). It has been documented that while Hawaiian petrels are flying toward their breeding colonies, they will fly close to the terrain (Swift and Burt-Toland 2009). Several conservation actions are in place to manage current populations. These actions include protecting suspected habitat, controlling nonnative predatory species, determining the distribution of the populations, controlling direct mortalities, and minimizing the effects of artificial lighting (USFWS 1983; Peshut et al. 2013). Currently, there is no USFWS-designated critical habitat for the Hawaiian petrel (USFWS 2010f). The Hawaiian petrel is not expected to be affected by the Action Alternatives; thus, further analysis of the Hawaiian petrel is via the endangered and threatened species discussion in Subsection 4.11.3.1.1, Impacts to Sensitive Species.

‘Ake‘ake or Band-Rumped Storm Petrel (*Oceanodroma castro*). The band-rumped storm petrel (*Oceanodroma castro*) is a federal candidate species and a state listed endangered species that could potentially occur within the proposed flight path and near the proposed LZs. The band-rumped storm petrel is blackish-brown with a white band across the rump area (Mitchell et al. 2005). The band-rumped storm petrel is a nocturnal seabird that is suspected to nest in burrows at above 3,900 ft (1,189 m) on barren lava flows within Hawai‘i Volcanoes National Park (Mitchell et al. 2005). Currently, little is known about the population size and distribution on Hawai‘i, and no known colonies or nests have been found within Hawai‘i Volcanoes National Park south of the proposed LZs, but there is one suspected nest and evidence that these birds breed within the park (Swift and Burt-Toland 2009). Additionally, use of the habitat in the Saddle region by band-rumped storm-petrels has been documented (Peshut and Schnell 2011a). During the surveys (Peshut et al. 2013), which are provided in Appendix A, several band-rumped petrel calls were identified near the connecting trails the between the LZs; however, there are no identified active band-rumped storm petrel breeding colonies near the proposed LZs. Several conservation actions are in place to manage current populations. These actions include protecting suspected habitat, controlling nonnative predatory species, identifying hazardous substances that could affect the species, and minimizing the effects of artificial lighting (Mitchell et al. 2005).

Currently, there is no designated critical habitat for the band-rumped storm-petrel (Mitchell et al. 2005). The band-rumped storm-petrel is not expected to be affected by the Action Alternatives; thus, further analysis of the band-rumped storm petrel is via the sensitive species discussion in Subsection 4.11.3.1.1, Impacts to Sensitive Species.

Nēnē or Hawaiian Goose (*Branta sandvicensis*). The nēnē (*Branta sandvicensis*) is a listed endangered species that could potentially occur within the ROI. The State of Hawai‘i has established the Kīpuka ‘Ainahou Nēnē Sanctuary (State of Hawai‘i 1981b), which is a designated area for the nēnē populations and is located northeast of the proposed LZs. The nēnē is native to the Hawaiian Islands. It is mostly dark brown, has a black face and crown, and has black streaks and cream-colored cheeks (Mitchell et al. 2005). The nēnē habitat consists of lowland dry forest, shrublands, grasslands, sparsely vegetated low- and high-elevation lava flows, alpine deserts, alpine grasslands, and shrublands from sea level to 8,000 ft (2,438 m) (Mitchell et al. 2005; USFWS 2004). Studies have shown that the nēnē moves between Hawai‘i Volcanoes National Park and the Hakalau Forest National Wildlife Refuge, north and east of the PTA, and to the south slopes of Mauna Kea (Peshut and Schnell 2011a). In addition, the nēnē has been known to cross the PTA from the Kīpuka ‘Ainahou Nēnē Sanctuary to Mauna Kea, but specific flight paths of the nēnē are unknown at this time, and research by the United States Geological Survey is continuing (Peshut and Schnell 2011a). No nēnē or potential habitats were observed during the surveys for ESA and MBTA species (Peshut et al. 2013; see Appendix A). Several conservation actions are in place to manage current populations. These actions include captive propagation, predator control, habitat enhancement, and research with continued monitoring (USFWS 2004; U.S. Army 2013a, Appendix G). Currently, there is no USFWS-designated critical habitat for the nēnē (USFWS 2004). Further analysis of the nēnē is via the sensitive species discussion in Subsection 4.11.3.1.1, Impacts to Sensitive Species.

3.11.5.2.2 Listed Amphibian, Reptile, and Fish Species— There are no listed amphibians, reptiles, or fish located within the ROI.

3.11.5.2.3 Listed Mammal Species—Only one listed mammal species, the Hawaiian hoary bat or ‘ope‘ape‘a (*Lasiurus cinereus semotus*), has been observed on the PTA. See Figure 3-19 for occurrences of federally listed birds and the Hawaiian hoary bat at the PTA (U.S. Army 2013a).

The Hawaiian hoary bat is listed as an endangered species, is found in habitats at elevations from sea level to 7,500 ft (2,286 m), and has been spotted near the summit of Mauna Kea; these bats have been known to occur near the elevations of the LZs but would not be expected to depend on this habitat for resources, because the bats are mostly associated with their native vegetation (Jacobs 1994; USFWS 1994; Peshut et al. 2013). A survey for presence and potential habitat for the Hawaiian hoary bat occurred in April 2013 (Peshut et al. 2013; see Appendix A). During the survey, no Hawaiian hoary bats or potential habitat for roosting was observed (Peshut et al. 2013). The Hawaiian hoary bat is solitary, is only active from sunset to sunrise, and roosts in trees in forested areas (USFWS 2010g). The USFWS has issued reasonable and prudent measures to minimize incidental take of the Hawaiian hoary bat from PTA activities (USAEC and COE 2009). However, with the lack of vegetation and wildlife resources in the vicinity of the LZs, the Hawaiian hoary bat would not likely frequent these areas, and sightings of this bat are rare. Currently, there is no USFWS-designated critical habitat for the Hawaiian hoary bat (USFWS 1994). Further analysis of the Hawaiian hoary bat is provided via the endangered and threatened species discussion in Subsection 4.11.3.1.1, Impacts to Sensitive Species.

3.11.6 PTA Conservation Program

According to the *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawai*‘*i* (U.S. Army 2013a), the conservation program at the PTA, and therefore the managing program for the ROI, is based on the *Integrated Natural Resources Management Plan 2010-2014, Island of Hawai*‘*i, Pōhakuloa* (USAG-HI 2010a); the *Implementation Plan Pōhakuloa Training Area, Island of Hawai*‘*i* (USAG-HI 2010b); and the *Integrated Wildland Fire Management Plan, Pōhakuloa and O*‘*ahu Training Areas, United States Army, Hawai*‘*i and 25th Infantry Division (Light)* (U.S. Army 2003). These programs ensure that potential impacts from operations and training activities have reduced impacts on biological resources on PTA (U.S. Army 2013a).

The Pōhakuloa implementation plan (PIP) (USAG-HI 2010b) was developed with cooperation with the USFWS and other agencies that used the requirements outlined in existing biological opinions and requirements stated in Army and other regulations. The PIP serves as a guide for Environmental Resource staff to conserve and enhance federally listed species and critical habitat, and the PIP describes monitoring protocols for each listed species to evaluate the success of management actions (U.S. Army 2013a).

The integrated natural resource management plan provides conservation and restoration measures for biological resources. The IWFMP was developed to reduce the possibility of fire outbreak from training and operation activities.

3.11.7 Biological Resources Surrounding PTA

Biological resources surrounding PTA are described below.

3.11.7.1 Vegetation and Habitat Types. The island of Hawai‘i is home to many native species of flowering plants, birds, and wildlife. The vegetation on lands surrounding PTA is similar to the community types of PTA; however, ungulates roam these areas, trampling the habitat of many plant species. Listed plant species and other native species are mostly prevalent in federally protected areas such as PTA and state lands (Peshut 2011a).

3.11.7.2 ***Wildlife.*** The following describes the wildlife found on lands surrounding PTA.

3.11.7.2.1 ***Invertebrates—***An estimated census of invertebrates of Hawai‘i consists of approximately 8,000 species of insects and more than 1,000 species of native snails. Invertebrate species in the surrounding area of PTA are likely to be similar to the types of invertebrates found on PTA.

3.11.7.2.2 ***Amphibians and Reptiles—***No native terrestrial reptiles are located on any of the Hawaiian Islands, but several species of sea turtles can be found on the coast of Hawaii Island (USFWS 2012). No amphibians are native to the Hawaii islands.

3.11.7.2.3 ***Terrestrial Mammals—***Mammals at PTA are introduced and include feral goats, 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 2010a). Sheep and goats are predominant ungulates that remain within PTA fence units; however, fencing is required to protect plants from trampling.

3.11.7.2.4 ***Birds.*** More than 100 species of birds are found on Hawai‘i. Sixty-nine of these bird species recorded from historical times are considered native. 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).

3.12 Cultural Resources

The following cultural summary is detailed further in the *Mauna Kea Comprehensive Management Plan, UH Management Areas* (University of Hawai‘i 2009). Additional cultural resources investigation information was gathered from the *Final Environmental Impact Statement, Permanent Stationing of the 2/25th Stryker Brigade Combat Team* (USAEC 2008); *Environmental Assessment for Range Modernization Pōhakuloa Training Area, Island of Hawai‘i* (U.S. Army 2004); *Mauna Loa Trail System Feasibility Study* (Nature Conservancy of Hawai‘i 2005); and an Army memoranda for the record (Yamauchi 2013) (see Appendix B).

Cultural resources are defined as historic properties or those that are eligible for listing on the National Register of Historic Places (NRHP), cultural items, archaeological resources, sacred sites, or collections subject to protection under the NHPA (16 USC 1A § 470 et seq.), Archaeological Resources Protection Act (ARPA) (16 USC 1B §§ 470aa-mm), Native American Graves Protection and Repatriation Act (25 USC 32 § 3001 et seq.), Executive Order 13007– Indian Sacred Sites (61 FR 104), American Indian Religious Act (42 USC 1996a and 1996b), American Antiquities Act (16 USC 431-433), and the guidelines on “Curation of Federally Owned or Administered Archaeological Collections” (36 CFR I § 79). Native Hawaiian cultural resources to be considered are those of importance to Native Hawaiian groups and include cultural beliefs and practices, sacred sites, prehistoric and historic archaeological sites, historic buildings and structures, and areas of cultural importance. Areas of cultural importance include traditional resources, use areas, and sacred sites that are potentially eligible for the NRHP as traditional cultural properties (U.S. Army 2004). A traditional cultural property is generally defined as “one that is eligible for inclusion in the National Register [of Historic Places] because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community’s history, and (b) are important in maintaining the continuing cultural identity of the community” (U.S. Army 2004, p. 3-72).

Also important to the consideration of Native Hawaiian resources are concepts, culture, and landscapes. The *Final Environmental Impact Statement, Permanent Stationing of the 2/25th Stryker Brigade Combat Team* (USAEC 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:

1. Areas of naturally occurring or cultivated resources used for food, shelter, or medicine

2. Areas that contain resources used for expression and perpetuation of Hawaiian culture, religion, or language

3. Places where known historical and contemporary religious beliefs or customs are practiced

4. 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

5. 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.

A literature search was conducted for this study, including gathering information on cultural significance and field surveys. The results of this search are summarized in following subsections.

3.12.1 Cultural Overview

It was the nature of place that shaped the cultural and spiritual view of the Hawaiian people. "Cultural attachment" comprises both the tangible and intangible values of a culture—how a people identify with and personify the environment around them. It is the intimate relationships (developed over generations of experiences) that people of a particular culture feel for the environment that surrounds them—their sense of place. This attachment is deeply rooted in the beliefs, practices, cultural evolution, and identity of a people (Kent et al. 1995).

In Hawaiian culture, natural and cultural resources are one and the same. Native traditions describe the formation (the birth) of the Hawaiian Islands and the presence of life on and around them in the context of genealogical accounts. All forms of the natural environment from the skies and mountain peaks, to the watered valleys and the lava plains, and to the shoreline and ocean depths are believed to be embodiments of Hawaiian gods and deities.

In 1778, British explorer Captain James Cook arrived in Hawaiʻi and began a period of sustained contact between Hawaiians and westerners that began to change Hawaiian culture (University of Hawaiʻi 2009, p. 5-18). In 1782, Kamehameha I became the ruler of Hawaiʻi Island and began his conquest of the other islands to unite them under a single rule. Following Kamehameha I's death in 1819, his son, Kamehameha II, succeeded him. Until then, Hawaiian life was regulated under laws of *kapu* (taboo). Kamehameha II ordered the end to the state *kapu* system and placed restrictions on traditional religious practices. He subsequently allowed Protestant missionaries to settle in Hawaiʻi, thus altering Hawaiian cultural and religious systems (NPS 2009). However, traditional beliefs and practices continued to be passed down covertly, especially in places far from the Christian centers (University of Hawaiʻi 2009, p. 5-5). Although some traditional religious beliefs and knowledge were likely lost, individual familial religious practices remained and continue.

Colonial expeditions, traders, whalers, and other foreigners visited the Hawaiian Islands following the Cook expedition. Some of these people took up residence in the islands, and some introduced new species. In 1792, Captain George Vancouver presented Kamehameha I with cattle and goats and requested that they be allowed to propagate for 10 years. Kamehameha I sent the cattle and goats into the mountains of Hawaiʻi Island and placed a *kapu* on killing them. Over the next decades, *kapu* continued, especially on cattle, in an effort to increase the herd. In the mid to late 1800s, land tenure was modified by the Kingdom of Hawaiʻi, with the result that ranch owners could control individually held land. Today, sheep and goats are actively hunted to control their impacts on the fragile ecosystem (University of Hawaiʻi 2009, pp. 6-11–6-16). Evidence of the early ranching and grazing activities are extant on the island of Hawaiʻi (University of Hawaiʻi 2009, pp. 5-17–18).

3.12.2 Region of Influence

The ROI considered for cultural resources includes the proposed and alternate access trails from the Hilo Kona Highway, the proposed four LZs, and the trails that link the LZs. The ROI falls within the Ahupuaʻa of Kaʻohe, Hāmākua District. Kaʻohe Ahupuaʻa begins as a narrow strip of land on the east coast of Hawaiʻi Island, but after 3 mi (5 km), it broadens, and 7.4 mi (12 km) further upslope, it broadens again to encompass most of Mauna Kea. The ahupuaʻa continues to the west and south to Mokuʻaweoweo, the crater at the summit of Mauna Loa. Kaʻohe Ahupuaʻa encompasses the complete range of ecotones found on Hawaiʻi Island. The following discussion considers those portions of Kaʻohe within which the project area lies. Recent traditional historical research was consulted for this document (e.g., McCoy et al. 2009). The literature consulted acknowledges the significance of Mauna Kea in Native Hawaiian culture but seeks to find a balance with modern activities.

3.12.3 Saddle Region Cultural Aspects

The saddle region, home to PTA, connects Mauna Kea to Mauna Loa. Various trails connecting population and resource centers run through the area and have small rock structures associated with them, including rest shelters and cairns to mark the trails.

Nineteenth century documents reveal the presence of the ʻuaʻu (Hawaiian petrel), a nocturnal, pelagic seabird that nests on the ground, in the plateau region between Mauna Kea and Mauna Loa. Although recent studies at PTA have not been able to document ʻuaʻu, they have been found on the slopes of Mauna Loa. Historically, the ʻuaʻu chicks were considered a delicacy, were hunted, and, with few exceptions, were consumed only by chiefs. It appears that adult ʻuaʻu were hunted and eaten by travelers in the saddle region who were perhaps on their way to Mauna Kea or Mauna Loa (U.S. Army 2004, p. 3-26). Hunting for ʻuaʻu and other birds continued from prehistoric times into the early 20th century (U.S. Army 2004, p. 3-27).

Numerous cultural-resource management investigations, including oral histories, archaeological field surveys, and historic building surveys, have been conducted in the saddle region, most for compliance purposes related to PTA. The Army manages more than 350 archaeological sites at PTA, including temporary habitation sites in lava tubes and on the surface of lava flows, trails, shrines, platforms, cairns, historic-era ranching walls and fence lines, and other site types. Oral histories were gathered in 2002 by Social Research Pacific, and a field visit was made to Ahu aʻUmi Heiau, which is located west of PTA between Hualālai and Mauna Loa and served as a ritual site and possibly a locus of tribute collection. Recorded as early as 1853, Ahu a ʻUmi Heiau has been described as one of the most prominent of Hawaiian archaeological sites (Dye 2005, p. 16). Native Hawaiians were also asked about possible burials, and the Native Hawaiians indicated some burials may exist in the vicinity of springs upslope from BAAF and Mauna Kea State Park (DOT 2010b).

Oral history subjects did report the continuation of bird hunting using old trails and modified lava blisters to encourage nesting in the region. Several major trails also linked population centers, and others likely led to procurement areas. In addition to prehistoric remnants, historic building surveys identified 138 PTA structures that are old enough to be considered for eligibility on the NRHP (U.S. Army 2004, pp. 3-25, 3-28).

3.12.4 Mauna Loa Cultural Aspects

The following subsections describe the cultural aspects of Mauna Loa.

3.12.4.1 Mauna Loa Cultural Beliefs and Practices. Perhaps because there have been fewer actions triggering the need for impact analysis, literature searches reveal much less cultural information about Mauna Loa than the saddle region (Donham 2010). However, information that was discovered makes it apparent that Mauna Loa's prehistoric and historic resources are similar in type and density to those found on PTA and that Mauna Loa holds a place of cultural importance to Native Hawaiians. One oral history subject described the importance this way:

> *Mauna Loa, the tip, was always kūpuna [elders, ancestors]. And there was no wanting to go on top. You know, just to know that it was there was just satisfying to us. And so it was kind of a hallowed place that you know is there, and you don't need to go there. You don't need to bother it. But it is there, and it exists. And it was always reassuring because it was the foundation for our island* (University of Hawai'i 2000b).

Hawaiian legends also describe Mauna Loa's importance in Native Hawaiian culture. They explain that the volcano goddess Pele was driven from her home by her angry older sister, Na-maka-o-kaha'i, because Pele had seduced her husband. Every time Pele would thrust her digging stick into the earth to dig a pit for a new home, Na-maka-o-kaha'i, goddess of water and the sea, would flood the pits. Pele eventually landed on the island of Hawai'i, where she made Mauna Loa her new home. Literally meaning "long mountain" in the Hawaiian language, Mauna Loa was so tall that even Pele's sister could not send the ocean's waves high enough on Mauna Loa to drown Pele's fires. So Pele established her home on its slopes.

3.12.4.2 Mauna Loa Archaeological/Historic Resources. 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 within the saddle region. The resources 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). 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 MLO monitors the global atmosphere.

An archeological survey for the Action Alternatives was conducted in February and March of 2013. The survey area included the proposed access trail to provide access to the LZs from the Hilo Kona Highway, an alternative trail approximately parallel to the access trail, four LZs and the trails linking them. A 262-ft (80-m) corridor was surveyed along each proposed trail segment. A 328- × 328-ft (100- × 100-m) area was surveyed around each proposed LZ location. Results of field surveys undertaken at PTA are discussed below.

Very few archaeological sites were identified during the survey. Two factors may account for the lack of archaeological sites encountered during the 340-acre (137-hectare) survey: (1) the relatively recent lava flow and (2) the high elevation. The proposed access and alternative trail are located on the Mauna Loa k4 'a'ā flow dated between 200 and 750 years ago. Two of the excavated pits are located along the eastern edge of the k4 'a'ā flow in the older Klo pāhoehoe flow that is estimated to have occurred between 5,000 and 10,000 years ago. Moreover, the proposed linking trail and LZs are located at approximately 8,920 ft (2,719 m) in elevation. The archaeological sites recorded are located between 7,480 and 7,680 ft (2,280 and 2,340 m) in elevation.

The potential archaeological sites identified include two pāhoehoe excavated pits (T-022613-01 and T-022613-02) and one cairn (T-022613-03). All of the archaeological sites are located in the northern portion of the Pioneer Trail. Sites T-022613-01 and T-022613-02 are consistent with pāhoehoe excavated pits that archaeologists have identified as associated with hunting Hawaiian petrel in the saddle region. The excavated pits may have provided a habitat favorable to the Hawaiian petrels, which typically nest in burrows and/or crevices that are deep enough for them to retreat fully, support a nest, and have an opening that is sufficiently small to provide protection (Yamauchi 2013) (see Appendix B). The sediment in the interior of the excavated pits is a result of secondary deposition, and no further information can be gleaned. Therefore, Sites T-022613-01 and T-022613-02 are not recommended as eligible for the NRHP.

Site T-022613-03 consisted of a single cairn with no associated archaeological or historic artifacts and deposits, thereby rendering its temporal designation as indeterminate. All pertinent information about the cairn has been documented, and numerous examples of cairns are present throughout PTA. Therefore, Site T-022613-03 is not recommended as eligible for the NRHP.

Additionally, nine military sites represented by 36 communication line poles are located in the northern portion of the access and alternative trail and are considered military features. The remote location and high elevation suggest military training occurred in the area rather than ranching or other civilian activities. No historic sites are in the general vicinity to suggest multiple communication lines would have been utilized by ranching or civilian activities. The quick construction and relatively short distance suggest localized use, which is more suggestive of military training than other activities.

Additionally, 25 nonarchaeological lava tube caves were identified and are limited to the survey area between the linking trail and LZs 3 and 4 and on LZ 3. The lava tube caves were all located on the k3 pāhoehoe flow.

No archeological sites, military sites, or lava tube caves were located in LZs 1, 2, or 4.

Figure 3-20 shows the archeological site, military sites, and lava tube caves identified during the 2013 survey in relation to the four LZ locations.

3.13 Human Health and Safety

The affected environment for human health and safety would be the extent to which human health and safety of construction workers, pilots, and the public are affected by the implementation of the Action Alternatives.

3.13.1 Region of Influence

The ROI for human health and safety was determined by the possible hazards, as defined by applicable standards, associated with the Action Alternatives. Possible hazards identified and discussed in this subsection include hazardous materials, occupational hazards, and wildfires.

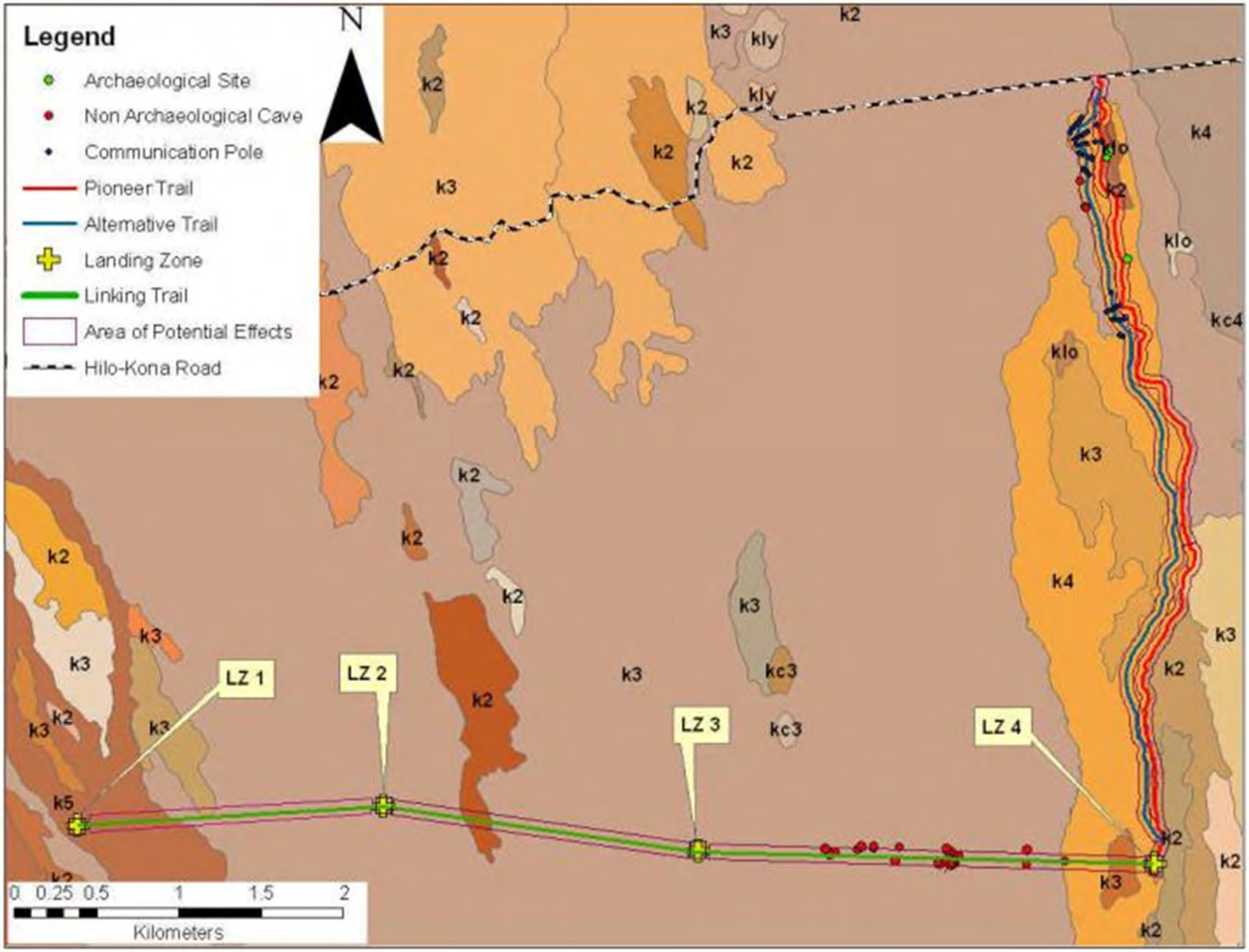

Figure 3-20. Map depicting the relationship between proposed LZs and features identified during the 2013 archaeological survey.

3.13.2 Hazardous Materials Standards

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 103 § 9601 et seq.) defines as hazardous 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. CERCLA specifically excludes petroleum from its statutory provisions. In particular, the law does not address releases of petroleum, including crude oil or any fraction thereof that is not otherwise specifically listed or designated as a hazardous substance, as well as natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel mixtures of natural gas and similar synthetic gas. The exclusion also extends to fuel oil, kerosene, and other petroleum-based fuels. While construction equipment and helicopters use petroleum-based fuels, these fuels would only be released under accident scenarios and not subject to CERCLA authorities. Spills and releases are managed under Army, federal, and state regulations, including Army Regulation 200-1 (U.S. Army 2007d), Department of the Army Pamphlet 200-1 (U.S. Army 2002), and PTA standard operating procedures (SOPs) to prevent impacts on human health or the environment from inadvertent releases.

Army Regulation 200–1, "Environmental Quality, Environmental Protection and Enhancement," (U.S Army 2007d) implements federal, state, and local environmental laws and DoD policies for preserving, protecting, conserving, and restoring the quality of the environment. Department of the Army Pamphlet 200-1, "Environmental Protection and Enhancement," (U.S. Army 2002) 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. Regulation 200-4, *Installation Hazardous Waste Management Plan (IHWMP)* (U.S. Army 2010d), and PTA external SOPs (U.S. Army 2008) govern hazardous waste management activities at PTA. The U.S. Department of Transportation defines a hazardous material as a substance or material that the Secretary of Transportation has designated as capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and that has been designated as hazardous under Section 5103 of the Federal Hazardous Materials Transportation Law (49 USC 51 § 5101 et seq.). The term "hazardous material" includes hazardous substances, hazardous wastes, marine pollutants, elevated-temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions in 49 USC 51 § 5101 et seq.

3.13.2.1 Hazardous Materials. Hazardous substances commonly associated with operation and maintenance of construction vehicles during construction activities are fuels and oils. Hazardous substances used during Proposed Action operations would be helicopter fuels and oils. Fueling and maintenance activities occur at designated facilities and areas within PTA. Additionally, no activities for generating or managing hazardous waste have been identified that would coincide with the Proposed Action or alternatives. PTA personnel follow Army, federal, and state regulations to prevent impacts on human health and the environment from use of fuels and oils.

3.13.2.2 Depleted Uranium. Hazards associated with depleted uranium (DU) at PTA were evaluated in the *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawai'i* (U.S. Army 2013a) and *Final Pohakuloa Training Area Firing Range Baseline Human Health Risk Assessment for Residual Depleted Uranium* (Cabrera Services 2010). 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. 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 manufacture of ammunitions used to pierce armor plating.

Between 1960 and 1968, the military used the M101 spotting round in training. The M101 was a small (about 8 in. [20 cm] in length and 1 in. [2.5 cm] in diameter) low-speed projectile weighing about 1 lb (0.45 kg) and containing about 6.7 oz. (200 g) 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' (O‘ahu) impact area. After confirming the presence of DU, the Army disclosed that information to the public and continues to review and characterize DU on Hawai‘i. The Army, based on public concerns and the reactive properties of DU, determined that the ROI for DU includes PTA and the areas immediately surrounding the installation.

Like any radioactive material, there is a risk of developing cancer from exposure to radiation emitted by natural uranium and DU. The annual dose limit set by the Nuclear Regulatory Commission for a member of the public is 1 millisievert (or 100 mrem), while the corresponding limit for a radiation worker is 50 millisievert (5,000 mrem). The additional risk of fatal cancer associated with a dose of 1 millisievert (100 mrem) is assumed to be about 1 in 20,000. This small increase in lifetime risk should be considered in light of the 1 in 5 risk 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.

An exposure pathway is the channel a chemical may take to reach potential receptors (humans in this case). Primary exposure pathways where DU may enter the human body are through inhalation of air and ingestion of food and water. The size of uranium aerosols and the solubility of the compounds in the lungs and intestinal tract influence the transport of uranium inside the body. Coarse (i.e., inhalable) particles are caught in the upper part of the respiratory system (nose, sinuses, and upper part of the lungs), where they are exhaled or transferred to the throat and then swallowed. Fine particles (i.e., 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 (U.S. Army 2013a)

The Army published the baseline risk assessment (BRA) (Cabrera Services 2010) based on the results of prior studies and what is known from the EPA on exposure and potential health impacts from uranium radionuclides. The BRA identified five reasonable maximum exposure receptor scenarios for DU: 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. Exposure pathways under the receptor scenarios included exposure through direct contact via ingestion or through contact with the skin, external gamma exposure, and inhalation.

The study conceded limitations to accurately calculating risk based on the unknown quantity of DU at the range area of PTA. For use in the BRA, an approximation of DU was developed based on known parameters such as DU mass and an understanding of uranium activity. The BRA concluded that no adverse human health impacts were likely to occur as a result of exposure to the uranium present in the soils at the installation (Cabrera Services 2010).

3.13.3 Occupational Standards

Army Regulation 385-10, "The Army Safety Program," (U.S. Army 2011b) and Department of the Army Pamphlet 385-10, "Army Safety Program," (U.S. Army 2010e) establishes the safety standards designed to protect against serious injury, loss of life, and damage to property. Installations develop processes to support all functions required to plan, develop, coordinate, evaluate, and implement Army safety and occupational health programs in accordance with federal and state statutes; DoD Instruction 6055.1, "DoD Safety and Occupational Health (SOH) Program" (DoD 1998); Army Regulation 385-10; and Department of the Army Pamphlet 385-10. EM 385-1-1, *Safety and Health Requirements Manual*, (U.S. Army Corp of Engineers 2008) contains the Army construction safety standards.

3.13.3.1 Construction Activities. The USAG-HI Directorate of Installation Safety (DIS) advises and assists the commander in sustaining the installation safety program, including construction safety. The DIS monitors installation and unit compliance with occupational safety and health policy; conducts safety surveys/inspections to ensure compliance with all laws, regulations, and policies; and educates and trains soldiers and civilian workers in risk management.

Health and safety hazards associated with the trails during construction are based on human activities proposed along the trails and LZs. The trails would be used only during construction of the LZs, and human activities are limited to travel within construction vehicles along the trails. Construction and environmental hazards at the LZs and along the trails would include:

- Slips, trips, and falls
- Fuel spills
- Vehicle accidents
- Risk of starting a wildfire
- High elevation
- High wind
- Extreme temperatures.

3.13.3.2 Operational Activities. While the LZs would differ in size and elevation to enable various helicopters to conduct a variety of flight and landing maneuvers, there is limited distinction between and among LZs from a human-health and safety-hazards perspective. A distinction among training capabilities is a pinnacle feature that would be approximately 35 × 20 ft (11 × 6 m) and 15 ft (4.6 m) tall proposed for construction on one of the LZs. This feature would be large enough for one helicopter at a time to practice pinnacle maneuvers. Likewise, there is limited distinction among the trails proposed under all Action Alternatives.

Existing hazards that could threaten human health and safety within the proposed LZs range from limited to nonexistent and are based on human presence within an LZ. In other words, there are no human health and safety hazards unless a human is present at the LZ. Because the proposed LZs are located within the perimeter of PTA, troops would be allowed to conduct actions such as loading/unloading activities, staging activities, security operations, maintenance activities, and pre-combat checks. No incidents involving human health and safety occurred during previous use of LZs at PTA. The primary human health and safety concerns include LZ safety, hazardous material, and wildfire (discussed below).

The Army has procedures in place to investigate and plan for possible hazards. As part of flight operations, a risk assessment is completed by a commanding officer and addresses general and specific hazards for each flight mission. Pilots are briefed on the risk assessment, hazards, mitigative actions, and emergency procedures during preflight briefings prior to the start of each training mission

(U.S. Army 2011a). Health and safety hazards associated with the proposed LZs are based on human activities proposed at each location. These operational and environmental hazards include the following:

- Hard landings or accidents
- Fuel spills
- Risk of starting a wildfire
- High elevation
- Risk of wildfire
- High wind
- Extreme temperature
- Night/low visibility.

3.13.3.3 Public Hazards. Because the Action Alternatives (both the construction and operational components) largely occur within the PTA boundary, hazards to the public are limited. For a potential hazard to exist, the public would need to be present in the area during construction vehicle. Hazards during travel would be those associated with vehicles, vehicle movement, and driver behavior. Hazards would range from minor property damage, such as possible windshield damage from a rock flung by a tire, to a possible accident if a driver were to illegally or inappropriately pass the construction vehicles while they travel.

3.13.3.4 Hazard Risk Assessment and Accident Reporting Requirements. The USAG-HI DIS conducts accident investigations under Army Pamphlet 385-40, “Army Accident, Investigations and Reporting” (U.S. Army 2010f) and PTA SOPs (U.S. Army 2008). Accident reporting requirements are applied during all tactical/combat operations and training. The lessons learned from training mishaps are vital for development of countermeasures. A written risk assessment is completed for all tasks and activities prior to unit deployment to PTA. The DIS performs, categorizes, and approves risk assessments using the risk-management process. Written risk assessments would be maintained for the duration of any of the Action Alternatives plus 30 days.

Reporting requirements for occupational accidents are covered under occupational standards previously discussed. Accidents occurring along public roadways are investigated and reported through standard procedures of the Hawai‘i County police. PTA military police may also investigate and report accidents through their standard procedures for accidents involving military personnel immediately outside the PTA boundary.

3.13.4 Wildfires

Fires in the area of PTA have occurred as a result of volcanic activity, lightning, military live-fire exercises and target practice, human error such as catalytic converters (i.e., vehicle exhaust systems), and discarded cigarettes (USAEC and COE 2009). Tracer ammunition (which is not used during training conducted on LZs) is by far the largest cause of fires within PTA. Since July 1990, more than 8,000 acres (3,237 hectares) at PTA have been recorded as burned. Of these, more than 7,700 acres (3,116 hectares), or 91% of all acres burned, were from fires caused by lightning or humans, and the largest of these fires started off Army lands and later burned onto PTA (USACE and COE 2009).

PTA has a mosaic of habitats that is relatively dry throughout the year. Additionally, the amount of precipitation received during the winter is not sufficient to change the probability of fire by any significant amount. Also, based on the fire history of PTA, the data show that the western and the northern sections of PTA potentially face the greatest threat of wildfire (USAEC and COE 2009). Therefore, the main cause of historic monthly variation in the data is probably the frequency and intensity of use by the military and not due to environmental or climatic conditions.

3.13.4.1 Wildfire Management and Prevention. Wildfire management on all Hawai‘i Army-administered lands, including PTA, is conducted in accordance with the *Integrated Wildland Fire Management Plan, Pōhakuloa and O‘ahu Training Areas* (IWFMP) (U.S. Army 2003); Army Regulation 420-90, "Facilities Engineering Fire and Emergency Services" (U.S. Army 2006); DoD Instruction 6055.06, "DoD Fire and Emergency Services (F&ES) Program" (DoD 2006); biological opinions, and various memoranda of agreement.

The IWFMP (U.S. Army 2003) is the primary guidance document with respect to environmental conditions and fire effects and was developed to help meet the Army's land stewardship responsibilities and comply with applicable federal and state environmental statutes. The plan lays out specific guidance, procedures, and protocols in the prevention and suppression of wildfires on training lands administered and leased by the Army in Hawai‘i.

The IWFMP discusses fire-management areas and describes baseline site characteristics, wildland fire fuel types, previous fires, biological and cultural resources protection, the firebreak system, firefighting resource descriptions, and requirements for post-fire actions such as investigations and reporting. The appendices to the IWFMP address SOPs.

According to the IWFMP, in the recent past, the entire Hawai‘i ecosystem has experienced an increase in wildfire frequency. Causes for the increase in fire frequency include the spread and intensification of alien grasses. In 1991, the Army began to reduce the frequency of fires on Army land with vegetation-management and fire-prevention programs. The Army uses vegetation-management techniques such as conducting prescribed burns, mowing, and applying herbicides. Additionally, during operations such as a typical training exercise, unit leaders receive briefings from Range Division staff on the locations of fire hazards and fire-prevention measures and procedures. Unit leaders brief every soldier in the unit on the importance of preventing wildland fires. In the event of a fire at PTA, affected activities (e.g., training) are stopped immediately, and appropriate actions are undertaken to control/extinguish the fire (USAEC and COE 2009).

The PTA wildfire SOP (Moller 2003) provides specific responsibilities of the Army Federal Fire Department, Range Control Safety staff, and military training units conducting live-fire exercises at PTA for the prevention and suppression of wildfires. The SOP's 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. In addition to addressing the environmental setting in the SOP, site-specific guidance is provided for fire prevention (including drought management), fire-suppression actions, and post-fire actions.

3.13.4.2 Wildfire Analysis at PTA. Table 3-10 presents information from the IWFMP and summarizes the wildfire risk in areas associated with the Action Alternatives. The LZs and trails lie primarily in Unit E, which means construction vehicles would briefly pass through Units C and D. Within Unit D, there are active live-fire training ranges that are oriented toward the impact area. Unit C includes the Cantonment Area, where there are no training activities. The IWFMP (U.S. Army 2003) does not apply to the area outside of PTA's southern border; however, the vegetation and conditions in this area are very similar to that found in Unit E. Table 3-10 shows that Unit E has the lowest risk of wildfires. The ignition potential for Unit E is classified as moderate with occasional firing of fire-prone weapons and little human activity. The hazard is classified as low, with sparsely vegetated and barren lands, and the value also is low, with no known listed species (U.S. Army 2003). Unit D, which parallels Redleg Trail where construction vehicles travel through to the proposed action site, is of low wildfire risk. Unit C, in the Cantonment Area, is an area with a high risk of wildfire but few ignition sources that would start a wildfire.

Wildfires within the surrounding area have predominantly occurred near the western portion of PTA. The most recent fire burned 3,500 acres (1,416 hectares) along PTA's western border. There have been four fires in the past 15 years on PTA, and there have been six fires on the KMA parcel in the past three years (Moller [2011] as cited in U.S. Army [2013a]).

Table 3-10. Wildfire analysis of areas associated with the Proposed Action and alternatives.[a]

Wildfire Unit	Wildfire Hazard Rating	Potential Fuels	Ignition Rating	Potential Ignition Sources	Value Rating	Values at Risk
Unit C Kipuka Alala	High	Heavy shrub fuels with fine fuels in the understory, few existing firebreaks	Low	No military training, little human activity	High	Presence of listed plant species
Unit D Redleg Trail	Low	Mostly barren, isolated vegetated areas, fires easily contained	High	Heavy military activity	Low	Minimal presence of listed plant species
Unit E Mauna Loa	Low	Sparsely vegetated and barren lands	Moderate	Occasional firing of fire-prone weapons, little human activity	Low	No known listed species
a. Source: U.S. Army 2003.						

3.13.4.3 Wildfire and Emergency Response. The Army is required to follow established SOPs for wildfire situations (U.S. Army 2003). The PTA fire department is a first responder for wildfire response for the area within the PTA boundary. The Hawai‘i County Fire Department, National Park Service, State Civil Defense, National Guard, and DOFW are available for fire suppression if a fire occurs in the surrounding area.

As part of its stated objectives, the IWFMP provides the necessary firefighting capabilities for firefighter and public safety (U.S. Army 2003). The IWFMP incorporates public health and environmental quality considerations into its fire-management planning and execution and, where practical, provides protection for natural and cultural resources. By following the guidelines set forth in the IWFMP and associated SOPs, the Army can reduce wildfires and provide for the protection of public services and utilities. In the event of a fire, wildland fire management on Army-controlled lands is conducted in accordance with the NHPA and the ESA.

3.13.4.3.1 Wildfire Response—Fire-response services are provided by Army staff based at PTA. There is one fire station located at BAAF, operated by 29 firefighters, who have access to three fire trucks, one military helicopter, and a backup helicopter (Moller [2011] as cited in U.S. Army [2013a]). Available firefighting equipment includes two brush trucks (wildland rigs), a tanker, a crash rig, and an ambulance. PTA has one fire department, which consists of 29 firefighters (Moller [2011] as cited in U.S. Army [2013a]); three fire trucks; one military helicopter; one UH-60, CH-46/7, or CH-53; one backup helicopter; at least one Humvee equipped to fight fire; and a radio dispatcher. The PTA fire department also has, upon request, a platoon unit (minimum of 20 members) to assist in fighting wildfires per the PTA wildfire SOP (Moller 2003). PTA currently maintains three Bambi fire buckets: two 660-gal (2,498-L) and one 2,000-gal (7,571-L) for emergency backup use by military UH-60, CH-53, or CH-47 helicopters assigned to conduct fire-bucket operations. A military helicopter with a certified and trained aircrew capable of performing fire-bucket operations are onsite at PTA during live-fire training operations. A UH-60, CH-46/7, or CH-53 are onsite 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 of notification.

Other firefighting resources include three leased 5,000-gal (18,927-L) water tankers, high-mobility multipurpose wheeled vehicles (i.e., Humvees), and helicopters. The water tankers are parked at designated spots to shuttle water to refill dip tanks or provide a water source for ground firefighting crews. In addition, two Humvees or a brush engine equipped with a 300-gal (1,135-L) slip-on pump unit (Class A foam capable) and one water tender (2,000-gal [7,571 L] capacity) or equivalent are assigned and available for initial attack response at PTA.

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.

3.13.4.3.2 Police—Army staff members provide all police services on PTA. Units that come to PTA for training may bring military police 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 per day, 7 days per week. Saddle Road, a public highway, is patrolled by Hawaiʻi County police, but PTA military police are available for support when necessary. Lands leased by the Army are not patrolled on a regular basis, but military police respond to calls in coordination with county police. PTA military police coordinate extensively with county police on a regular basis (USAEC and COE 2009).

3.13.4.3.3 Emergency Medical Services—Emergency medical services are provided by Army staff members based at PTA. Serious medical emergencies rely on medical helicopter transport to Hilo, which is about 10 minutes away by air. PTA emergency staff members respond to accidents on the roughly 25 mi (40.2 km) of Saddle Road that pass through PTA, and, at the border of the installation, the injured are transferred to the care of the City of Hilo and County of Hawaiʻi (USAEC and COE 2009).

3.14 Socioeconomics and Environmental Justice

The socioeconomic indicators used to describe the affected environment of the ROI for socioeconomic resources include population, economy, employment, and income. The population data include the number of residents in the area and recent changes in population growth. Data on employment, labor force, unemployment trends, income, and industrial earnings describe the economic health of a region. Income information is provided as an annual total by county and per capita.

3.14.1 Region of Influence

The ROI for socioeconomic impacts includes the County of Hawaiʻi, which is where the project is proposed to occur. 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 Action Alternatives.

3.14.2 Socioeconomics

The County of Hawai‘i is composed of nine administrative districts based on traditional land divisions called Moku of ancient Hawai‘i. The four LZs are located within the District of Hāmākua. The total population of the county is 185,079 as reported in the 2010 census (U.S. Census Bureau 2013). During the period of 2000–2010, Hawai‘i County experienced 24% growth in population compared to the state growth rate of 12%. The majority of people live near the coast away from the center of the island where PTA is located. The population is projected to increase by 1.8% annually over the next 10 years (County of Hawai‘i 2013).

The state government is the single largest employer in Hawai‘i County, accounting for 7,962 (10%) jobs in 2011 followed by Hawai‘i County itself with 2,630 (3%) and the federal government with 1,429 (2%) jobs (County of Hawai‘i 2013). The next largest employer is the Hilton Waikoloa Village with 935 jobs, highlighting the importance of tourism to the county. Tourism accounts directly for approximately 12,772 (16%) jobs. Most of these jobs are centered primarily on the leeward (Kona) or western coast of the island in the North Kona and South Kohala districts. The County of Hawai‘i had an unemployment rate of 6.6% in April 2013, lagging the overall state rate of 4.9% (Hawai‘i Department of Labor 2013).

Within the Hāmākua District, the main sources of income and employment are cattle, macadamia nuts, and various other crops. There are numerous cattle ranches and several different varieties of crops in the district. Of these, macadamia nuts are expected to continue to play an important role in the future of agricultural development. Other crops grown in this area are taro, watermelons, tomatoes, ginger, kava, coffee, and vegetables. Manufacturing within the district is limited to the processing of macadamia nuts and other agricultural products (County of Hawai‘i 2010).

The per-capita income for the period 2007 through 2011 for Hawai‘i County was $25,573. This is an increase of 26.5% from 2000 (U.S. Census Bureau 2000).

Federal government expenditures in the County of Hawai‘i totaled $12.5 billion in 2009. Defense expenditures in the county accounted for 4% ($108.6 million) of federal spending in 2009. This is an increase of 290% since 2000 (Hawai‘i Department of Business, Economic Development, and Tourism 2011). The economic impacts of defense spending have a ripple effect throughout the Hawai‘i 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.

Military presence within the county is represented by the U.S. Army, which operates a field training facility at PTA. With an area of 132,000 acres (52,800 hectares), PTA is the largest DoD installation anywhere in the Pacific.

NOAA operates MLO, a premier atmospheric research facility that has been continuously monitoring and collecting data related to atmospheric change since the 1950s on Mauna Loa to the south of the PTA boundary.

3.14.3 Environmental Justice

On February 11, 1994, President Clinton issued "Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority and Low-Income Populations" (59 FR 32). It was designed to focus the attention of federal agencies on the human health and environmental conditions in minority and low-income communities. Environmental justice is analyzed to identify and address disproportionately high and adverse human health or environmental effects of federal agency programs, policies, and activities on minority and low-income populations and to identify alternatives that might mitigate these impacts. Data from the U.S. Department of Commerce 2010 Census of Population and Housing were used for this environmental justice analysis (U.S. Census Bureau 2010).

Minority populations included in the census are identified as Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and other Pacific Islander; Hispanic; of two or more races; and other. These groups accounted for 68.8% of the total population of Hawai‘i County. The majority of residents (33%) in Hawai‘i County are of Native Hawaiian, Asian, and other Pacific Islander descent.

Poverty status, used to define low-income status, is reported as the number of persons with income below the poverty level. The Census Bureau bases the poverty status of families and individuals on 48 threshold variables, including income, family size, number of family members under the age of 18 and over 65 years of age, and amount of money spent on food.

The Census Bureau defines the poverty level as an annual income of $11,945 or less for an individual, and an annual income of $23,681 or less for a family of four for 2012. The U.S. Census Bureau estimates indicate that nearly 15.8% of the population of Hawai‘i County was below the poverty level of families for the period of 2007 to 2011 (U.S. Census Bureau 2013).

3.14.4 Protection of Children

"Executive Order 13045 – Protection of Children from Environmental Health Risks and Safety Risks" (62 FR 78) requires federal agencies, to the extent permitted by law and mission, to identify and assess environmental health and safety risks that might disproportionately affect children and ensure that the policies, programs, activities, and standards of federal agencies address disproportionate risks to children that result from environmental health or safety risks. Environmental health and safety risks primarily entail risks that are attributable to products or substances that the child is likely to come into contact with or to ingest. In 2010, 22.8% of the county's population (U.S. Census Bureau 2013) was made up of children (under 18 years old), which is a 3.3% decrease from 2000 (U.S. Census Bureau 2000).

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4. ENVIRONMENTAL CONSEQUENCES

This section presents a summary of the potential environmental impacts from the Action Alternatives and the No Action Alternative. Each of the main subsections includes a discussion of methodology and assumptions used for impact analysis and a discussion of factors used to determine the significance level of direct and/or indirect impacts. Direct impacts are caused by an action and occur roughly at the same time and place as the action. Indirect impacts occur later or are farther removed in distance from the action itself. The terms "impact" and "effect" are used synonymously throughout this section.

Once a potential impact is identified, to determine whether or not it is significant, CEQ regulations require the context and intensity of the impact to be considered. Context normally refers to the setting (i.e., the affected region, the affected interests, and the locality), and intensity is the severity of the impact (i.e., beneficial/adverse, degree of impact). To maintain consistent evaluation of impacts and significance, thresholds of significance were used for each resource area. Some thresholds were determined based on legal or regulatory limits or requirements, while other thresholds were determined through either consultation with resource or regulatory specialists or through discretionary judgment on the part of the Army in accomplishing its primary mission of military readiness, while also fulfilling the Army's conservation stewardship responsibilities. Quantitative and qualitative analyses were used, if appropriate, in determining whether, and the extent to which, a significance threshold was exceeded. Based on the analyses, Army subject matter experts then determined whether there was no impact, significant impacts, significant-but-can-be-mitigated-to-less-than-significant impacts, or less-than-significant impacts.

Mitigation is the reduction or elimination of the severity of an impact. The intention of mitigation is to reduce the effects of an action on the environment. CEQ defines mitigation (40 CFR V §§ 1500 et seq.) as:

- Avoiding an impact altogether by not taking a certain action or parts of an action
- Minimizing impacts by limiting the degree or magnitude of an action and its implementation
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
- Reducing or eliminating an impact over time by preservation and maintenance operations during the life of the action
- Compensating for an impact by replacing or providing substitute resources or environments.

Only mitigation measures that are technically feasible and do not interfere with the Proposed Action or alternatives meeting the purpose and need, are proposed.

Considering impacts and mitigation together, the following significance thresholds were used:

- No Impact (NI): The term used to indicate that no discernible impact could be determined.
- Less than Significant (<SI): The term used to indicate a readily apparent, but not significant, impact. The range of impacts in this category would be from minor to moderate in context and intensity. If mitigation were desired to further lessen impacts, mitigating impacts under this category may involve following SOPs, employing best management practices (BMPs), or applying precautionary measures.

- Significant Impact but Mitigable to Less than Significant (S/MI): The term used to indicate the context and intensity of the impact, as defined in CEQ regulations (40 CFR V §§ 1500 et seq.). Predicted impacts of implementing the action would be significant without the implementation of mitigation measures. To lessen (adverse) impacts below the significant threshold, it would be necessary to apply mitigation measures such as SOPs, BMPs, specifically designed mitigation measures, precautionary measures, or a combination of several mitigation measure types.

- Significant (S): The term used to indicate either an adverse or beneficial impact, reflecting the impact's severity in terms of the context and intensity defined in CEQ regulations (40 CFR §1508.27).

Summary impact tables are presented in each of the major sections that follow to provide an overview of the impacts by alternative. These tables show the highest level of impact for each resource by issue area. A narrative describing these conclusions is presented, and if mitigation measures are necessary for significant impacts and less-than-significant impacts, they are detailed. A summary table of overall impacts for all resource areas is presented in Table 6-1 of Section 6, Conclusions.

It should be noted that all four of the proposed LZs would be located in the same area within the southern boundary of PTA under all Action Alternatives; therefore, many potential impacts are expected to be similar among Action Alternatives. Additionally, the Proposed Action and Alternative 1, Alternate Trail Location, both have proposed access trails in close proximity to each other such that many impacts may also be similar. Each resource section discusses if, and how, alternatives were combined for analysis if there was a rationale to do so.

Unless otherwise indicated, data used in developing the impact analysis for the Action Alternatives relied on, and reference, quantitative/qualitative analyses conducted for this assessment, existing environmental documents, field surveys, and other studies developed as part of past or concurrent projects associated with the Proposed Action, PTA, and the lands and resources in the affected environment area.

4.1 Impacts from Implementing the No Action Alternative

The No Action Alternative would be to not construct four additional LZs. The impact analysis of the No Action Alternative reviewed the consequences of not constructing or conducting training flights to these LZs. It was found that the No Action Alternative would result in no changes in the existing environment. Findings from all resource areas include the following:

- Impacts to **land use** are not anticipated under the No Action Alternative. The alternative does not curtail the range of beneficial uses of the environment, result in secondary land-use impacts, or conflict with existing or planned land uses. Additionally, the alternative is not incompatible, and does not conflict with, objectives, policies, or guidance of state and local land use plans such as the *County of Hawai'i General Plan* (County of Hawai'i 2005), the CZMA, or any special or administrative land-use designations.

- Impacts to **recreation** are not anticipated under the No Action Alternative. The alternative does not curtail the range of recreational uses of the environment; disrupt recreational use of land-based resources or conservation areas surrounding PTA, interfere with the public's right of access, prevent long-term recreational use or use during a peak season, impact any scenic vistas associated with recreation areas, or impede or discourage existing recreational activities.

- Impacts to **airspace** are not anticipated under the No Action Alternative. There would be no reduction to the amount of navigable airspace, no change or modification of the classification of airspace, no change of existing or future military flight use of the airspace, and no creation of obstructions that would impact air navigation.

- Impacts to **visual and aesthetic resources** are not anticipated under the No Action Alternative. There would be no introduction of physical features and no site alternations conducted under the alternative. The visual resources policies of the *County of Hawai‘i General Plan* (County of Hawai‘i 2005) would not be affected.

- Impacts to **air quality** are not anticipated under the No Action Alternative. There would be no increase in emissions or subsequent changes in air quality that would result by not conducting construction or operation activities. Additionally, no GHGs would be emitted through implementation of this alternative.

- Impacts to **land-based traffic** are not anticipated under the No Action Alternative. The alternative does not increase traffic on public roads such that it would disrupt or alter local circulation patterns, nor would the alternative result in creating any safety hazards on roadways.

- Impacts to **noise** are not anticipated under the No Action Alternative. There would be no increase in annual average noise levels (A-weighted day-night average sound level [ADNL]) above the allowable noise thresholds for land use compatibility as outlined in Army Regulation 200-1 (U.S. Army 2007d). Additionally, no maximum noise level violation of the Hawai‘i Community Noise Control rule (State of Hawai‘i 1996a) or noise annoyances would occur.

- Impacts to **water resources** are not anticipated under the No Action Alternative. There would be no change in surface water status over current conditions, no degradation of surface or groundwater quality, and no availability or accessibility limits to the beneficial use of surface or ground water. Surface water movement patterns would not be altered, and noncompliances with water quality standards would not occur.

- Impacts to **geology and soil resources** are not anticipated under the No Action Alternative. There would be no soil loss through either erosion or terrain-altering drainage patterns, no increase in exposure of people or structures to geologic hazards, and no adverse altering of existing geologic conditions or processes.

- Impacts to **biological resources** are not anticipated under the No Action Alternative. There would be no risk of species habitat loss, injury or death that would result in a “take” directly from the proposed construction or training operations, and no reduction in the population of a sensitive species.

- Impacts to **cultural resources** are not anticipated under the No Action Alternative. There would be no adverse effect on a historic property, as defined under Section 106 of the NHPA (16 USC 1A § 470 et seq.), and no violation of the provisions in the American Indian Religious Freedom Act (42 USC §§ 1996a and 1996b), ARPA (16 USC 1B §§ 470aa et seq.), or Native American Graves Protection and Repatriation Act (25 USC 32 § 3001 et seq.).

- Impacts to **human health and safety** are not anticipated under the No Action Alternative. There would be no effects to construction workers, pilots, or the public (primarily recreationists) from hazardous materials, DU exposure, or wildfires with implementation of the alternative.

- Impacts to **socioeconomics and environmental justice** are not anticipated under the No Action Alternative. There would be no changes in the county’s unemployment rate, total income, business volume, local housing market, or vacancy rates with implementation of the alternative. Additionally, there would be no socioeconomic affects to any particular low-income or minority group or children.

4.2 Land Use

This subsection presents the evaluation of impacts of the Action Alternatives on the land use ROI, as described in Section 3, Affected Environment.

4.2.1 Impact Methodology

All Action Alternatives include construction of LZs and access trails on PTA. All Action Alternatives, except Alternative 2, include construction of linking trails. All Action Alternatives include helicopter training operations. No construction or operations activities occur external to PTA under any of the Action Alternatives.

Impacts on land use were assessed based on the consistency of the Action Alternatives with state and local plans and on compatibility with land uses in and near to the ROI.

4.2.2 Factors Considered for Determining Significance of Impacts

An action would be considered to have a significant impact on land use if it would do any of the following:

- Curtails the range of beneficial uses of the environment
- Involves substantial secondary land-use impacts, such as population changes or effects on public facilities
- Conflicts with existing or planned land uses on or around the site
- Conflicts with CZMA policies
- Conflicts, or is incompatible, with the objectives, policies, or guidance of state and local land use plans, such as the *County of Hawai‘i General Plan* (County of Hawai‘i 2005)
- Conflicts, or is incompatible, with administrative or special designations.

4.2.3 Summary of Impacts

Potential impacts to land use resources from the alternatives are summarized in Table 4-1 and discussed following the table.

None of the Action Alternatives:

- Curtail the range of beneficial uses of the environment. The range of beneficial uses of the environment within the ROI would not change directly or indirectly with the construction of LZs and trails or the use of LZs.
- Involve substantial secondary land use impacts, such as population changes or effects on public facilities. No population changes would directly or indirectly result from construction or operation

activities. No public facilities are located in the ROI that would be impacted by construction or operation activities.

Table 4-1. Summary of potential impacts to land use.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 4 – Construction of Only One LZ	Alternative 5 – Construction of Only Two LZs	Alternative 6 – Construction of Only Three LZs	No Action Alternative
Curtails the range of beneficial uses of the environment	NI	NI	NI	NI	NI	NI
Involves substantial secondary impacts such as population changes or effects on public facilities	NI	NI	NI	NI	NI	NI
Conflicts with existing or planned land uses on or around the site	NI	NI	NI	NI	NI	NI
Conflicts with CZMA policies	NI	NI	NI	NI	NI	NI
Conflicts, or is incompatible, with the objectives, policies, or guidance of state and local land use plans	NI	NI	NI	NI	NI	NI
Conflicts, or is incompatible with, special land use designations (i.e., NNL status for Mauna Kea)	NI	NI	NI	NI	NI	NI

The Action Alternatives would not change land use on PTA. Construction of LZs and trails and use of the LZs are fully compatible with land use within PTA for these five alternatives. Noise impacts resulting from construction equipment and vehicles would result in short-term increases in noise levels during construction of the access and linking trails and LZs. Because of the short-term duration of construction activities paired with the permitting process to allow for a temporary increase in allowable noise levels as discussed in the Noise subsection, the impact from construction-related noise is less than significant. Operational use of the LZs may annoy some recreational users of the forest reserve in the immediate vicinity of the LZs. However, the low number of operations would minimize annoyance potential. These impacts are discussed in the Recreation and Noise subsections.

None of the Action Alternatives conflict with CZMA policies or is incompatible with the objectives, policies, or guidance of other state and local land use plans, such as the *County of Hawai‘i General Plan* (County of Hawai‘i 2005). Because no land is being acquired or rezoned, no land uses are being changed to be incompatible with current land uses.

As discussed in Section 3, general features for which an NNL designation is considered for an area include rarity, diversity, and value for science and education. The specific features for which Mauna Kea was designated as an NNL include:

- Being the highest insular mountain (rising to an elevation of 13,796 ft [4,200 m] above sea level) in the United States
- Having the highest lake (Lake Waiau at 13,030 ft [3,971 m] above sea level) in the country
- Possessing evidence of glaciations above the 11,000-ft (3,353-m) level.

Construction of the LZs and trails and use of the LZs under any of the Action Alternatives would not compromise or disturb the illustrative value or condition of the features for which Mauna Kea was designated NNL status. Thus, implementing any of the Action Alternatives would have no impact on NNL designation. The potential impacts to land use with respect to the significance factors for each alternative are summarized in Table 4-1.

4.3 Recreation

This subsection presents the evaluation of impacts of the Action Alternatives on the recreation ROI, as described in Section 3, Affected Environment.

4.3.1 Impact Methodology

All Action Alternatives include construction of LZs and access trails on PTA. All Action Alternatives, except Alternative 2, include construction of linking trails. All Action Alternatives include helicopter training operations. No construction or operations activities occur external to PTA under any of the Action Alternatives.

Impacts on recreational resources were assessed by determining the types of recreational uses in and around the ROI and then determining the sensitivity of those uses to the project effects such as noise, visual disturbance, and access and recreational restrictions. Recreational activities occur in the areas described in Section 3.3, Recreation. The Mauna Loa Forest Reserve, located next to the southern boundary of PTA, is the recreation area that lies closest to the Action Alternatives. Impacts from the Action Alternatives would be expected to be the greatest in this recreational area. Thus, the recreation impacts analysis evaluated impacts directly to the forest reserve as representative of the larger ROI. The recreation analysis was done in conjunction with the findings of the noise and visual analyses.

4.3.2 Factors Considered for Determining Significance of Impacts

An action would be considered to have a significant impact on recreation if it:

- Curtails the range of recreational uses of the environment
- Substantially affects scenic vistas and view planes

- Disrupts recreational use of land-based resources such as parks or recreational paths or interferes with the public's right of access

- Disrupts recreational use of conservation areas surrounding PTA

- Prevents long-term recreational use or use during a peak season or impedes or discourages existing recreational activities.

4.3.3 Summary of Impacts

Potential impacts to recreation from the alternatives are summarized in Table 4-2 and discussed following the table.

Table 4-2. Summary of potential impacts to recreational use.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 4 – Construction of Only One LZ	Alternative 5 – Construction of Only Two LZs	Alternative 6 – Construction of Only Three LZs	No Action Alternative
Curtails the range of recreational uses of the environment	NI	NI	NI	NI	NI	NI
Substantially affects scenic vistas and view planes	<SI	<SI	<SI	<SI	<SI	NI
Disrupts recreational use of land-based resources, such as parks or recreational paths, or interferes with the public's right of access	NI	NI	NI	NI	NI	NI
Disrupts recreational use of conservation areas surrounding PTA	<SI	<SI	<SI	<SI	<SI	NI
Prevents long-term recreational use or use during a peak season or impedes or discourages existing recreational activities	NI	NI	NI	NI	NI	NI

4.3.3.1 Construction and Operations. As detailed in Subsection 4.8, Noise, LZ construction activities, under all Action Alternatives, would result in a temporary increase in allowable noise levels. Noise generated with construction activities is expected to be short-term and occur during weekdays. Recreationists using the Mauna Loa Forest Reserve to the south of the LZs may notice this short-term increase in noise during the construction phase of all Action Alternatives. The impact from this construction-related noise is considered less than significant (see Subsection 4.8 for complete analysis).

Fully described in Subsection 4.8, Noise, the annoyance assessment indicates helicopter use of the proposed LZs may annoy Mauna Loa Forest Reserve recreational users in the immediate vicinity of the LZs.

Noise from operations activities is not expected to be greater overall than current operations, because the number of overall flights is not increasing. However, because 10% of flights would be using the LZs at the southern end of PTA, noise would be expected to be experienced farther south of PTA than is currently experienced. This expectation was found to be true as a result of the noise analysis, and this finding is shown on Figure 3-13. Dispersed recreational activities, such as hunting, may occur very near PTA's southern boundary in the Mauna Loa Forest Reserve. Hunters near this area may experience and perceive noise as a distraction/disruption under all Action Alternatives. As discussed in Section 4.8, Noise, the extent and magnitude of the distraction would depend on the distance the hunter is from the noise source (i.e., training activities). It should be noted that the existing trail to the southern boundary is approximately 3 mi (4.8 km) of rugged travel over a surface that is inhospitable to most vehicle tires. While hunters can legally, physically, and logistically access this location, other locations on the island afford hunting opportunities that are not as challenging. Hunting that occurs in the area is conducted on weekends, and the majority of operations are conducted on weekdays, which would minimize noise annoyance conflicts. The noise evaluation showed that noise impacts from operations were less than significant (see Subsection 4.8 for complete analysis).

Noise from construction and operations activities is expected to be of short, intermittent duration and was not found to be significant in the recreational area nearest to the Action Alternatives, so none of the Action Alternatives is anticipated to result in obstruction or curtailment of any recreational activities in the ROI. Recreational trails and activities in the ROI would not be closed or modified as a result of noise introduced through implementation of any of the Action Alternatives. Additionally, the public right of access to any recreation areas would not be modified. Thus, impacts to the recreation resource are expected to be less than significant with the implementation of any of the Action Alternatives.

4.3.3.2 Scenic Vistas. As fully discussed in the visual analysis in Section 4.5, Visual and Aesthetic Resources, recreationists at the Mauna Loa Forest Reserve would not be significantly impacted visually under any of the Action Alternatives.

Observers would not notice any change in landscape features resulting from the construction of the proposed LZs because of the relatively small size of the LZs in contrast to the distance and angle at which they are viewed by most observers. The scenic vista would not be obscured by construction of the LZs or the resultant LZs. The LZ areas would look similar to the adjacent areas from most viewer locations.

Operations activities would not significantly impact vistas from any of the observer points throughout the area analyzed, including from within the Mauna Loa Forest Reserve. Helicopters could be visible (barely and in short duration) from most viewing locations, but clouds, haze, trees, etc., would limit the ability to see a helicopter from many distant locations. Training operations would not obscure or change any of the viewing areas. Therefore, the proposed training operations would be a less-than-significant impact for obscuring views or introducing physical features that are out of character.

Recreational impacts from construction and operations activities involving scenic vistas would be less than significant, because any view of such activities would, at most, be short, of intermittent duration, and not result in obstructing scenic vistas.

4.3.3.3 Disruption or Changes in Recreational Use. Operations activities may introduce short-term aesthetic disturbances that may be perceived as a distraction by some recreationists in the very immediate area. On the other hand, because of the proximity of the LZs to the forest reserve, members of the public who have high-clearance, four-wheel drive vehicles that can traverse the existing trail from Mauna Loa Observatory Road to the southern PTA boundary may elect to access the area specifically to watch operations activities. The public can currently access the existing trail and would still be able to access the existing trail with implementation of any the Action Alternatives. The surface of the existing trail (i.e., sharp edged ‘a‘ā lava) is inhospitable for most vehicle tires. Additionally, most members of the public would have to drive a significant distance to watch operations (i.e., round trip: Kona, 158 mi [254 km]; Hilo, 96 mi [154 km]; Waimea, 104 mi [167 km]). Because in general, members of the public would have to make a significant investment in gasoline and mileage (and possibly vehicle tires) to watch operations from the reserve, it is anticipated that few people would do so. Thus, current recreational use of the forest reserve is not expected to change or be disrupted significantly by operations activities at the LZs. Because the public would not be prohibited from viewing helicopter operations from the reserve locale, impacts were determined to be less than significant.

Because impacts to recreational use are less than significant, and intermittent and short-term when any occur, long-term existing recreational uses and/or peak season uses would not be prevented, impeded, or discouraged.

4.3.3.4 Mitigation. As previously presented, construction and operations activities may be perceived as slight noise and visual distractions by people in the nearest recreation area, Mauna Loa Forest Reserve, for any of the Action Alternatives. None of the alternatives was found to significantly impact or result in the cessation of any recreational activities, or access to them, including recreational activities associated with the Mauna Loa Forest Reserve.

Potential impacts to recreation could be further mitigated through public notification of the construction and operations schedule. With mitigation, the potential impacts to recreation, shown in Table 4-2, would be held at levels that are less than significant.

4.4 Airspace

This subsection presents the evaluation of impacts of the Action Alternatives on the airspace ROI, as described in Section 3, Affected Environment.

4.4.1 Impact Methodology

All Action Alternatives include construction of LZs and access trails on PTA. All Action Alternatives, except Alternative 2, include construction of linking trails. All Action Alternatives include helicopter training operations. No construction or operations activities occur external to PTA under any of the Action Alternatives.

Impacts on airspace were assessed by evaluating the potential effects of the construction and operations activities of the Action Alternatives.

4.4.2 Factors Considered for Determining Significance

Significant impacts on airspace were determined based on the extent or degree to which the Proposed Action and alternatives would result in the following:

- Reduce the amount of navigable airspace
- Change or modify the classification of any airspace
- Change existing or future military flight use of the airspace
- Create an obstruction to air navigation.

4.4.3 Summary of Impacts

There would be no impacts to airspace from either construction or operations activities under the Action Alternatives. Impacts on airspace resulting from all of the alternatives are summarized in Table 4-3 and discussed following the table.

Table 4-3. Summary of potential impacts to airspace.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 4 – Construction of Only One LZ	Alternative 5 – Construction of Only Two LZs	Alternative 6 – Construction of Only Three LZs	No Action Alternative
Reduce the amount of navigable airspace	NI	NI	NI	NI	NI	NI
Change or modify the classification of any airspace	NI	NI	NI	NI	NI	NI
Change existing or future military flight use of the airspace	NI	NI	NI	NI	NI	NI
Create an obstruction to air navigation. Curtails the range of beneficial uses of the environment	NI	NI	NI	NI	NI	NI

4.4.3.1 Construction Activities. The Army determined constructing the proposed LZs and trails under all Action Alternatives would have no impacts on current use of airspace within the ROI. No changes to use of airspace or to airspace classifications are proposed or needed. Additionally, none of the Action Alternatives would reduce navigable airspace or create an obstruction to air navigation.

4.4.3.2 Operations Activities. The Army determined that 10% of current flights on PTA would use the proposed LZs. These flights would originate at BAAF or from other training ranges within PTA. There would be an increase of intermittent flight activity occurring at the southern area of PTA to use the LZs. Flights are allowed within this airspace in accordance with current airspace classification. There would be no increase in overall flight frequency at PTA through existence/use of the LZs. Flight distribution patterns on PTA would change slightly in response to a 10% increase in use of the southern end of PTA and the LZs. Thus, operations activities would result in an allowed change in distribution of current flights within the airspace but not of an amount that would result in any flight increases, flight conflicts, or airspace changes. There is no threshold for distribution patterns within the PTA airspace. Army flights would continue to follow standard FAA procedures for flights conducted in and out of controlled airspace. Flights to the proposed LZs would not leave PTA's airspace(s) under any of the alternatives. Thus, the Army determined that conducting flights to the proposed LZs under all alternatives would have no impacts on current use of airspace within the ROI.

4.5 Visual and Aesthetic Resources

This subsection presents the evaluation of impacts of the Action Alternatives on the visual and aesthetic ROI, as described in Section 3, Affected Environment.

4.5.1 Impact Methodology

To determine the potential impacts from the proposed construction of LZs and associated training operations, a visual contrast analysis was conducted. A visual contrast analysis can be summarized as the degree to which a project or activity affects the scenic quality or visual resources depending on the visual contrasts created or imposed by a project on the existing landscape. A visual contrast analysis is typically conducted from specific points or locations where an action would be most revealing. These points (i.e., observer points) are chosen based on existing land use, frequency of visibility, duration of visibility, and anticipated activities of the observer. From these points, the analysis compared the existing characteristic features and contrasts of the landscape to the contrasts imposed on that landscape by implementing the alternatives. The landscape features used on the comparison were the forms, colors, textures, and lines that compose the existing and potentially modified landscape.

All Action Alternatives include construction of LZs and access trails on PTA. All Action Alternatives, except Alternative 2, include construction of linking trails. All Action Alternatives include helicopter training operations. No construction or operations activities occur external to PTA under any of the Action Alternatives.

From a visual and aesthetic analysis standpoint, the Proposed Action and Alternative 1 (Alternate Access Trail Location) are equivalent. Thus, the Proposed Action, which involved the most activity that could be observed, appropriately bounded the analysis.

Criteria for selecting the observer points were as follows:

- Areas with visual sensitivity, which for the Proposed Action would be areas that are designated as sites and vistas of extraordinary beauty as defined by the *County of Hawai‘i General Plan* and are located within the saddle region and on Mauna Loa and Mauna Kea (County of Hawai‘i 2005).

- The potential number of viewers of the project area. The most comprehensive views of the project area should be from major thoroughfares (highways, scenic byways, or popular hiking trails and overlooks).

- The length of time the project area is in view. Frequently used recreation areas would have the best views of existing scenic quality and any changes to that quality.

- Angle of observation. Views that are elevated and present slopes and aspects that show more of the project area are preferred.

Ten observer points were identified based on the criteria listed above. Table 4-4 provides a list of these observer points.

With the observer points, viewsheds were calculated using the Spatial Analyst Observer Points tool in Esri ArcMap 10. A viewshed is an area of land or water that is visible to the human eye from a fixed vantage point. The calculated viewshed represented all the area that the observer can see from that point. The observer is assumed to be approximately 6 ft tall standing at ground level. The viewsheds were mapped, and the maps were analyzed. See Figure 4-1 for an overview of all of the observer points. The viewshed from specific observer points are represented in individual maps shown in Figures 4-2 through 4-11.

Table 4-4. Observer points used to determine the potential impacts from the proposed construction of LZs and associated training operations on visual and aesthetic resources.

Viewpoint	Location	Description	Reasoning	Figure
1	Mauna Kea summit area	Contains the highest point on Mauna Kea, the Natural Ice Age Natural Reserve, observatories, and unique geologic features. Geologic features include Lake Waiau and Puʻu Poliʻahu. The Mauna Kea summit area is recognized as sacred to Native Hawaiians.	It is a culturally sensitive area and popular with recreationists.	Figure 4-2
2	Mauna Loa summit	Contains the highest point on Mauna Loa and is recognized as sacred to Native Hawaiians.	It is an area of visual sensitivity and popular with recreationists and users of Hawaiʻi Volcanoes National Park.	Figure 4-3
3	Mauna Kea Access Road	Road from Saddle Road to the Mauna Kea observatories.	It is a major thoroughfare and the location of the Mauna Kea Visitor Center.	Figure 4-4

Table 4-4. (continued.)

Viewpoint	Location	Description	Reasoning	Figure
4	Mauna Loa Trail	Trail from near Kīlauea crater to the summit of Mauna Loa.	It is used by recreationists and is the main access point from Hawaiʻi Volcanoes National Park and associated cabins.	Figure 4-5
5	MLO	NOAA atmospheric research facility.	It is a major visitor point on the summit of Mauna Loa.	Figure 4-6
6	Saddle Road, State Highway 200	Road that traverses the island from Hilo to its junction with Hawaiʻi Route 190.	It is the major thoroughfare through the saddle region.	Figure 4-7
7	Mauna Loa Observatory Road	Road from Highway 200 to MLO.	It is the main access road to the Mauna Loa summit and is near the Proposed Action.	Figure 4-8
8	Waikiʻi Ranch	3,000-acre ranch consisting of 10-, 20-, and 40-acre residential lots.	It is a residential area with an angle of observation toward the Proposed Action.	Figure 4-9
9	Mauna Kea State Recreation Area	20-acre state park used for picnicking, camping, lodging, and viewing.	It is used for recreationists with an angle of observation toward the Proposed Action.	Figure 4-10
10	Mauna Loa Forest Reserve	Approximately 55,000-acre protected/ recreational area located south of PTA.	It is used for recreationists near the Proposed Action.	Figure 4-11

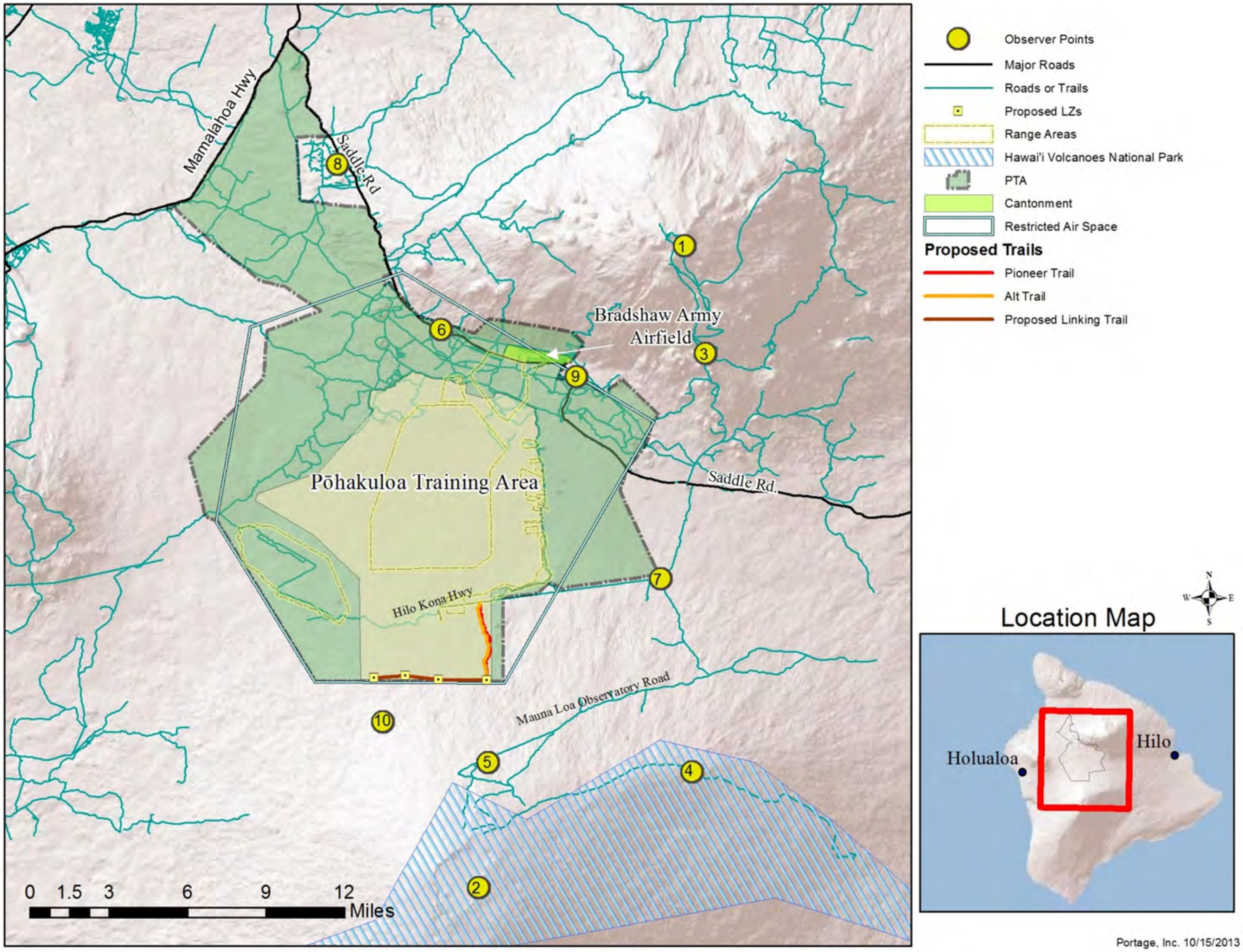

Figure 4-1. Observer points for viewshed analysis.

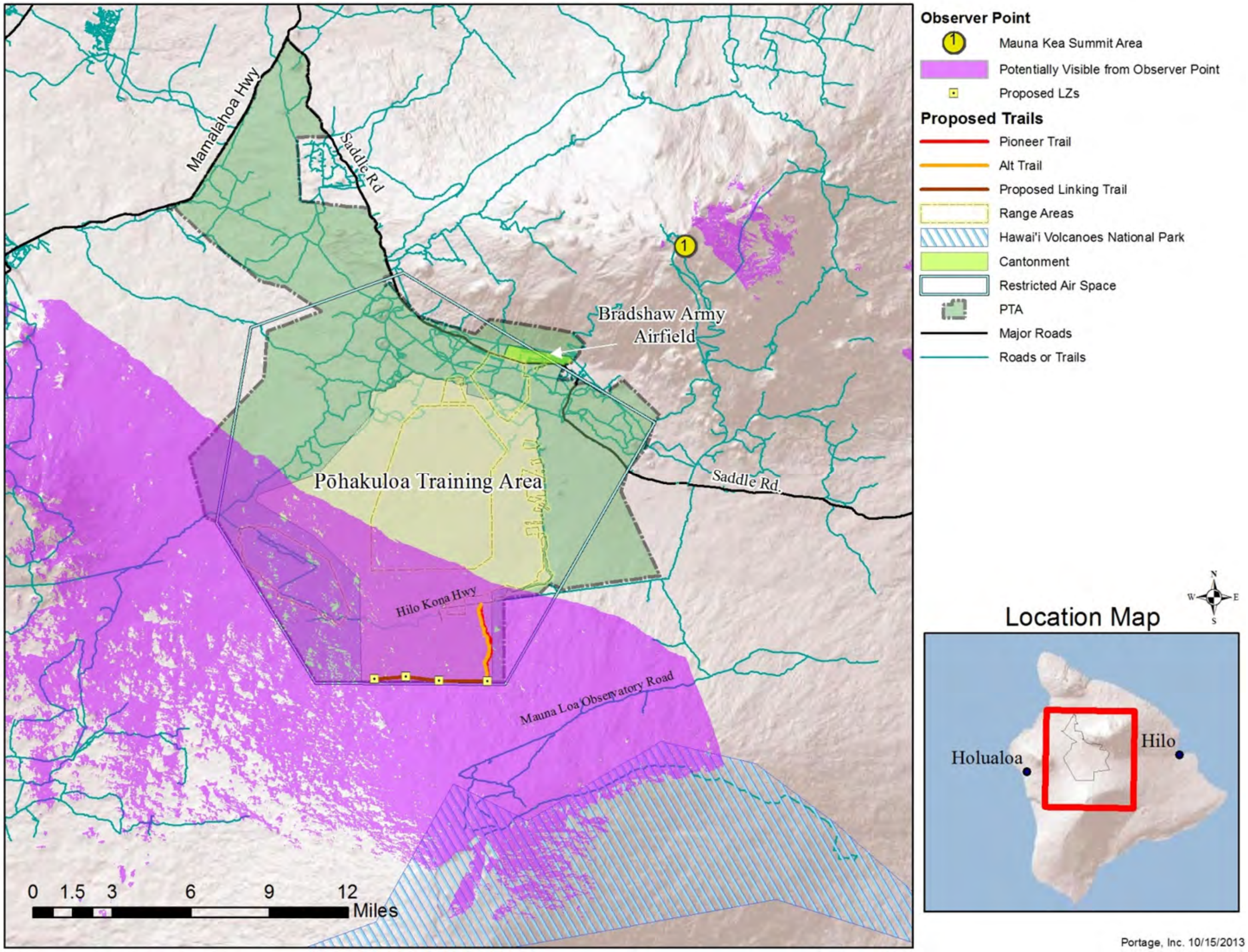

Figure 4-2. Observer Point 1, Mauna Kea summit area.

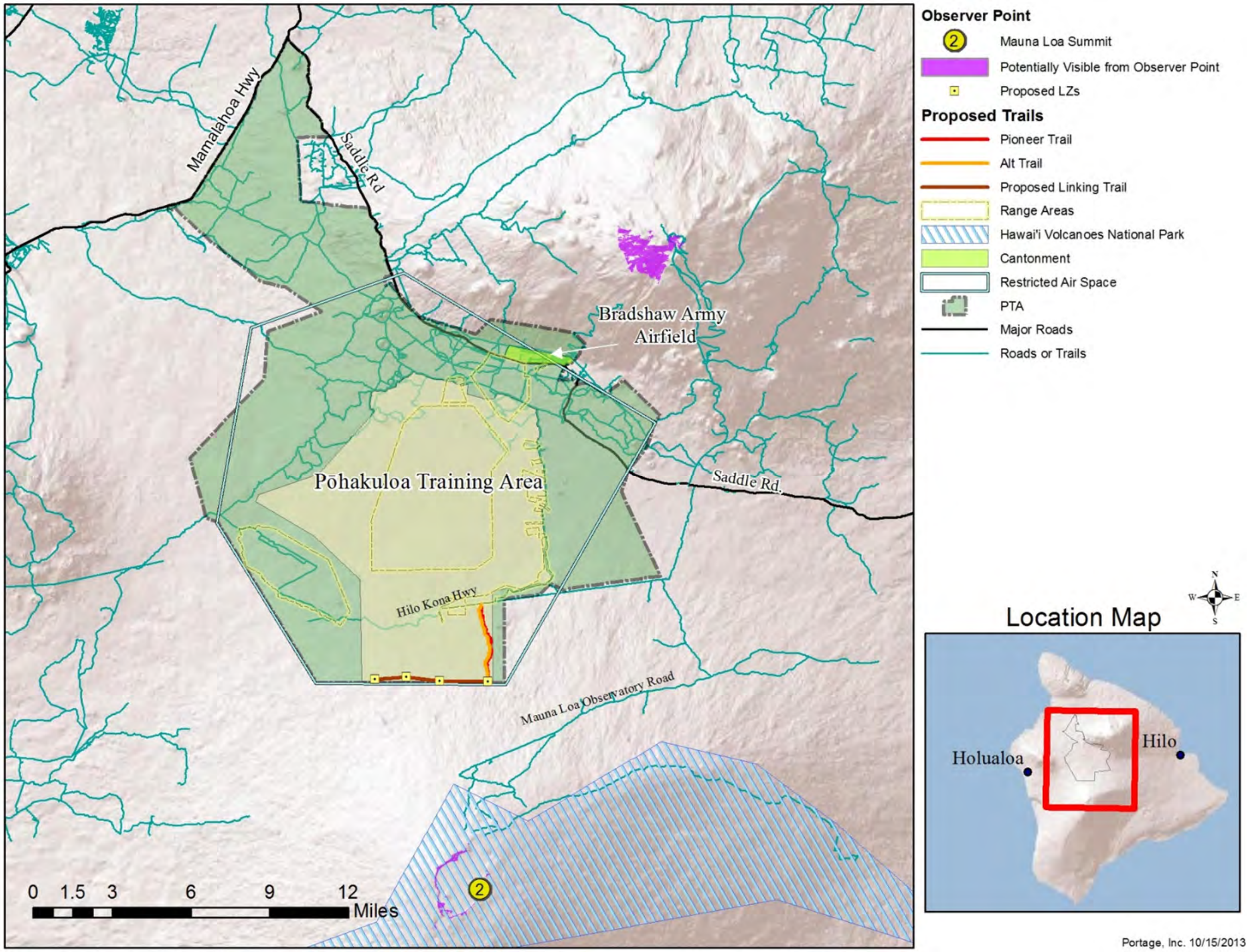

Figure 4-3. Observer Point 2, Mauna Loa summit.

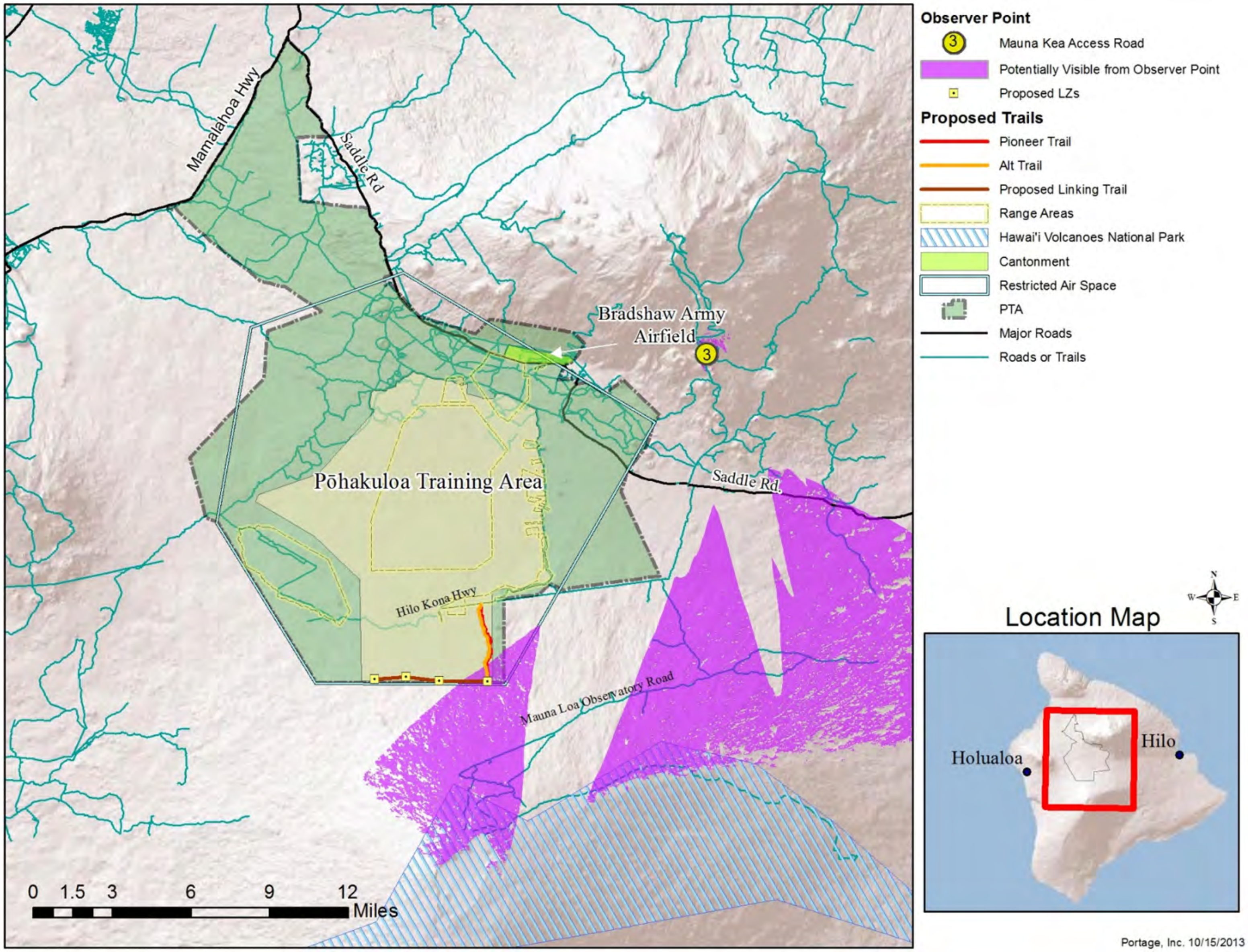

Figure 4-4. Observer Point 3, Mauna Kea Access Road.

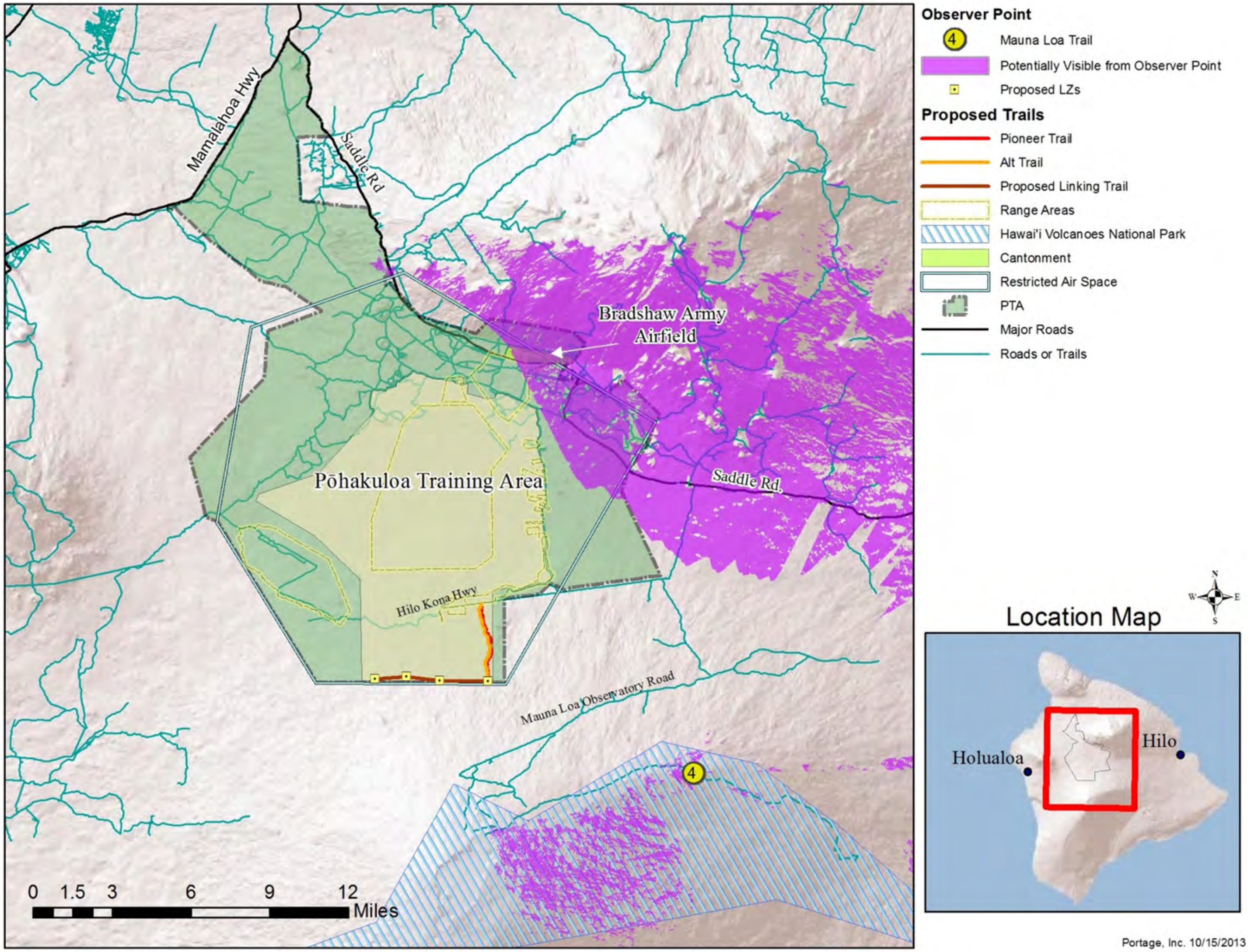

Figure 4-5. Observer Point 4, Mauna Loa Trail.

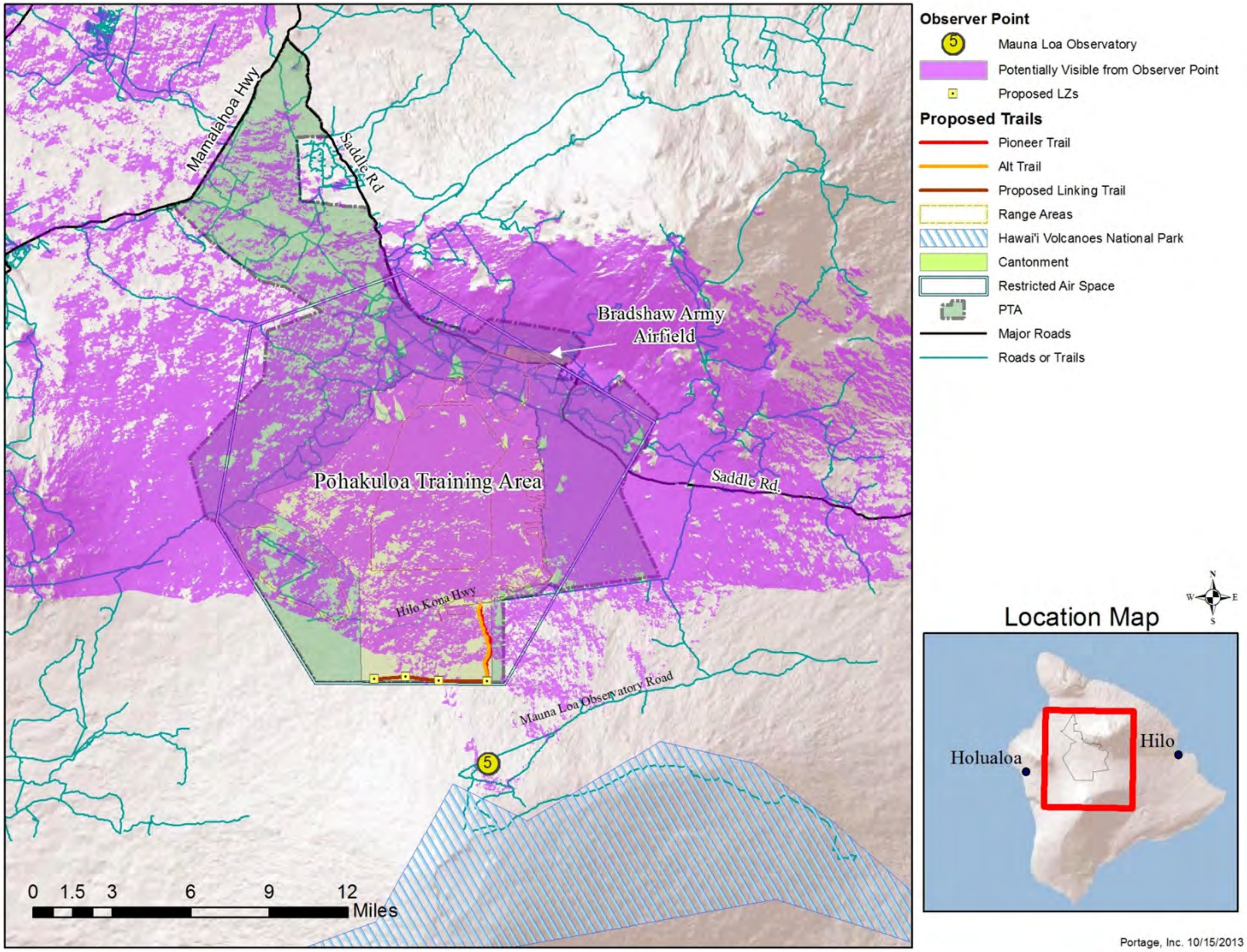

Figure 4-6. Observer Point 5, MLO.

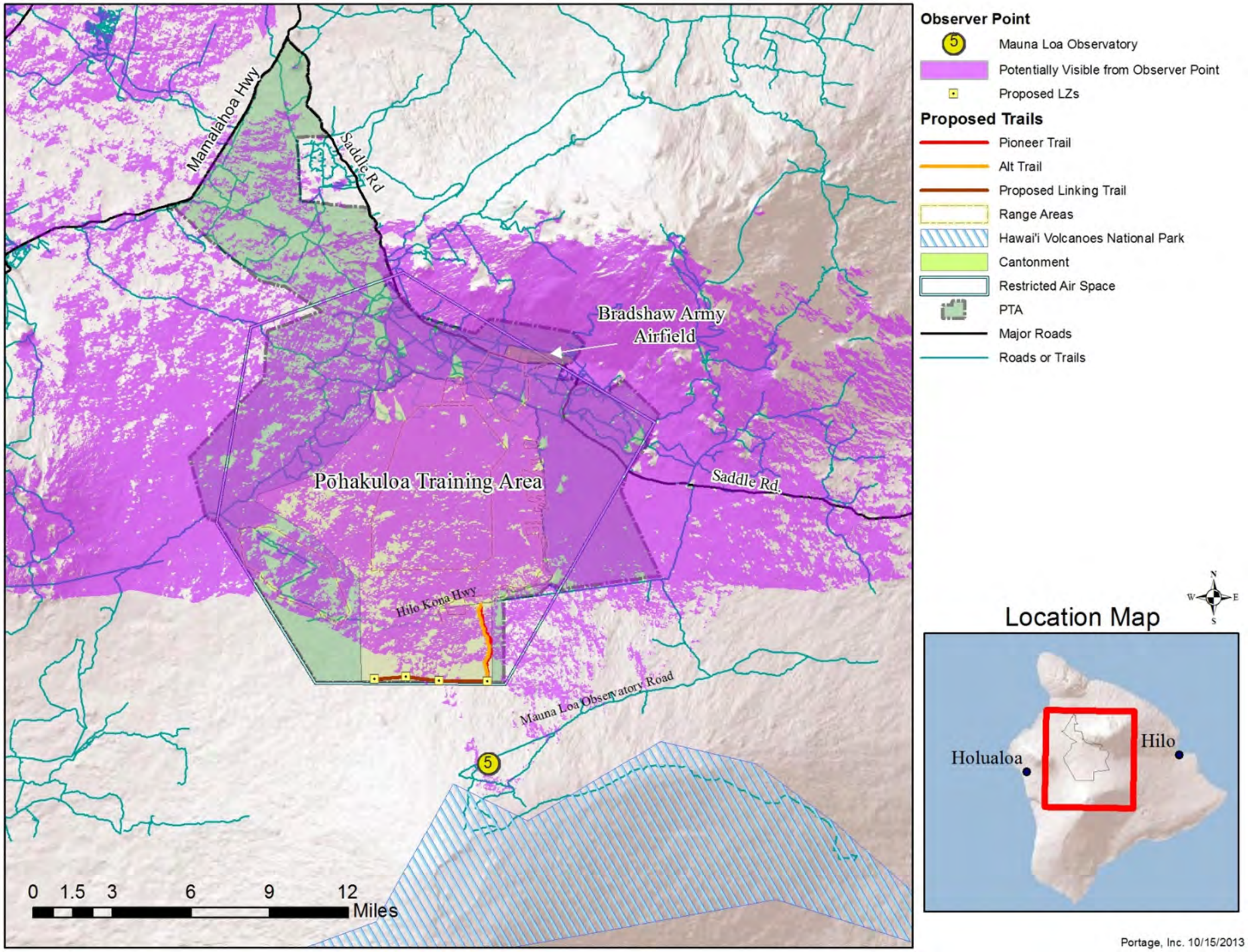

Figure 4-7. Observer Point 6, Saddle Road, State Highway 200.

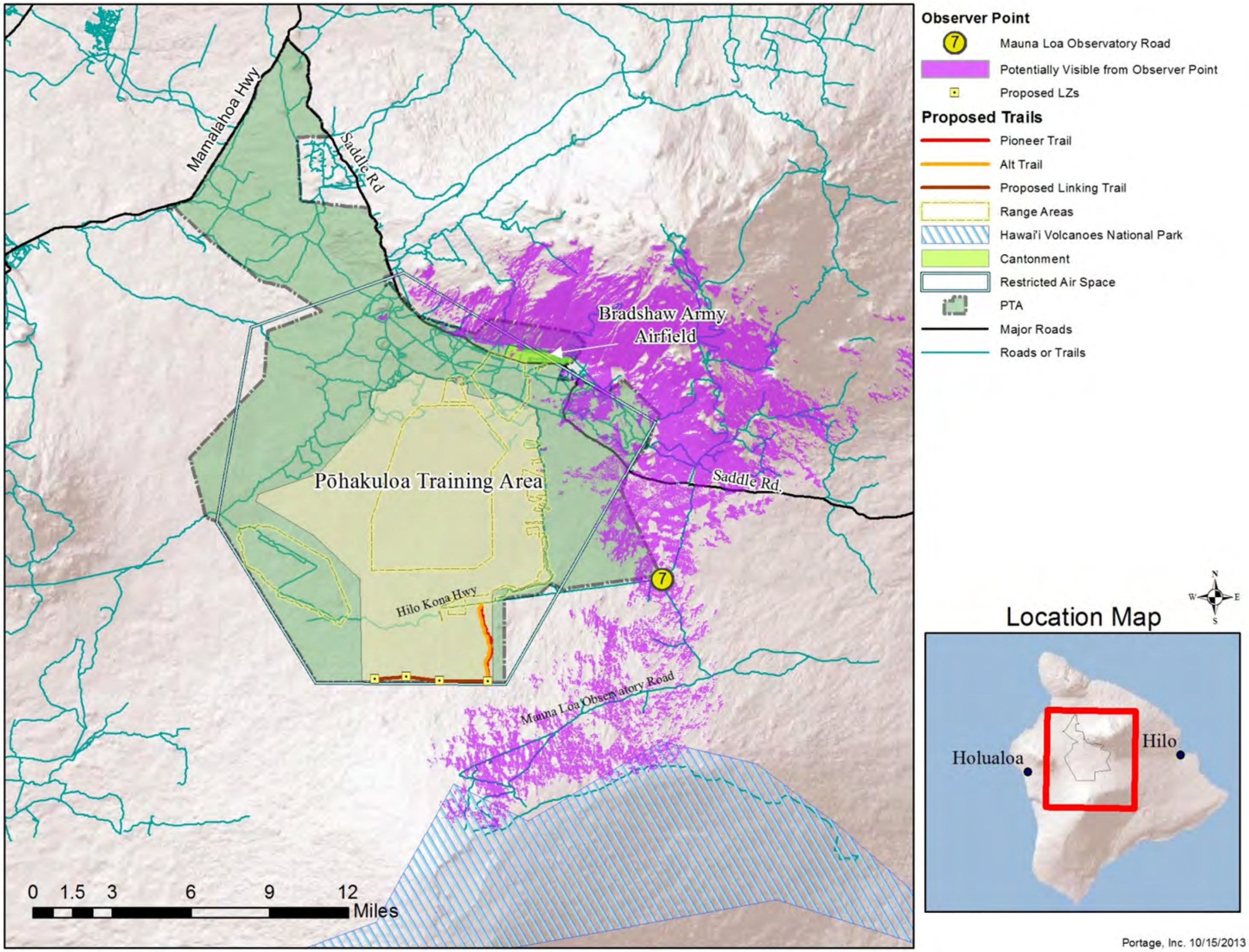

Figure 4-8. Observer Point 7, Mauna Loa Observatory Road.

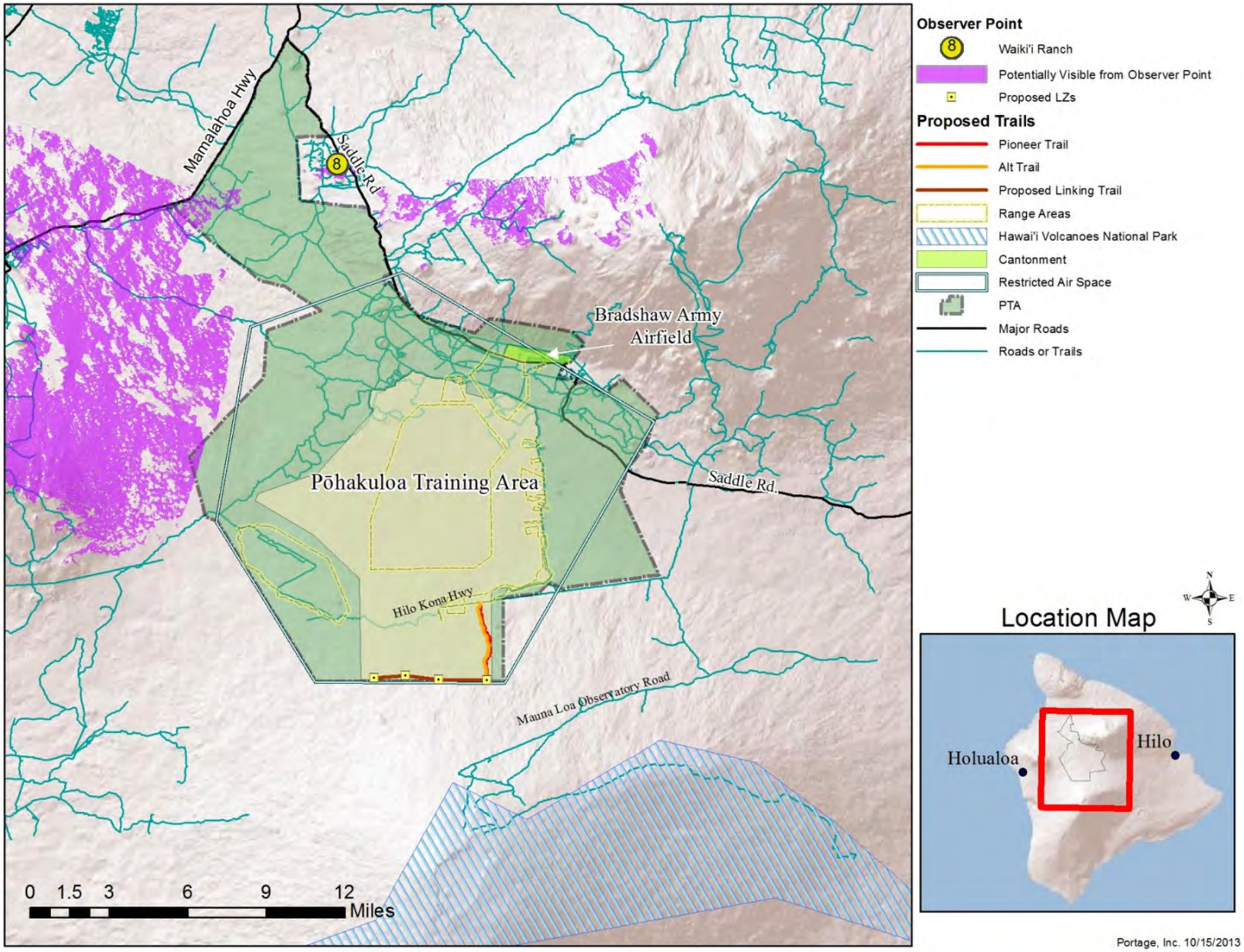

Figure 4-9. Observer Point 8, Waiki‘i Ranch.

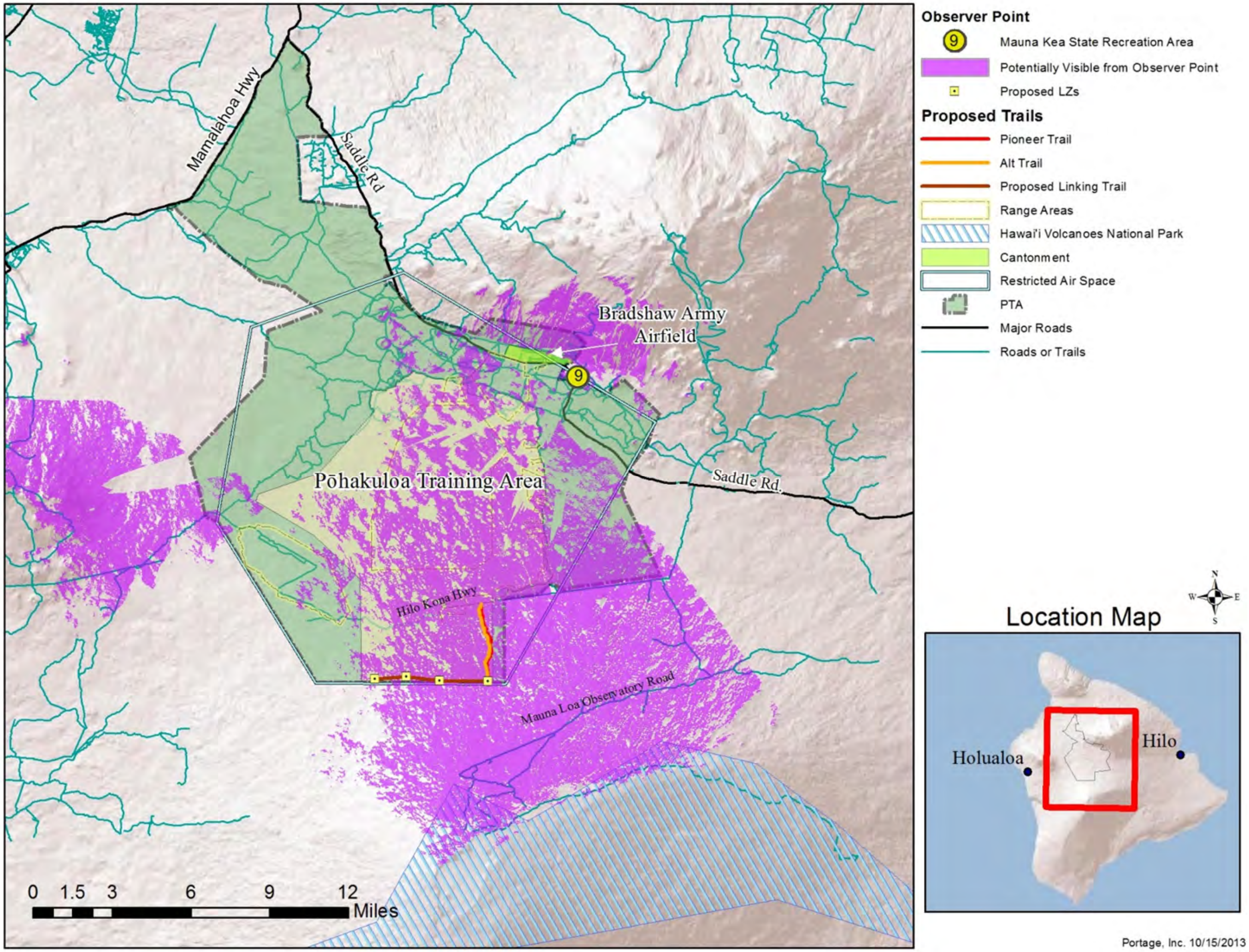

Figure 4-10. Observer Point 9, Mauna Kea State Recreation Area.

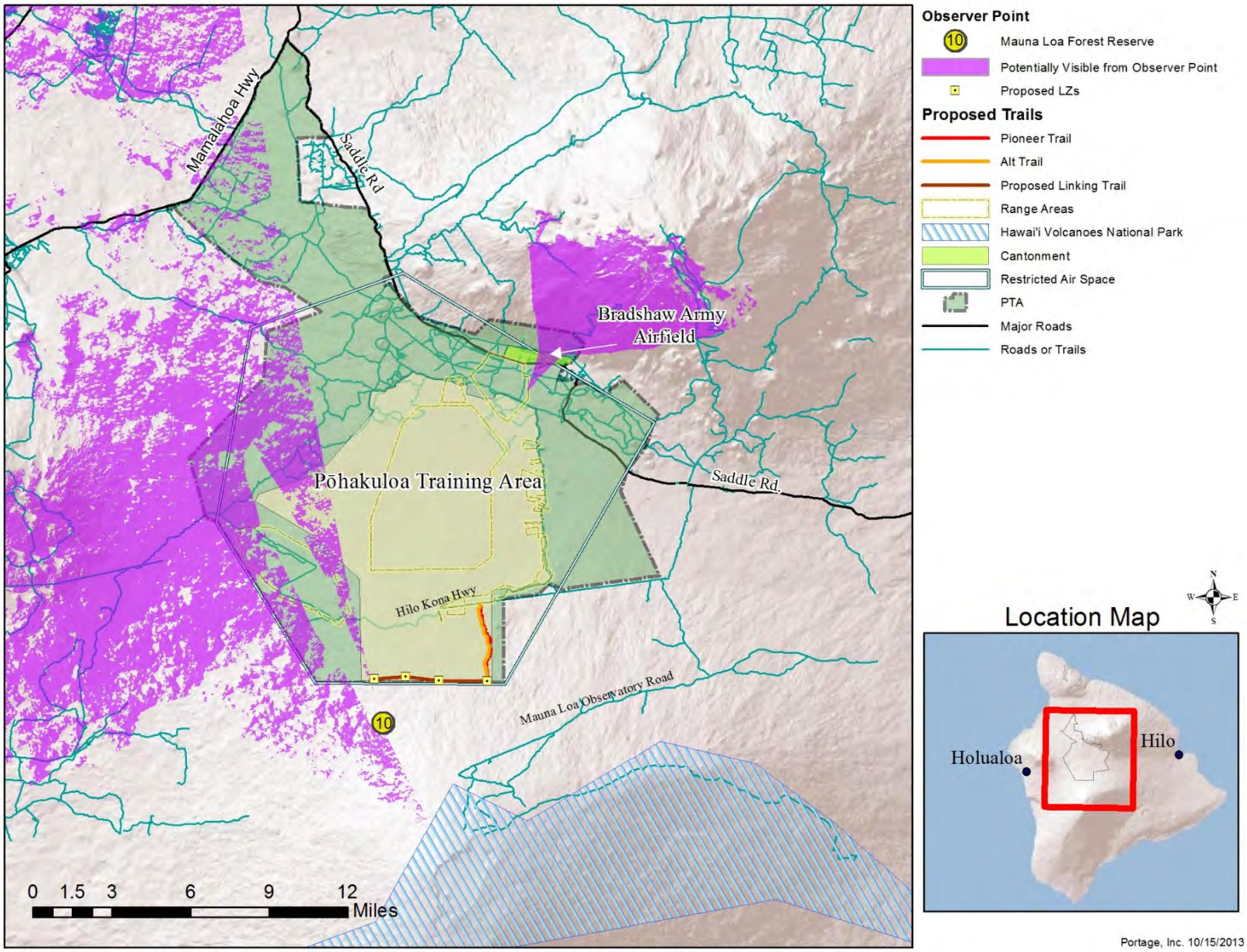

Figure 4-11. Observer Point 10, Mauna Loa Forest Reserve.

4.5.2 Factors Considered for Determining Significance of Impacts

Factors considered for determining whether an alternative would have a significant impact on visual resources include the extent or degree to which its implementation would do the following:

- Introduce physical features that are substantially out of character (forms, colors, textures, and lines) with adjacent developed areas
- Alter a site so that observer points are obstructed or adversely affected, or if the scale or degree of change appears as a substantial, obvious, or disharmonious modification of the overall view
- Be inconsistent with the visual resource policies of the *County of Hawai'i General Plan* (County of Hawai'i 2005)

4.5.3 Summary of Impacts

Potential impacts to visual and aesthetic resources from implementing the alternatives are summarized in Table 4-5 and discussed following the table.

Table 4-5. Summary of impacts to potential visual and aesthetic resources.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4– Construction of Only Three LZs	No Action
Introduce physical features that are out of character with adjacent developed areas	NI	NI	NI	NI	NI	NI
Obscure or change viewing areas	<SI	<SI	<SI	<SI	<SI	NI
Inconsistent with County of Hawai'i visual resources policies	NI	NI	NI	NI	NI	NI

4.5.3.1 Proposed Action. The construction of the proposed LZs would not significantly impact the visual sensitivity of the area surrounding the LZs, because these areas are not identified as areas of high scenic quality and are not readily accessible to or used by a large number of people. Based on the viewshed analysis, the proposed LZs and access trail could potentially be viewed from three observer points. See Figures 4-2, 4-7, and 4-10. Only LZ 4 could be potentially be seen from Observation Point 5 (Figure 4-4). The access trail can also be potentially seen from Observation Point 5 (Figure 4-6). However, observers from the identified points would not notice any change in the landscape features due to the construction because of the relatively small size of the proposed activities versus the distance and angle at which the area is located from the observer. The potential for dust to be observed is limited because of the lack of particulate material at the LZ locations and the short duration of the construction phase (see Subsection 4.6, Air Quality, for more information related to particulates). Any noticed change from an observer point would not obscure the viewing area and would look similar to the adjacent areas.

The training operations would not significantly impact the visual sensitivity from any of the observer points throughout the analysis area. However, it is anticipated that helicopters would be barely visible from most locations and short in duration. Clouds, haze, trees, etc., would limit the ability to see a helicopter from many of the distant locations. Additionally, the density of helicopters from the proposed training operations would not appear to be greater than the existing density of military and commercial aircraft in the saddle region. Training operations would not obscure or change any of the viewing areas. Therefore, the proposed training operations would not impact views by obscuring them or introducing physical features that are out of character.

It is anticipated that there is a less-than-significant impact caused by the Proposed Action, because most of the training activities and construction would be obscured from many of the observation points or visible short period. The impact would be minor, and no permanent visual impact would change or obscure the observer's view.

The construction of the proposed LZs and the training operations would be consistent with County of Hawai‘i visual resource policies and would have no impact. This is because the proposed LZs and training operations are located entirely within the PTA boundary, and all activities would be compatible with existing land uses in the area, which are consistent with the County of Hawai‘i visual resource policies.

4.5.3.2 Alternative 1 – Alternative Trail Location. Impacts from the proposed construction of the LZs and training operations would be similar to those described in the Proposed Action.

4.5.3.3 Alternative 2 – Construction of Only One LZ. Because there would only be one LZ constructed and no linking trails, the potential visual impacts from the proposed construction of just LZ 4 would be less than those from the Proposed Action. Training operations would be similar to those described in the Proposed Action. It is anticipated that there is a less-than-significant impact caused by implementing Alternative 2.

4.5.3.4 Alternative 3 – Construction of Only Two LZs. The potential visual impacts associated with construction of LZs 3 and 4 and the linking trail between them would be slightly less than the Proposed Action and slightly greater than Alternative 2. Training operations would be similar to those described in the Proposed Action. It is anticipated that there is a less-than-significant impact caused by implementing Alternative 3.

4.5.3.5 Alternative 4 – Construction of Only Three LZs. The potential visual impacts associated with construction of LZs 2, 3, and 4 and the linking trails between them would be slightly less than the Proposed Action and slightly greater than Alternatives 2 and 3. Training operations would be similar to those described in the Proposed Action. It is anticipated that there is a less-than-significant impact caused by implementing Alternative 3.

4.6 Air Quality

This subsection presents the evaluation of impacts of the Action Alternatives on the air quality ROI, as described in Section 3, Affected Environment.

4.6.1 Impact Methodology

Potential impacts to air quality within the ROI were assessed by determining whether the Action Alternatives would produce fugitive dust (PM_{10}) at levels in excess of federal and state PM_{10} or $PM_{2.5}$ standards at off-post locations. Fugitive dust generation from construction and operations activities was analyzed. The amount of net increase in annual emissions of criteria pollutants from military helicopter engines was also considered.

The PM_{10} estimate is the most appropriate size fraction to address fugitive dust issues. The PM_{10} estimate determined for construction and operations activities also provides a conservative estimate of $PM_{2.5}$ emissions. Visible dust is a clear indication of airborne PM_{10} concentrations that are typically in the range of several micrograms per cubic meter. PM_{10} emissions are important, because the PM_{10} size fraction represents airborne particles small enough to be inhaled into the lower respiratory tract, where they can have adverse health effects. Previous investigations have shown minimal dust as a result of helicopter rotorwash (U.S. Army 2011a).

4.6.2 Factors Considered for Impact Analysis

Major factors considered in determining whether a project alternative would have a significant impact on air quality include the following:

- The amount of net increase in annual emissions of criteria pollutants on a given island. The 100 tons (90.7 metric tons) per year Clean Air Act conformity de minimums threshold does not apply to Hawai‘i, because it is an attainment area, but the threshold was used nonetheless as a basis of comparison in analyzing air quality impacts.

- Whether or not dispersion modeling analyses indicated a potential for violation of federal and state PM_{10} or $PM_{2.5}$ standards, for either construction or operations activities, at off-post locations.

- Consideration of the CEQ’s *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions* (CEQ 2010).

- Whether or not there is a potential for violation of federal and state carbon monoxide, nitrogen oxide, and sulfur dioxide standards at off-post locations.

4.6.3 Summary of Impacts

Potential impacts to air quality from the alternatives are summarized in Table 4-6 and discussed following the table.

Table 4-6. Summary of potential impacts to air quality.

Impact Issues	Proposed Action	Alternative 1	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
PM_{10} emissions	<SI	<SI	<SI	<SI	<SI	NI
Pollutant emissions	NI	NI	NI	NI	NI	NI
Impacts to Visibility	<SI	<SI	<SI	<SI	<SI	NI
Greenhouse Gas Emissions	<SI	<SI	<SI	<SI	<SI	NI

4.6.3.1 Impacts on Air Quality from Trail and LZ Construction. Impacts on air quality from the construction phase were considered for the Action Alternatives. Standard production rates were estimated based on information from the *Caterpillar Performance Handbook, Edition 15* (Caterpillar 1984) and linear distances for access and linking trails. Estimated volumes of soil/rock to be moved and production rates are shown in Table 4-7.

Table 4-7. Estimated volumes to be moved and production rates.

Site	Volume (m^3)	Production (m^3/hr)	Excavation (hr)
Access (Pioneer) Trail	NA[a]	200	11
Access (Alternative) Trail	NA[a]	200	11
LZ 1	219	950	1
LZ 2	1,938	950	1
LZ 3	92,000	420	20
LZ 4	145,000	280	265
Linking trail between LZ 4 and 3	NA[a]	200	6
Linking trail between LZ 3 and 2	NA[a]	200	4
Linking trail between LZ 2 and 1	NA[a]	200	4
a. Trails will be softened, which does not require moving material.			

An average emission factor for bulldozing overburden was obtained from EPA AP-42, Chapter 11, Table 11.9-1 (EPA 1995), which assumed an average silt content of 3.8% and a moisture content of 2.2% for ‘a‘ā and pāhoehoe lava flows with small amounts of eolian sands. This emission factor was calculated to be 1.844 lb (0.85 kg) of PM_{10} per hour and 1.07lb (0.49kg) of $PM_{2.5}$ per hour during construction activities. Other activities associated with construction, such as vehicle and water truck movement, were estimated to produce 1.145 lb (0.52 kg) per hour for PM_{10} and 0.115 lb (0.052 kg) $PM_{2.5}$ per hour. If dust suppression measures are also implemented, such as spraying construction areas with water, these estimates may be reduced by up to 50% (EPA 1992). With the PM_{10} and $PM_{2.5}$ emission factors, the estimated total amount of dust generated for each alternative was calculated and is presented in Table 4-8.

Table 4-8. Suspended particulate produced during construction.

Alternative	Time to Construct (hr)	PM_{10} Produced (lb)	$PM_{2.5}$ Produced (lb)	24 hr PM_{10} ($\mu g/m^3$)	24 hr $PM_{2.5}$ ($\mu g/m^3$)
Proposed Action	312	933	370	9.164	0.040
1 – Alternate Trail	312	933	370	9.164	0.040
2 – Construction of Only One LZ 4	276	824	327	9.149	0.040
3 – Construction of Only Two LZs	302	903	357	9.163	0.041
4 – Construction of Only Three LZs	307	918	364	9.163	0.040

To calculate the 24-hour emission rate, it was assumed that the dust was dispersed in a plume approximated 1 mi wide, 3 mi long, and 500 ft into the air. Based on calculated suspended particulate production estimates, and compared to the PM standards shown in Table 4-9 (and discussed in detail in Subsection 3.6, Air Quality), it is apparent that the construction activities associated with the Proposed Action would result in no significant fugitive dust impacts on the air quality. Alternative 1 emissions would be the same as the Proposed Action, because the scope of the construction activities in Alternative 1 is roughly the same as the Proposed Action. Implementing Alternatives 2, 3, and 4 would produce less fugitive dust, because the scope of construction activities in these alternatives requires less construction. Thus, all of the Action Alternatives result in less-than-significant impacts to air quality.

Table 4-9. Federal and state PM standards.

Particulate	Measure	Hawai‘i AAQS	Federal Primary Standard	Federal Secondary Standard
PM_{10}	24-hr block average	150 $\mu g/m^3$	150 $\mu g/m^{3d}$	Same as primary
	Annual average	50 $\mu g/m^3$	None	None
$PM_{2.5}$	24-hr block average	None	35 $\mu g/m^3$	Same as primary
	Annual average	None	12 $\mu g/m^3$	15 $\mu g/m^3$

4.6.3.2 Impacts on Air Quality from Operations. Evaluating impacts on air quality, as well as other resource areas, required an understanding of the mechanism of physical disturbance associated with helicopter rotorwash. Rotorwash is a term used to define a “wave” of air created by the rotor disc of a helicopter. As shown in Figure 4-12, this wave is created by the downward thrust of air that produces lift. The wave extends out in a 360° pattern from the center of mass of the helicopter, which is usually the rotor mast (DOT 2000). High-speed rotorwash can be produced up to approximately three times the diameter of the rotor disc (U.S. Army 2007e).

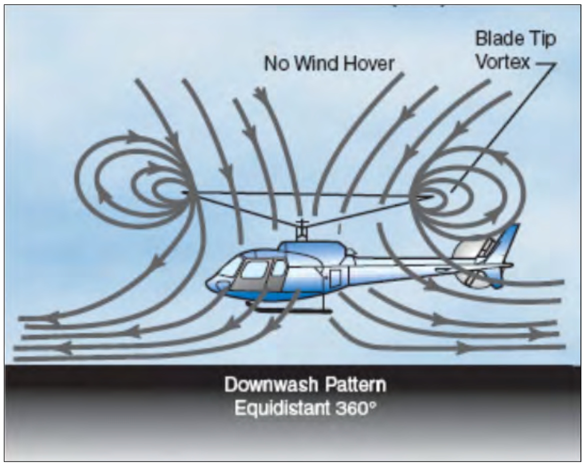

Figure 4-12. Rotorwash shown as "downwash" from DOT (2000).

Within a specific height from the ground, related to the helicopter's rotor blade diameter, rotorwash intensity may be sufficient to displace dust, dirt, rocks, or other loose materials. Rotorwash intensity tends to decrease as the distance from the helicopter increases. The intensity of rotorwash on the localized area is directly related to many factors, including helicopter weight, disc area of the helicopter, and the height of the helicopter from the ground. For example, a heavier helicopter, such as the Chinook, requires more lift than a Black Hawk and produces rotorwash across a wider area than the lighter Black Hawk would generate in the same area. Similarly, the Chinook's rotorwash, generated by a 60-ft (18-m) diameter rotor, begins to affect a localized environment when the pilot lowers the helicopter to approximately 90 ft (27 m) AGL (Figure 4-13). The Black Hawk, which is lighter and has a smaller rotor diameter at 53 ft (16 m), begins to affect a localized environment when the pilot lowers it to 79 ft (24 m) AGL.

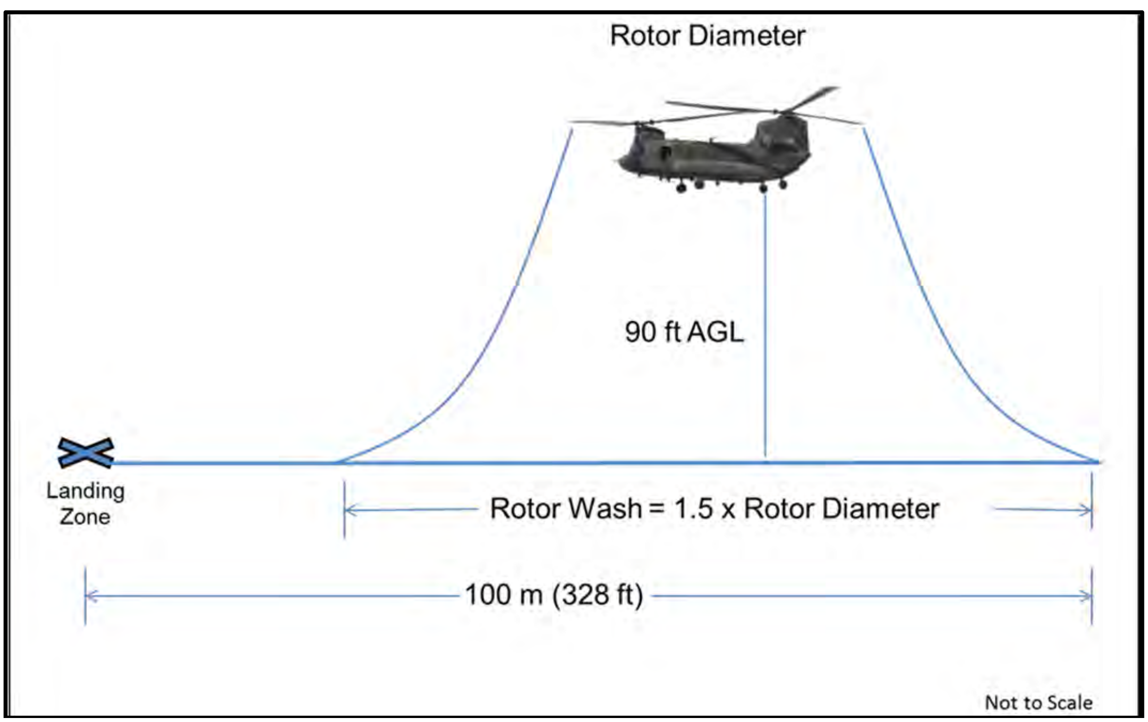

Figure 4-13. Rotorwash impact area.

For the operations analysis, the rotorwash from the Chinook and Black Hawk, at 90 ft (27 m) AGL, was determined to impact an area of 180 ft (55 m) and 159 ft (48 m), respectively. For a conservative analysis, the area of impact analyzed was 100 m (328 ft) from the center point of the LZ, or roughly twice as large as the typical rotorwash area. Air quality impacts during operations result from military helicopter engine exhaust and fugitive dust emissions from helicopter landings and take-offs. The analysis was performed assumed a maximum flight frequency of 420 flights per year and a maximum of 20 landings per day.

- Fugitive Dust. PM_{10} modeling was performed to evaluate the potential for violations of the federal PM_{10} standards due to fugitive dust emissions associated with helicopter use. The modeling analyses for operations used the EPA AP-42 emission calculation (EPA 1995) and Fugitive Dust Handbook from the Western Regional Air Partnership (WRAP 2004). The particle size category used was for undisturbed soils to determine particle settling and deposition. Meteorological conditions assumed in the modeling analysis included Class B (stable) and C (slightly unstable) for daytime operation with an average speed of 15.4 ft (4.7 m) per second from the north-northwest and Class D (neutral) and E (mild temperature inversion) for nighttime operations with an average wind speed of 16.7 ft (5.1 m) per second from the south-southeast. The dispersion modeling results obtained for evaluating helicopter maneuver exercises on a 1.2-acre (5,046 m^2) section of undisturbed soil were used to extrapolate potential PM_{10} concentrations from wind erosion due to landings and take-offs from the LZ's conditions. Based on modeling results, the impact of fugitive dust from helicopter activity would be less than significant. This is based on each LZ being treated as a separate area source and assuming one landing per episode. Using these assumptions, the maximum concentration at 1,093 yd (1,000 m) away from the center of the LZ(s) is less than 17.98 $\mu g/m^3$, which is below the state and EPA emission standard of 150 $\mu g/m^3$ per 24 hours of exposure to the general public (see Table 3-4). Consequently, PM_{10} emissions would be a less-than-significant impact for all Action Alternatives. Because PM_{10} emissions are less than significant, impacts that PM_{10} would have to visibility would also be less than significant.

- Pollutant Emissions from Helicopter Engine Use. The number of flights occurring over PTA would not increase under the Action Alternatives, so there would not be an increase in pollutant emissions. This is true for all Action Alternatives, because the number of flights is the same for each. Therefore, no impact would be associated with pollutant emissions.

4.6.3.3 Greenhouse Gas Analysis. There is currently no regulatory threshold for GHG emissions in NEPA analysis, nor is there a DoD or Army threshold. However, it is a requirement in NEPA to consider impacts to the environment, including air quality, which in turn requires consideration of emissions that are known contributors to global warming. The four most important GHGs are carbon dioxide, methane, nitrous oxide, and fluorinated gases (e.g., hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride). These GHGs have varying heat-trapping abilities and atmospheric lifetimes. Long-lived GHGs, for example, carbon dioxide, methane, and nitrous oxide, are chemically stable and persist in the atmosphere from a single decade to centuries or even longer, so that their emission has a long-term influence on climate. Short-lived gases (e.g., sulfur dioxide and carbon monoxide) are chemically reactive and generally removed by natural oxidation processes in the atmosphere (e.g., by washout in precipitation); thus, their concentrations are highly variable (Solomon et al. 2007). For this analysis, emissions for common GHGs were considered in conjunction with particulate (PM) generation, which was presented in Subsection 4.6, Air Quality.

The following assumptions were made for the analysis:

- Under the operations phase for all Action Alternatives, there would be no increase in emissions over current operations; thus, operations emissions were not considered further in the GHG analysis.
- The Proposed Action's construction duration would be the longer of the Action Alternatives; thus, equipment would be expected to run longer and generate the most emissions. Thus, analysis of the Proposed Action was considered to bound the analysis for all the Action Alternatives.
- Construction vehicles would be driven to PTA and would remain at PTA through project completion; thus, commuting emissions for these vehicles were not further considered.
- Workers, if not working at PTA, would likely be driving to/and working elsewhere on the island; their vehicle emissions were also not considered.

To calculate emissions, the following equation was used. Emission factors for diesel were obtained from EPA's AP-42, *Compilation of Air Pollutant Emission Factors*, Table 3.3.1, Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines (EPA 1996). Emissions were calculated using a maximum of five heavy construction vehicles onsite over the duration of construction activities. Use of these factors and the results for the Proposed Action are shown in Table 4-10.

$$Eeq = EF * hp * hr * N$$

where:

Eeq = emissions of equipment/vehicles (tons/yr)

hr = number of hours per year equipment/vehicles operate

hp = horsepower of the equipment/vehicle

N = number of equipment/vehicles.

Table 4-10. Estimated emissions for the Proposed Action.

Pollutant	Emissions Factor – Diesel (lb/hp-hr)[a]	Horsepower (hp)	Duration (hr)	Number of Vehicles (N)	Emissions (Eeq) (ton/yr)	Long-Lived Greenhouse Gases Carbon Dioxide Ton Equivalent[b]
Nitrogen oxide	0.031	310	312	5	7.496	1,912
Carbon monoxide	6.68 E-03	310	312	5	1.615	—
Sulfur oxide	2.05 E-03	310	312	5	0.496	—
Carbon dioxide	1.15	310	312	5	278.07	228
Hydrocarbon	2.47 E-03	301	312	5	0.597	—

a. EPA 1996.
b. EPA 2013b.

The results shown in Table 4-10 were considered with CEQ's *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions* (CEQ 2010). The reference point cited in the work, of 22,680 tons (25,000 metric tons) of direct carbon dioxide-equivalent GHG emissions, was not used as a standard of significance/insignificant of impacts. The value is the minimum standard for reporting emissions under the Clean Air Act and was used as a reference point for consideration for further analysis. The table results show that none of the emissions of long-lived GHGs approached the EPA's reporting value, and no further analysis was undertaken.

4.7 Land-Based Traffic

This subsection presents the evaluation of impacts of the Action Alternatives on the land-based traffic ROI, as described in Section 3, Affected Environment.

4.7.1 Impact Methodology

Impacts on land-based traffic were assessed based on determining the probable, common potential impacts from transporting construction equipment on public roads to PTA. Because the Action Alternatives are not anticipated to result in an overall increase in pilots who train at PTA, the Army did not conduct a detailed traffic analysis based on long-term impacts from training with the proposed LZs at PTA.

Construction contracts generally detail and formalize the numbers and type of equipment that are used on a project. Upon project initiation, this equipment would be mobilized and would likely remain at PTA for extended periods, or the duration of the project, which would minimize the potential for daily traffic conditions to be affected by slow-moving equipment on Saddle Road. When the project is completed, the equipment would again be demobilized and returned to its origin.

Because workers and successful construction project bidders could hail from anywhere on the island, it was assumed that Saddle Road would be used under all alternatives and workers would carpool to PTA. Under the Action Alternatives, construction vehicles would enter through the PTA directly with special access (bypassing the main gate) and stay on non-public roads within PTA as described in Subsection 3.7, Land-Based Traffic.

It was assumed for analysis that to implement any of the Action Alternatives, one fuel truck, one water truck, one supervisor vehicle, and less than five pieces of heavy equipment, which could include a combination of bulldozers, graders, and excavators, would be needed and that there would be fewer than 10 additional construction workers' personal vehicles that would travel to PTA.

4.7.2 Factors Considered for Determining Significance of Impacts

An action would be considered to have a significant impact on land-based traffic if would do either of the following:

- Increase traffic on public roads such that it would disrupt or alter local circulation patterns
- Cause safety hazards on roadways.

4.7.3 Summary of Impacts

The impacts on land-based traffic from the alternatives are summarized in Table 4-11 and discussed following the table.

Table 4-11. Summary of potential impacts to land-based traffic.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Increase traffic on public roads such that it would disrupt or alter local circulation patterns	<SI	<SI	<SI	<SI	<SI	NI
Cause safety hazards on roadways	<SI	<SI	<SI	<SI	<SI	NI

The Army found that under all Action Alternatives, there would be no significant increase in traffic on public roads to disrupt or alter local circulation patterns. Construction vehicle transport to and from PTA would be limited, because these vehicles are anticipated to stay onsite for the majority of the project. Construction vehicle transport to and from PTA is anticipated to be limited to the periods during project initiation and termination. However, construction vehicles traveling to PTA may temporarily delay traffic on Saddle Road because construction vehicles generally travel at slower speeds than passenger vehicles. Travel on PTA roads is not expected to produce delays or conflicts, because construction activities and military training activities are not anticipated to occur concurrently. Training that must occur could be scheduled well away from the construction activities.

4.7.3.1 Public Roads. The speed at which traffic generally flows could be reduced temporarily as traffic encounters the vehicles carrying heavy equipment to PTA. The presence of heavy equipment traffic could contribute to potential safety hazards as motorists in passenger vehicles encounter flatbed trucks carrying construction equipment. The heavy equipment traveling on Saddle Road may delay or cause some safety conflict with other motorists, but these conflicts are anticipated to be minor and most noticeable on sections of Saddle Road that have not been improved, on sections that are undergoing reconstruction, or at intersections where construction equipment accesses Saddle Road when traveling to PTA. Traffic involving heavy equipment generally is limited to non-peak commute times to minimize conflicts with other users of Saddle Road and minimize safety hazards posed by passenger cars encountering heavy equipment.

The Army anticipates a slight, short-term increase in traffic volume on Saddle Road during the duration of LZ and trails construction resulting from the transport of the heavy equipment and the workers who drive their vehicles to PTA. The Army anticipates this to be less than significant.

4.7.3.2 PTA Roads. It is anticipated that construction of LZs and trails would not occur when training is being conducted at PTA. This separation of activities would reduce the potential for conflicts to occur. If training and construction activities were to occur at the same time or overlap, the Range Commander has responsibility to ensure conflicts do not exist between these activities. Conflicts could be reduced by temporarily suspending training or rescheduling training to ranges not in the vicinity of construction vehicle travel or use.

Travel-related conflicts involving construction equipment and military traffic could occur, because ranges exist near the PTA roads being used to access the area where the access trail would be constructed. Overall traffic on these roads would increase by the number of workers traveling to the construction site. This increase is expected to be small, because workers would likely carpool to the construction site and because few total vehicles are involved in the project. Conflicts would most likely include delays when heavy equipment is being transported to the construction site. Personal vehicles of construction workers would likely be granted extended access passes to reduce congestion at the main range entrance. Carpooling from the Cantonment Area to the construction site would further reduce delays or conflicts. Given these factors, the potential impacts from the Action Alternatives to PTA land-based traffic would be less than significant.

4.8 Noise

This subsection presents the evaluation of impacts of the Action Alternatives regarding noise on the ROI, as discussed in Section 3, Affected Environment.

4.8.1 Impact Methodology

Noise impacts were assessed by determining both long- and short-term noise levels associated with use of the proposed LZs. The short-term increase in noise levels associated with construction of the LZs was also assessed. For the construction noise analysis, each alternative was evaluated independently. However, for the operations noise analysis, the number of flights and use of LZs would be the same under all of the Action Alternatives. Evaluating noise impacts of the Proposed Action appropriately bound the analysis for all Action Alternatives.

4.8.2 Factors Considered for Impact Analysis

Significant impacts on the existing noise environment were evaluated based on the following criteria:

- Increases ADNL above the allowable noise thresholds for land use compatibility as outlined in Army Regulation 200-1 (U.S. Army 2007d)
- Creates maximum noise levels in violation of the Hawai‘i Community Noise Control rule (State of Hawai‘i 1996a)
- Creates a high likelihood of annoyance based on maximum noise levels from individual noise events.

4.8.3 Summary of Impacts

The existing noise environment is discussed in Section 3.8.3, Existing Conditions. Use of the proposed LZs would not increase the current number of training flights originating at BAAF within PTA, and flights would be limited to restricted airspace (R-3103) over PTA. Impacts resulting from implementing the Action Alternatives are summarized in Table 4-12 and discussed following the table.

Table 4-12. Summary of potential noise impacts.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Increase in ADNL resulting in incompatibility with current land uses	<SI	<SI	<SI	<SI	<SI	NI
Maximum noise levels exceeding community noise control rules	<SI	<SI	<SI	<SI	<SI	NI
High likelihood of annoyance from individual noise events	<SI	<SI	<SI	<SI	<SI	NI

4.8.3.1 Construction. Noise impacts resulting from construction equipment and vehicles would result in short-term increases in noise levels during construction of the access and linking trails and LZs. Table 4-13 shows the expected duration of construction associated with each alternative. Construction activities are expected to have maximum noise levels from construction equipment estimated up to 90 dBA (DOT 2006). These noise levels are in excess of the maximum permissible sound level of 55 dBA, as regulated under the Hawai‘i Administrative Rules, for daytime hours for conservation land areas such as the Mauna Loa Forest Reserve (State of Hawai‘i 1996a). However, permits to allow for increased noise levels associated with construction activities are outlined in the Hawai‘i Community Noise Control rule (State of Hawai‘i 1996a) and include stipulations for disclosing times and locations of construction activities. Because of the short-term duration of construction activities paired with the permitting process to allow for a temporary increase in allowable noise levels, the impact from construction-related noise for all Action Alternatives is less than significant.

Table 4-13. Construction duration for the Action Alternatives.

Alternative	Construction Duration (days)
Proposed Action	40
1 – Alternate Trail	40
2 – Construction of Only One LZ	35
3 – Construction of Only Two LZs	38
4 – Construction of Only Three LZs	39

4.8.3.2 Operations. As discussed in Section 12.4.1 of the SONMP (U.S. Army 2010c), the low number of military flights at PTA does not generate ADNL noise contours. Therefore, use of the proposed LZs under all Action Alternatives would not alter the existing ADNL levels and the annual average noise levels from aviation activities are compatible with the surrounding land uses. In order to support this assumption, the ADNL for the CH-47 helicopter was calculated. The CH-47 was selected for this analysis, because it has the highest maximum noise level of the helicopters in use at PTA.

The maximum A-weighted sound exposure level (SEL) for the CH-47 at a distance of 200 ft (61 m) is 92 dBA. The SEL represents the noise level normalized to 1 second. The average noise level over a specified amount of time, in this case 1 day, can be calculated using the following equation (Berger et al., 2003):

$$\text{DNL} = SEL - 10\log\frac{T}{T_o}$$

where:

DNL = average sound level over time T (dBA)

SEL = 92 dBA

T = specified time in seconds = 86,400 seconds (in a 24-hour day)

T_o = reference time duration = 1 second.

Using this calculation, for a single CH-47 flight at a distance of 200 ft (61 m), the average noise level over a 24-hour period is 43 dBA. The increase in noise resulting from doubling the frequency of flights is 3 dBA, so two CH-47 flights would result in a DNL of 46 dBA, and four CH-47 flights would result in a DNL of 49 dBA. Using this approach, 161 flights over a single location within one 24-hour period would be required to generate an average noise level of 65 dBA. Taking into account the limited number of helicopters using the airspace along with the availability of other LZs within PTA, it is unlikely that average noise levels that are incompatible with surrounding land uses would be generated. Therefore, the impact from helicopter-related noise is less than significant.

However, the noise from LZ use has the potential to cause annoyance and generate noise complaints. Table 4-14 shows noise levels ranging from 70 to 90 dBA and the associated percentage of the population expected to be highly annoyed by the noise source. The study by Rylander and others (1974) included airfields with 50 to 200 operations per day.

Table 4-14. Percent of population annoyed by aircraft noise (Rylander et al. 1974).

Maximum dBA	% Population Highly Annoyed
90	35
85	28
80	20
75	13
70	5

Using the annoyance values shown in Table 4-14, annoyance percentages were calculated for noise levels of the Apache (AH-64) and Chinook (CH-47) helicopters. As previously stated, the CH-47 was selected for this analysis, because it has the highest maximum noise level of the helicopters in use at PTA; the AH-64 has the second highest maximum noise levels and was therefore also included in the annoyance assessment. Table 4-15 lists the AH-64 and CH-47 noise levels associated with helicopter altitudes of 50 and 100 ft (15 and 30 m) above ground level (AGL). For a receiver standing directly under either the AH-64 or CH-47 that is flying at an altitude of 50 ft (15 m) AGL, more than 35% of the population would be highly annoyed by helicopter noise levels. However, if the receiver were standing 0.25 mi (0.4 km) away from the helicopter, the percentage drops to 11% for the AH-64 and 12% for the CH-47; for a receiver 0.5 mi (0.8 km) away, the annoyed percentage drops further to 1% and 3%, respectively, for each helicopter. Maximum noise level contours for the CH-47 flying at an altitude of 50 ft (50 m) AGL directly above each LZ are shown in Figure 4-15. The noise contours depict the expected noise level reaching an observer on the ground at distances of 0.25 mi (0.4 km) and 0.5 mi (0.8 km) from each LZ.

The annoyance assessment indicates helicopter use of the proposed LZs may annoy Mauna Loa Forest Reserve recreational users in the immediate vicinity of the LZs. However, the low number of operations would minimize annoyance potential.

Table 4-15. Overflight annoyance potential.[a]

Helicopter – Altitude	Ground Track Distance[b] (ft)	Slant Distance[c] (ft)	Maximum dBA[d]	% of Population Highly Annoyed[e]
AH-64 – 50 ft AGL	0	50	104	+35
	1,320 (1/4 mi)	1,321	74	11
	1,760 (1/3 mi)	1,761	71	7
	2,640 (1/2 mi)	2,640	67	1
AH-64 – 100 ft AGL	0	100	98	+35
	1,320 (1/4 mi)	1,324	74	11
	1,760 (1/3 mi)	1,763	71	7
	2,640 (1/2 mi)	2,642	67	1
CH-47 – 50 ft AGL	0	50	104	+35
	1,320 (1/4 mi)	1,321	75	12
	1,760 (1/3 mi)	1,761	72	9
	2,640 (1/2 mi)	2,640	69	3
CH-47 – 100 ft AGL	0	100’	98	+35
	1,320 (1/4 mi)	1,324	75	12
	1,760 (1/3 mi)	1,763	72	9
	2,640 (1/2 mi)	2,642	69	3

a. Annoyance based on 50 to 200 overflights per day (Rylander et al. 1974).
b. Distance between receiver and a point on ground with the helicopter directly overhead.
c. Direct distance between the receiver and a helicopter.
d. Based on slant distances of 200 to 2,500 ft (61 to 762 m) obtained from Table 12-1 of the statewide operational noise management plan (U.S. Army 2010c). Noise levels for distances not included in the noise management plan were calculated using logarithmic regression analysis.
e. Linear regression analysis performed based on annoyance levels shown in Table 4-14.

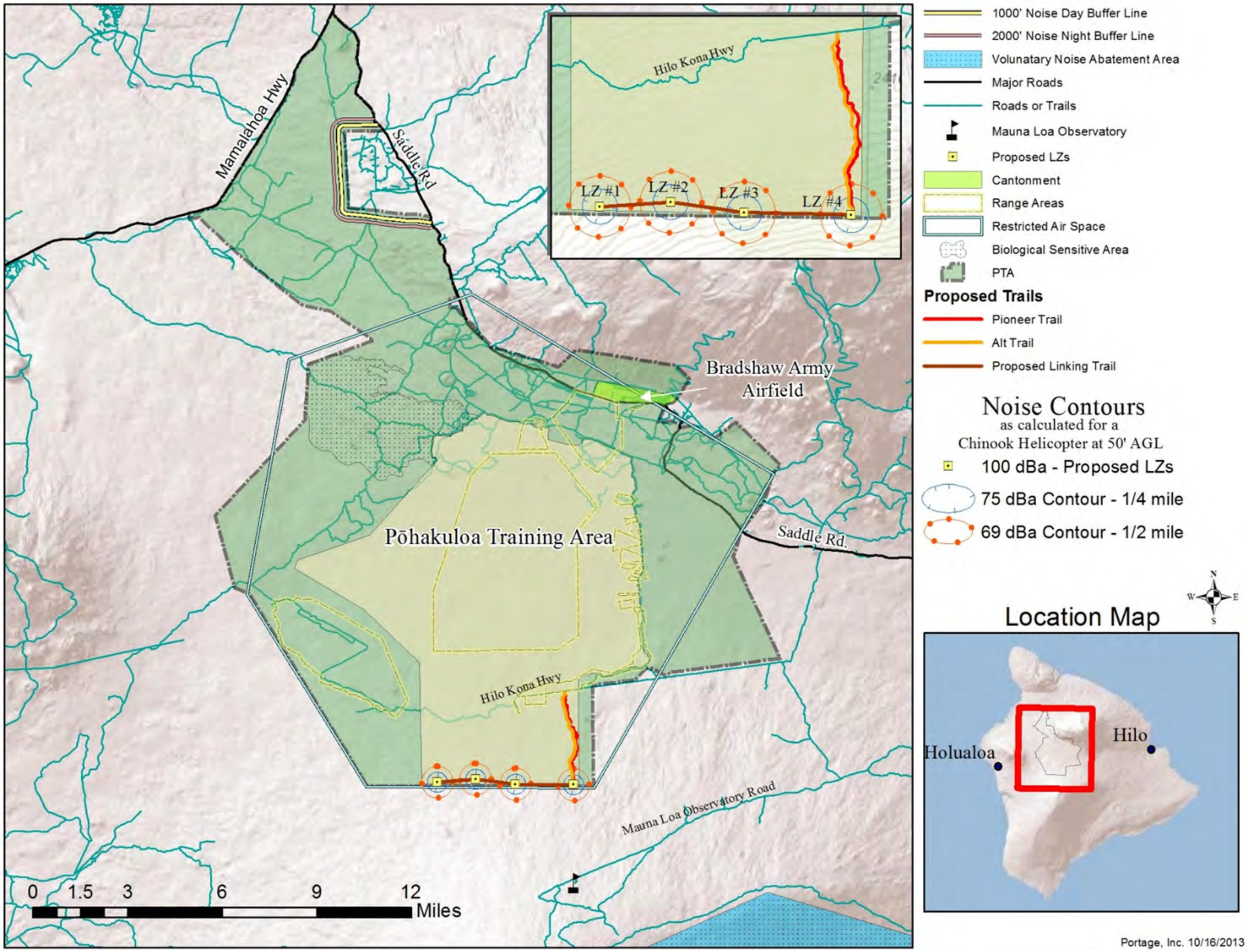

Figure 4-15. Map showing maximum noise levels decreasing with distance from LZs.

4.8.3.3 Alternative 1– Alternative Trail Location. Noise impacts associated with the construction activities of Alternative 1 would be the same as those described for the Proposed Action, because both alternatives take the same amount of time to construct and are co-located with each other.

4.8.3.4 Alternatives 2 – Construction of Only One LZ. Noise impacts associated with the construction of Alternative 2 would be slightly less than those of the Proposed Action because this alternative would take 5 days less to construct. Noise impacts from operations would be similar to those of the Proposed Action. However, because operations would only occur on one LZ, operational noise at that location would last longer than the Proposed Action/Alternative 1, for which operations would likely be spread over four LZs.

4.8.3.5 Alternative 3 – Construction of Only Two LZs. Noise impacts associated with the construction of Alternative 3 would be slightly less than those of the preferred alternative because the alternative would take 2 days less to construct. Noise impacts from operations would be similar to those of the preferred alternative. However, because operations would only occur on only two LZs, operational noise at those locations may last longer than the preferred alternative or Alternative 1, for which operations would like be spread over four LZs.

4.8.3.6 Alternative 4 – Construction of Only Three LZs. Noise impacts associated with the construction of Alternative 4 would be slightly less than those of the preferred alternative because the alternative would take 1 day less to construct. Noise impacts from operations would be similar to those of the preferred alternative. However, because operations would only occur on only three LZs, operational noise at those locations may last longer than the preferred alternative or Alternative 1, for which operations would likely be spread over four LZs

4.9 Water Resources

This subsection presents the evaluation of impacts of the Action Alternatives on the water resources ROI, as discussed in Section 3, Affected Environment.

4.9.1 Impact Methodology

Potential impacts to water resources within the ROI were assessed using a methodology that determined whether project activities are consistent and compatible with federal, state, and local regulations and the effects on water resources within the ROI and surrounding areas. Direct and indirect impacts were determined by identifying types of water resources within and surrounding the ROI and then determining the sensitivity of those resources to the short- and long-term project impacts from point and non-point source pollution.

All Action Alternatives include construction of LZs and access trails on PTA. All Action Alternatives, except Alternative 2, include construction of linking trails. All Action Alternatives include helicopter training operations. All Action Alternatives are smaller in scope than the Proposed Action. Thus, no construction or operations activities occur external to PTA under any of the Action Alternatives.

4.9.2 Factors Considered for Determining Significance

Factors considered in determining a significant impact on water resources included the extent or degree to which its implementation would:

- Cause a change in surface water impairment status (i.e., exceeding the total maximum daily loads for sediments)

- Degrade surface water and groundwater quality in the ROI, thereby reducing the existing or future beneficial uses of that water or limit availability or accessibility to the beneficial use of that water

- Create or increase a potential risk to human health, or create or increase potential risk of environmental hazards

- Alter surface water movement patterns in a manner that would adversely affect water uses within or surrounding the ROI

- Create noncompliance with existing or proposed water quality standards or require an exemption from permit requirements in order for the project to proceed.

4.9.3 Summary of Impacts on Water Resources

In general the ROI, and PTA, lies in an area with exceptionally limited water resources. A very deep aquifer lies below the ROI, and surface water sources are located well away from the area. The impacts on water resources from the alternatives are summarized in Table 4-16 and discussed following the table.

Table 4-16. Summary of potential water resource impacts.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action
Impacts on watersheds and water supply	NI	NI	NI	NI	NI	NI
Impacts on surface water	<SI	<SI	<SI	<SI	<SI	NI
Groundwater impacts	NI	NI	NI	NI	NI	NI
Wastewater impacts	NI	NI	NI	NI	NI	NI

4.9.3.1 Proposed Action. The Proposed Action would have no impact on the existing watersheds or the current water supply at PTA. There are currently no water bodies within PTA, including the area immediately surrounding the proposed construction, due to the high porosity of the area. The high porosity of soils does not allow water to accumulate. Potable water would still be trucked in as it is currently for the foreseeable future (U.S. Army 2013a).

The Proposed Action would not impact any wastewater or groundwater. Due to groundwater depths near the proposed construction areas and within the saddle region, construction activities are highly unlikely to encounter any groundwater, nor is there any potential for surface water run-off to be discharged into groundwater.

As described in the Proposed Action, site clearing and grading from the construction of the LZs and trails would expose lava flow areas and soils to potential surface water run-off that could cause erosion. Because of the potential for erosion from surface water run-off, it is anticipated that the construction of the trails and LZs would have a less-than-significant impact. BMPs implemented during construction can mitigate any potential impacts. BMPs may include:

- Erosion and sediment control inspections and maintenance practices
- Regular removal of built-up sediment from erosion control features.

The Proposed Action would be in compliance with existing water quality and regulatory standards and not create or increase risk to human health or cause an environmental hazard. The Proposed Action would have no effect on surface water movement patterns in so much that it would not adversely affect existing water use within the ROI. The proposed training operations would also have no impact on water resources.

4.9.3.2 Alternative 1 – Alternative Trail Location. Water resource impacts associated with activities of Alternative 1 would be the same as those described for the Proposed Action, because both alternatives would impact a similar area.

4.9.3.3 Alternatives 2 – Construction of Only One LZ. Water resource impacts associated with Alternative 2 would be slightly less than those of the Proposed Action, because this alternative would impact less surface area. Alternative 2 would have no effect on surface water movement patterns in so much that it would not adversely affect existing water use within the ROI. The proposed training operations would also have no impact on water resources

4.9.3.4 Alternative 3 – Construction of Only Two LZs. Water resource impacts associated with Alternative 3 would be slightly less than those of the preferred alternative, because the alternative impacts less surface area. Impacts would be slightly greater than Alternative 2. Alternative 3 would have no effect on surface water movement patterns in so much that it would not adversely affect existing water use within the ROI. The proposed training operations would also have no impact on water resources.

4.9.3.5 Alternative 4 – Construction of Only Three LZs. Water resource impacts associated with Alternative 3 would be slightly less than those of the preferred alternative, because the alternative impacts less surface area. Impacts would be slightly greater than Alternatives 2 and 3. Alternative 4 would have no effect on surface water movement patterns in so much that it would not adversely affect existing water use within the ROI. The proposed training operations would also have no impact on water resources.

4.10 Soil Resources

This subsection presents the evaluation of impacts of the Action Alternatives on the geology and soil resources ROI, as discussed in Section 3, Affected Environment.

4.10.1 Impact Methodology

Potential impacts from the Action Alternatives were assessed using a methodology that determined whether project activities would be consistent and compatible with federal, state, and local regulations and the effects on geologic and soil resources within the ROI. The identification of direct and indirect impacts relied on the use of available geologic studies, reports, observations, and professional judgment to make reasonable inferences about the potential impacts of the project, given the interpretation of the geologic setting provided in Subsection 3.10, Soil Resources.

All Action Alternatives include construction of LZs and access trails on PTA. All Action Alternatives, except Alternative 2, include construction of linking trails. All Action Alternatives include helicopter training operations. No construction or operations activities occur external to PTA under any of the Action Alternatives.

4.10.2 Factors Considered for Determining Significance of Impacts

Factors considered in determining whether an alternative would have a significant geologic impact include the extent or degree to which its implementation would:

- Result in substantial soil loss (e.g., through increased erosion) or terrain modification (e.g., altering drainage patterns through large-scale excavation, filling, or leveling)
- Cause impacts that conflict with existing government regulations and statues
- Increase the exposure of people or structures to geologic hazards (e.g., ground shaking, liquefaction, volcanism, slope failure, expansive soils, hazardous constituents of soils) that could result in injury, acute or chronic health problems, loss of life, or major economic loss
- Adversely alter existing geologic conditions or processes such that the existing or potential benefits of the geologic resources are reduced (e.g., construction of a jetty that would interfere with sand transport processes and beach formation or would increase shore erosion).

4.10.3 Summary of Impacts

The impacts on geology and soil resources from the Action Alternatives are summarized in Table 4-17 and discussed following the table.

Table 4-17. Summary of potential geology and soil resource impacts.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4– Construction of Only Three LZs	No Action
Loss of soil (from erosion)	<SI	<SI	<SI	<SI	<SI	NI
Conflicts with current regulations and statues	NI	NI	NI	NI	NI	NI
Altering existing geologic conditions	NI	NI	NI	NI	NI	NI
Exposure to geologic hazards	<SI	<SI	<SI	<SI	<SI	NI

4.10.3.1 Proposed Action. Site clearing and grading at the proposed LZs and the access trails would expose solidified lava-flow areas and soil to enhanced erosion by water and wind. To mitigate for potential erosion during and after construction, erosion-control practices would be used. Erosion control includes the placement of silt fences, waddles, etc. Long-term soil loss and erosion would not be significant because of the low availability of soil in the immediate vicinity of the LZs and access trails and their overall management. The Army would maintain access trails and LZs using BMPs to manage potential erosion. The use of the LZs by helicopters would not contribute to soil loss. Available soil and rock particles may be moved by rotorwash as the LZs are in use, but this material movement would be limited to the area of the LZs, and rotorwash is expected to be less than 120 ft (36.5 m) from the point of the helicopter landing (Peshut et al 2013).

The potential exposure to geologic hazards such as slope failure and soil containments is low, because the proposed LZs and access trails are located mostly on solidified lava flows with little soil. The potential of slope failure from the constructed LZs is a low possibility, but the cut angle of repose would limit such slope failures. Exposure to fugitive dust particulates and naturally occurring metals would be minimal during construction and mitigated with the use of dust-suppression techniques.

Construction of the access trails would require areas to be cut to an acceptable grade for equipment to reach the designated LZ locations. The LZs would need to be leveled to a 5% grade in order for acceptable helicopter use and ideal training conditions. Construction of the LZs and access trails would not result in a significant change in the beneficial use of the geology and soil; therefore, it is anticipated that construction and use of the LZs would have no impact on existing geologic conditions.

The construction and use of the LZs would follow all current regulations and statutes. Conflicts with current regulations and statutes would not occur.

4.10.3.2 Alternative 1 – Alternate Trail Location. Impacts from the construction of an alternative access trail to the proposed LZs and training operations would be similar to those described in the Proposed Action.

4.10.3.3 Alternative 2 – Construction of Only One LZ. The construction of only LZ 4 would have the potential for less exposure to geologic hazards and soil loss than the Proposed Action, because the construction would only consist of one LZ and no linking trails. However, the overall potential geologic hazards and soil loss impacts would be similar to those described in the Proposed Action, which were found to be less than significant.

Similar to the Proposed Action, no impact to the existing geologic conditions is anticipated. The construction and use of the LZs would follow all current regulations and statutes. Conflicts with current regulations and statutes would not occur.

4.10.3.4 Alternative 3 – Construction of Only Two LZs. The construction of only LZs 3 and 4 would have the potential for less exposure to geologic hazards and soil loss than the Proposed Action, because the construction would only consist of two LZs and one connecting trail. However, the overall potential geologic hazards and soil loss impacts would be similar to those described in the Proposed Action, which were found to be less than significant.

Similar to the Proposed Action, no impact to the existing geologic conditions is anticipated. The construction and use of the LZs would follow all current regulations and statutes. Conflicts with current regulations and statutes would not occur.

4.10.3.5 Alternative 4 – Construction of Only Three LZs. The construction of only LZs 2, 3, and 4 would have the potential for less exposure to geologic hazards and soil loss than the Proposed Action, because the construction would only consist of three LZs and two connecting trails. However, the overall potential geologic hazards and soil loss impacts would be similar to those described in the Proposed Action, which were found to be less than significant.

Similar to the Proposed Action, no impact to the existing geologic conditions is anticipated. The construction and use of the LZs would follow all current regulations and statutes. Conflicts with current regulations and statutes would not occur.

4.11 Biological Resources

This subsection presents the evaluation of impacts of the Action Alternatives on the biological resources ROI, as discussed in Section 3, Affected Environment.

4.11.1 Impact Methodology

Potential impacts to endangered and threatened species, sensitive species, and other vegetation and wildlife species and to their respective habitats within the ROI were assessed by examining the planned activities in conjunction with past and present Section 7 ESA consultations, biological surveys, and relevant literature. All actions that could affect biological resources would be determined to be significant if that action substantially affects rare, threatened, or endangered species or their habitat.

All Action Alternatives include construction of LZs and access trails on PTA. All Action Alternatives, except Alternative 2, include construction of linking trails. All Action Alternatives include helicopter training operations. No construction or operations activities occur external to PTA under any of the Action Alternatives.

4.11.2 Factors Considered for Impact Analysis

Generally speaking, the impacts to the biological resources may be short- or long-term, direct, or indirect. Direct impacts on biological resources result when those resources are altered, destroyed, or removed during the project. Examples of direct impacts include injury or mortality to biological resources from collisions with helicopters. Indirect impacts occur when project-related activities result in environmental changes that can influence the survival, distribution, or abundance of a species. An example of an indirect impact includes the long-term effects of noise.

The significance of all potential impacts, as defined by NEPA, to biological species (vegetation and wildlife) is based on the following:

- Importance or value of the resource affected
- Occurrence of a resource in the region
- Sensitivity of a resource to the potential impact
- Anticipated severity of the potential impact
- Anticipated duration of the potential impact.

When evaluating the potential impacts to biological resources, the sensitivity of the vegetation or wildlife is taken into account. Sensitive species are considered significant, while common species are considered significant if they are sensitive to modification. The determination of a potential impact’s significance on common species depends on habitat quality, population size, and the extent of the anticipated impact.

Evaluation the significant environmental consequences for each alternative included examining how the potential impact would affect the vegetation and wildlife. For each alternative, the impact on the vegetation and wildlife resources was considered using the following factors:

- Whether or not the impact would cause the injury or mortality that would result in a “take” under the ESA for an identified threatened or endangered species.

- Whether or not the impact would reduce the population of a sensitive species. A reduced population is defined as a reduction in numbers; alteration in behavior, reproduction, or survival; introductions of new species; or loss or disturbance of habitat.

- Whether or not the impact would have an adverse effect on the species habitat, such as a critical habitat.

Information on sensitive species is based on existing data from biological assessments, surveys, and previous EAs. A list of sensitive species that potentially occur in the ROI is provided in Table 3-10. There are sensitive species that have been known to occur and that can be potentially affected by construction of the proposed LZs and access trails and training operations: the Hawaiian catchfly (*Silene hawaiiensis*), Hawaiian goose (*Branta sandvicensis*), Hawaiian hoary bat (*Lasiurus cinereus semotus*), Hawaiian petrel (*Pterodroma sandwichensis*), and band-rumped storm petrel (*Oceanodroma castro*). Detailed descriptions of the potentially impacted species are found in Subsection 3.11, Biological Resources.

Section 7 of the ESA calls for interagency cooperation to conserve federally listed species and designated critical habitat. A Section 7 consultation requires that cooperating federal agencies determine whether or not a Proposed Action may affect listed species or critical habitat. As mentioned in Subsection 3.11, no critical habitat is located in the immediate vicinity of the proposed LZs or access trails.

4.11.3 Summary of Impacts

The impacts on biological resources from the Action and Alternatives are summarized in Table 4-18 and discussed following the table.

Table 4-18. Summary of potential biological resource impacts.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action
Impacts from site clearing and grading	<SI	<SI	<SI	<SI	<SI	NI
Impacts from helicopter-caused fire	NI	NI	NI	NI	NI	NI

Table 4-18. (continued).

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action
Impacts from nonnative species	<SI	<SI	<SI	<SI	<SI	NI
Impacts from noise	<SI	<SI	<SI	<SI	<SI	NI
Impacts from collisions with helicopters	<SI	<SI	<SI	<SI	<SI	NI
Impacts from wind from helicopters	NI	NI	NI	NI	NI	NI

4.11.3.1 Proposed Action. Impacts from the Proposed Action are described below.

4.11.3.1.1 Impacts to Sensitive Species—The construction of the proposed LZs and access trails could cause habitat loss, injury, or death for some members of sensitive species. The potential impacts could occur when construction or maintenance equipment travels across habitat within the proposed construction area. Based on the surveys conducted between April 2013 and June 2013, potential habitat for sensitive species is limited to all but a few species in the area of the proposed LZs and access trails because of the lack of available resources needed by wildlife species (e.g., sparse vegetation for food and cover) (Peshut et al. 2013). Impacts to sensitive species from construction activities are anticipated to be less than significant because of the potential habitat for the observed sensitive species and measures to mitigate any potential habitat loss, injury, or death. Mitigation measures include marking locations for known species, identifying potential nesting habitat prior to construction, and observing construction operations to avoid any potential incidental deaths (Peshut et al. 2013). The conducted surveys showed potential habitat for Hawaiian petrel, band-rumped storm petrel, and the Hawaiian catchfly. Specific impacts to these species and other sensitive species that have the potential to occur near the LZs are discussed individually below.

In general, wildland fire is a devastating threat to sensitive species, because fire can cause death and habitat loss. However, not only is a potential wildland fire remote because of the sparse vegetation but also because of the unlikely event of a helicopter crash and/or the remoteness of a crash with fire. Therefore, the potential for impacts to sensitive species experiencing habitat loss and death from a wildland fire is low, and thus implementing the proposed action was determined to result in no impact.

The introduction of nonnative vegetation and wildlife species can have direct and indirect impacts on biological species and their habitats, because nonnative species compete with native species for available resources, prey on native species, and carry disease. Potential impacts of nonnative species for the Proposed Action include the transportation of nonnative species to the proposed LZs by helicopter and construction equipment. The potential for transportation of nonnative species is low and less than significant because of mitigation measures that would require the cleaning and inspection of helicopters and construction equipment prior to proposed activities (Peshut et al. 2013). These measures should minimize the transport of nonnative species to area of the proposed LZs.

Noise in the form of rotorwash from helicopter operations has the potential to impact sensitive species. The noise from helicopter operations is a potential distraction to wildlife and may cause them to flee the area, interrupting life-cycle activities and modifying behavior. However, in most cases of disturbance from noise, wildlife will avoid the disturbance and then return to normal when it is over, and after repeated disturbances, wildlife will become habituated to frequent noise (Whittaker and Knight 1998; Peshut et al. 2013). It is unlikely that wildlife species would be attracted to the noise. According to the DoD operational noise manual (U.S. Army 2005b), the specific reaction to noise is dependent on the species, and the reaction of a specific species can only be known after subsequent studies. Although results from studies cannot be applied across species, studies have demonstrated that birds can become habituated and co-exist with loud noises (Peshut and Schell 2011a; Delaney et al. 2000; Pater et al. 2009). Furthermore, published academic literature on the effects of noise on bird species has indicated that they are more affected by ground-based noise, such as hiking and hunting, than air-based noise (Delaney et al. 2000). Noise from construction activities would cause land-based noise within the construction area. This noise is temporary, and it is anticipated that any sensitive species in the area would leave the area and return when the noise subsides. Noise has no impact on vegetation species. The overall potential impacts from noise to sensitive species is anticipated to be less than significant, because species would not be attracted to the noise and would vacate the area until the noise subsides; the short duration of noise events would be less than 10 minutes.

Collisions of sensitive bird species and the Hawaiian hoary bat with the helicopters constitute a potential impact that could cause injury or death to members of those species. Air collisions are a possibility. Academic literature has indicated that most collisions with birds happen near runways where birds tend to migrate to avoid predators and because airports present roosting and feeding areas (Burger 1983). Military records indicate that there have only been two document air collisions from 2001 to 2010 for all Army aircraft flights in the state of Hawaii (Peshut et al. 2013). In addition, it has been noted from viewing birds from helicopters in flight that birds will change their flight paths to avoid helicopters (Peshut 2011b). Within the ROI, and specifically near the LZs, the potential impact between helicopters and sensitive species is low and thus considered less than significant. This is because of the locations of known bird and bat habitat, the lack of potential habitat near the LZs, established flight procedures, and mitigations to prevent collisions (USACE and COE 2009). The mitigation measures include discontinuing the use of specific LZs for a period in the presence of nesting birds within 330 ft (100 m) of that LZ (Peshut et al. 2013).

There is no impact from dust and wind to sensitive species throughout the ROI because of the scattered nature of the vegetation over barren rock and the small amount of available particulate matter. Furthermore, potential impacts from wind created by rotorwash from helicopters would not be greater than impacts from the natural wind conditions near the proposed LZs (Peshut et al. 2013).

Hawaiian Catchfly. The April 2013 botanical surveys (Peshut et al. 2013) to determine the presence and potential habitat of sensitive species observed the Hawaiian catchfly at four locations in the access trails between the LZs near LZ 2 and LZ 4. However, no Hawaiian catchfly were observed in the proposed LZ locations (refer to Peshut et al. [2013] in Appendix A for specific locations and survey methods). Potential direct impacts from the construction of the LZs and training operations include temporary localized disturbance and dust and wind generated from rotorwash.

To avoid localized disturbance during construction, the four known LZ locations would be marked with flagging to identify the location so construction equipment operators can avoid these species during

LZ construction. Additionally, the survey area for the proposed route between LZs is an area of 130 ft (40 m) wide; therefore, the Hawaiian catchfly locations can be easily avoided.

Wind and dust generated from helicopter rotorwash is a potential impact. Due to the limited amount of fine particulate matter, the short duration of wind generation events (less than 10 minutes), and natural wind velocities in the area of the LZs, it is anticipated that wind and dust impact would be minimal and have no impact on the Hawaiian catchfly (Peshut et al. 2013).

It is anticipated that potential impacts to the Hawaiian catchfly would be insignificant and not increase from the impacts from natural conditions in the ROI.

Hawaiian Petrel. The May and June 2013 surveys for Hawaiian petrel presence and potential habitat recorded no Hawaiian petrel calls, but potential nesting habitat is present near the locations of the proposed LZs. Refer to Peshut et al. (2013) in Appendix A for survey methods and results. Potential direct impacts from the construction of the LZs and training operations include injury or death from construction activities, noise disturbances, and air collisions.

If present during construction, eggs, chicks, and/or adults could be injured or killed if occupied burrows collapse under the bulldozer. However, this is not anticipated, because no Hawaiian petrels were detected during the radio surveys, and the lack of visual evidence indicated no recent use during habitat surveys. Additionally, potential suitable habitat near the LZs is sparse and would provide limited areas for petrel colonies. It is not anticipated that an active breeding colony is present at the area of the proposed LZs or access routes.

Noise is a potential impact that could cause the petrel to leave the area, interrupt life-cycle activities, or modify behavior. However, noise from training operations is temporary, allowing petrels to return to the area if present. The majority of the training operations are conducted during daylight hours, and because the petrel is a nocturnal bird species, it is anticipated that noise from operations would have little to no impact on the petrel. In addition, past surveys conclude that the petrel presence within the ROI is limited to a few individual birds that use the saddle region as a flyway. The limited number of petrels and their nocturnal tendencies would limit the overall impact of noise to the petrel.

It is anticipated that air collisions as a result of the training operations would not be a concern for Hawaiian petrels. Because the majority of training operations are conducted during daylight hours, petrels would not encounter helicopters. With limited individuals using the area during the night hours, encounters would be considered rare. Additionally, helicopters are typically slow moving at the elevations proposed for training activities at the LZs due to reduced aircraft performance, which would further reduce the likelihood of air collisions (Peshut et al. 2013). Based on this information, air collisions with Hawaiian petrels would be unlikely.

Artificial light sources are known to be hazardous to fledging petrels, because these light sources disrupt navigation; however, artificial light sources will not be placed at the LZs, because this is not consistent with realistic combat conditions. Therefore, no impacts to petrels from artificial light sources are expected (Peshut et al. 2013).

Band-Rumped Storm Petrel. The May and June 2013 presence surveys recorded several calls over the course of the survey, and potential nesting habitat was identified near the proposed LZs during the habitat surveys. Overall call activity was relatively low, indicating no colonial activity in proposed LZ area. Refer to Peshut et al. (2013) in Appendix A for survey methods and results. Potential direct impacts from the construction of the LZs and training operations include injury or death from construction activities, noise disturbances, and collisions.

If present during construction, eggs, chicks, and/or adults could be injured or killed if occupied burrows collapse under the bulldozer. However, construction of the LZs is not a concern because of the limited amount of suitable nesting habitat. Additionally, potential suitable habitat between LZs is sparse, which would provide limited areas for petrel colonies. Areas for potential nesting sites would be marked before construction of the LZs to ensure that these areas are avoided. It is not anticipated that an active breeding colony is present at the area of the proposed LZs or access routes.

Noise is a potential impact that could cause the petrel to leave the area, interrupt life-cycle activities, or modify behavior. However, noise from training operations is temporary, allowing petrels to return the area if present. The majority of the training operations are conducted during daylight hours, and because the petrel is a nocturnal bird species, it is anticipated that noise from operations would have little to no impact on the petrel. In addition, past surveys conclude that the petrel presence within the ROI is limited to a few individual birds that use the saddle region as a flyway. The limited number of petrels and their nocturnal tendencies would limit the overall impact of noise to the petrel.

It is anticipated that collisions as a result of the training operations would not be a concern for band-rumped storm petrels. Because the majority of training operations are conducted during daylight hours, petrels would not encounter helicopters. With limited individuals using the area during the night hours, encounters would be considered rare. Additionally, helicopters are typically slow moving at the elevations proposed for training activities at the LZs due to reduced aircraft performance, which would further reduce the likelihood of collisions (Peshut et al. 2013). Based on this information, potential collisions with band-rumped storm petrels are unlikely.

Artificial light sources are known to be hazardous to fledging petrels because they disrupt navigation; however, artificial light source would not be placed at the LZs, because this is not consistent with realistic combat conditions. Therefore, no impacts to petrels from artificial light sources are expected (Peshut et al. 2013).

Hawaiian Hoary Bat. The April 2013 surveys for potential habitat and presence of the Hawaiian hoary bat near the area of the proposed LZs and access routes showed that two potential habitat types were in the area. However, the identified habitat is not considered roosting habitat, which would indicate no daytime bat use. Refer to Peshut et al. (2013) in Appendix A for survey methods and results. Potential direct impacts on Hawaiian hoary bats from the construction of the LZs and training operations include noise disturbances and collisions.

Due to the lack of suitable roosting habitat, bat presence at the LZ area during daytime hours is improbable, so noise impacts would be unlikely. It is possible that bats would use this area during nighttime hours, but given the sparse vegetation and lack of available resources in the area, it is unlikely that bats are present in this area during nighttime hours. Because of this, any noise impacts on bats would be low.

Air collisions during training operations are not considered to be a concern for the Hawaiian hoary bat. Bat presence near the proposed LZ locations is rare, and bat density near the LZs is expected to be extremely low (Peshut et al. 2013). The potential for a helicopter collision with a bat is unlikely, because the bats are solitary, are only active during nighttime hours, only roost in trees in forested areas, and are not expected to depend on the habitat around the LZs for resources (Peshut et al. 2013). If bats are present during operations, they are expected to vacate the area.

Nēnē or Hawaiian Goose. The April 2013 surveys for presence and potential habitat for avifauna did not observe any nēnē at the proposed LZ area or the access trails. There is possibility that the nēnē could have a presence near the LZs, but due to the sparse vegetation and lack of resources, its presence is highly unlikely. Refer to Peshut et al. (2013) in Appendix A for survey methods and results. Potential direct impacts from the construction of the LZs and training operations include noise disturbances and air collisions.

Impacts from noise would be minimal. If a nēnē were to occupy the LZs during training, it is anticipated that the individual geese would depart the area when noise levels become loud and disruptive. An air collision is also unlikely, because the nēnē have been known to avoid helicopters during flight (Peshut 2011b). A January 2013 biological opinion (U.S. Army 2013, Appendix G) from the USFWS directs the Army for managing nēnē populations that are present on the PTA; management actions directed in that biological opinion would be followed for this project.

4.11.3.1.2 Impacts to Vegetation and Wildlife Species—The construction of the proposed LZs and access trails could cause habitat loss, injury, or death for some vegetation and wildlife. The potential impacts could occur when construction or maintenance equipment travels across habitat within the proposed construction area. Based on the surveys conducted in April 2013, potential habitat for wildlife species is limited to all but a few species in the area of the proposed LZs and access trails because of the lack of available resources need by wildlife species (e.g., sparse vegetation for food and cover) (Peshut et al. 2013). Avifauna surveys identified the presence of two MBTA species, the ‘apapane and ‘ōma‘o. Impacts to these species and other birds species from construction activities are anticipated to be less than significant because of the potential habitat for the observed sensitive species; measures to mitigate any potential habitat loss, injury, or death; and the expectation that bird species would vacate the area and return when the construction is over. Vegetation species located at the proposed LZs and access trails are common throughout the construction area and ROI. Individuals lost during construction would not limit the entire population within the area. Impacts to vegetation and wildlife species from construction activities are anticipated to be less than significant because of the potential habitat for the observed species.

In general, wildland fire is a devastating threat to vegetation and wildlife species, because fire can cause death and habitat loss. However, not only is a potential wildland fire remote because of the sparse vegetation but also because of the unlikely event of a crash and/or the remoteness of a crash with fire (Lugo 2010). Therefore, the potential for impacts to vegetation and wildlife species experiencing habitat loss and death from a wildland fire is low, and thus implementing the proposed action was determined to result in no impact.

The introduction of nonnative vegetation and wildlife species can have a direct and indirect impact on biological species and their habitats, because nonnative species compete with native species for available resources, prey on native species, and carry disease. Potential impacts of nonnative species for the Proposed Action include the transportation of nonnative species to the proposed LZs by helicopter and construction equipment. The potential for transportation of nonnative species is low and a less-than-significant impact because of mitigation measures that would require the cleaning and inspection of helicopters and construction equipment prior to proposed activities (Peshut et al. 2013). These measures should minimize the transport of nonnative species to the area of the proposed LZs.

Noise in the form of rotorwash from helicopter operations has the potential to impact wildlife species. The noise from helicopter operations is a potential distraction to wildlife and may cause them to flee the area, interrupt life-cycle activities, and modify behavior. However, in most cases of disturbance from noise, wildlife will avoid the disturbance and then return to normal when it is over, and after repeated disturbances, wildlife will become habituated to frequent noise (Whittaker and Knight 1998; Peshut et al. 2013). It is unlikely that wildlife species would be attracted to the noise. According to the DoD operational noise manual (U.S. Army 2005b), the specific reaction to noise is dependent on the species, and the reaction of a specific species can only be known after subsequent studies. Although results from studies cannot be applied across species, studies have demonstrated that birds can become habituated and co-exist with loud noises (Peshut and Schell 2011a; Delaney et al. 2000; Pater et al. 2009). Furthermore, published academic literature on the effects of noise on bird species has indicated that they are more affected by ground-based noise, such as hiking and hunting, than air-based noise (Delaney et al. 2000). Noise from construction activities would cause land-based noise within the construction area. This noise is temporary, and it is anticipated that any sensitive species in the area would leave the area and return when the noise is subsided. Noise has no impact on vegetation species. The overall potential impacts from noise to wildlife species is anticipated to be less than significant, because species would not be attracted to the noise and vacate the area until the noise subsides, the short duration of noise events (less than 10 minutes), and mitigation measures to minimize the effects. Mitigation measures include the majority of flight operations occurring during the day, this would allow roosting to occur at night (Peshut et al. 2013).

Collisions of bird species with helicopters constitute a potential impact that could cause injury or death to those species. Collisions are a possibility. Academic literature has indicated that most collisions with birds happen near runways where birds tend to migrate to avoid predators and because airports present roosting and feeding areas (Burger 1983). The military records have indicated that there have only been two documented collisions from 2001–2010 for all Army aircraft flights in the state of Hawaiʻi (Peshut et al. 2013). In addition, it has been noted that from viewing birds from helicopters in flight that birds will change their flight paths to avoid helicopters (Peshut 2011b). Within the ROI and specifically near the LZs, the potential impact between helicopters and wildlife species is low and thus considered less than significant. This is because of the locations of known bird habitat, the lack of potential habitat near the LZs, established flight procedures, and mitigations to prevent collisions (USACE and COE 2009). The mitigation measure includes discontinuing the use of specific LZs for a period of time in the presence of nesting birds within 330 ft of that LZ (Peshut et al. 2013).

There is no impact from dust and wind to sensitive species throughout the ROI because of the scattered nature of the vegetation over barren rock and the small amount of available particulate matter. Furthermore, potential impacts from wind created by rotorwash from helicopters would not be greater than impacts from the natural wind condition near the proposed LZs. It is anticipated that the Action Alternatives would have no impact on any listed plant species, because flight operations would be above any plant habitat and the construction of the trails and LZs are outside any listed plant habitat (Peshut et al. 2013).

4.11.3.2 Alternative 1 – Alternative Trail Location. Impacts of Alternative 1 from the proposed construction of the LZs and conduct of training operations would be similar to those described in the Proposed Action.

4.11.3.3 Alternative 2 – Construction of Only One LZ. The construction of only LZ 4 would have less impact to biological resources than the Proposed Action and the other Action Alternatives, because construction activities would only consist of the one access trail, one LZ, and no linking trails. Mitigation measures would ensure any nearby Hawaiian catchfly locations would not be affected. Other potential impacts to biological resources during construction and training operations are similar to those described for the Proposed Action.

4.11.3.4 Alternative 3 – Construction of Only Two LZs. The construction of only LZs 3 and 4 would have less impact to biological resources than the Proposed Action and Alternative 4 but more potential impact than Alternative 2, because construction would consist of only one access trail, two LZs, and the LZs' associated linking trails. Mitigation measures would ensure any nearby Hawaiian catchfly locations would not be affected. Other potential impacts to biological resources during construction and training operations are similar to those described for the Proposed Action.

4.11.3.5 Alternative 4 – Construction of Only Three LZs. The construction of only LZs 2, 3, and 4 would have the potential for less impact to biological resources than the Proposed Action but more potential for impacts than both Alternatives 2 and 3, because construction would only consist of one access trail, two LZs, and the LZs' associated linking trails. Mitigation measures would ensure any nearby Hawaiian catchfly locations would not be affected. Other potential impacts to biological resources during construction and training operations are similar to those described for the Proposed Action.

4.12 Cultural Resources

This subsection presents the evaluation of impacts of the Action Alternatives on the cultural resources ROI, as discussed in Section 3, Affected Environment.

4.12.1 Impact Methodology

A literature search was conducted to gather information on cultural resources in the ROI, namely the proposed Pioneer Trail to provide access to the LZs from the Hilo Kona Highway, an alternative trail approximately parallel to the Pioneer Trail, four LZs, and the trails linking them. The search was conducted to determine direct, indirect, and cumulative impacts on cultural resources within the ROI.

Maps, cultural resource reports, resource management plans, and past environmental documents have been examined to identify cultural resources in the ROI. In addition, an archaeological survey was conducted (Yamauchi 2013) to provide cultural resource survey results within the ROI (see Appendix B). The survey resulted in the identification of three cultural sites, none of which are recommended as eligible for the NRHP (16 USC 1A § 470 et seq.). See Subsection 3.12, Cultural Resources, for more details on known and assumed cultural resources.

All Action Alternatives include construction of LZs and access trails on PTA. All Action Alternatives, except Alternative 2, include construction of linking trails. All Action Alternatives include helicopter training operations. No construction or operations activities occur external to PTA under any of the Action Alternatives.

4.12.2 Factors Considered for Impact Analysis

Several federal laws and regulations guide the protection of cultural resources, primary among them is the NHPA (16 USC 1A § 470 et seq.), specifically Section 106. Section 106 of the NHPA requires that all federal agencies consider the impact of their actions on properties that are on, or eligible for listing on, the NRHP. Called historic properties, they would potentially include some of those that are significant for their importance to Native Hawaiian groups. An undertaking would have an effect on a historic property when that undertaking may alter the characteristics that make the property eligible for inclusion on the NRHP. Two determinations of effect can be made: (1) no historic properties affected, meaning there are either no historic properties within the ROI or there are historic properties, but they would not be affected by the undertaking, or (2) historic properties affected, meaning that historic properties exist within the ROI and may be affected by the undertaking. If the latter determination is made, it is then required to determine whether the effect would be adverse. Adverse impacts include the following:

- Physical destruction, damage, or alteration of all or part of the property
- Isolation of the property or alteration of the character of the property's setting when that character contributes to the property's qualifications for the NRHP

- Introduction of visual, audible, or atmospheric elements that are out of character with the property, or changes that may alter its setting

- Neglect of a property, resulting in its deterioration or destruction

- Transfer, lease, or sale of a property without adequate provisions to protect its historic integrity.

Native Hawaiian cultural resources include cultural practices and beliefs, sacred sites, burials, and cultural items. Although they may not be eligible under NRHP criteria, they may be protected under the American Indian Religious Freedom Act (42 USC §§ 1996a and 1996b), ARPA (16 USC 1B § 470aa et seq.), or Native American Graves Protection and Repatriation Act (25 USC 32 § 3001 et seq.). Factors considered in determining whether an alternative would have a significant impact on cultural resources include the extent or degree that its implementation would result in the following:

- An adverse effect on a historic property, as defined under Section 106 of the NHPA and its implementing regulations (36 CFR § 800)

- A violation of provisions in the American Indian Religious Freedom Act, ARPA, or Native American Graves Protection and Repatriation Act.

Opinions differ on the use of Mauna Loa for nontraditional activities such as the Proposed Action. Broadly, the public is divided into two groups, those who believe traditional and contemporary activities can co-exist and those who believe that disturbance of Native Hawaiian lands is significant. Additionally, Native Hawaiians have expressed concern over access to traditional and religious sites for ceremonial purposes, access for hunting and gathering, access to trails and known travel corridors, protection and preservation of archaeological and traditional sites, interpretation of significance based on Native Hawaiian tradition and the knowledge of community elders, community involvement in managing cultural resources on Army land, and compliance with federal and state laws and regulations concerning cultural-resources protection (USAEC 2008) and religious practices (University of Hawaiʻi 2009, p. 1-1). Some Native Hawaiians have also expressed concern with the cumulative impacts associated with various and multiple activities from a wide range of groups (University of Hawaiʻi 2009).

4.12.3 Consultation

In compliance with the NHPA, the Army consulted the Hawaiʻi State Historic Preservation Division (SHPD) and 30 additional agencies/individuals on the Proposed Action (see Section 7, Consultation and Coordination, and Appendix B, Enclosure 1). There has been no response from SHPD, to date, to the November 26, 2013, consultation letter (Appendix B). Under the regulations, SHPD has 30 days from receipt of the letter in which it needs to state an objection. Also, there was one response provided to the Army from the initial consultation letter issued July 16, 2013. The Flores-Case ʻOhana raised several concerns (Appendix B) in an e-mail dated August 9, 2013. Under Section 106 consultation (36 CFR § 800), a federal agency is obligated to take comments into consideration, but there is no obligation to formally resolve or respond to them.

4.12.4 Summary of Impacts

Potential impacts to cultural resources are summarized in Table 4-19 beginning with those related to cultural resources and followed by those related to cultural beliefs and practices. These impacts are discussed following the table.

Table 4-19. Summary of potential cultural resource impacts.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Cultural resources – inadvertent landings resulting in the physical destruction, damage, or alteration of all or part of the property	<SI	NI	<SI	<SI	<SI	NI
Beliefs/practices – access restrictions that could isolate the property or alter the character of the property's setting when that character contributes to the property's qualifications for the NRHP	NI	NI	NI	NI	NI	NI
Beliefs/practices – introduction of visual, audible, or atmospheric elements, due to the presence of military helicopters that could impact the quality or frequency of cultural practices and beliefs. For some Native Hawaiians, any flights in the vicinity of Mauna Loa will be perceived as causing significant impacts. However, alternative design features and	<SI	<SI	<SI	<SI	<SI	NI

Table 4-15. (continued.)

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
mitigations lessen the level of significance.						
Beliefs/practices – introduction of visual, audible, or atmospheric elements due to the presence of military helicopters that could impact the quality or frequency of cultural practices and beliefs. Native Hawaiians who believe that cultural practices can exist alongside secular activities will see that compliance with regulations and careful planning and implementation can ensure less-than-significant impacts to the culturally significant lands.	<SI	<SI	<SI	<SI	<SI	NI

4.12.5 Summary of Direct Impacts to Cultural Resources

A survey conducted in February, March, and September of 2013 of the proposed Pioneer Trail to provide access to the LZs from the Hilo Kona Highway, an alternative trail approximately parallel to the Pioneer Trail, four LZs, and trails linking the LZs revealed no cultural resources directly within the LZs (Yamauchi 2013) (see Appendix B). The surveys did identify three potential cultural sites, all of which are located on the northern portion of Pioneer Trail. Under the Action Alternatives, no cultural sites would be directly impacted. The only cultural sites identified during the 2013 surveys are located a minimum of 111.5 ft (34 m) from the proposed Pioneer Trail and can be avoided during construction activities. No direct impacts would occur from project activities.

The February and March 2013 survey identified two potential cultural resources within approximately 115 ft (35 m) of the proposed Pioneer Trail and another approximately 128 ft (39 m) from the proposed trail. Site T-022613-01 is an elongated-shaped excavated pit, located at the base of the k4 ‘a‘ā flow and at the edge of the Klo pāhoehoe flow. This site is located approximately 115 ft (35 m) from the proposed Pioneer Trail. The excavated pit measures 12 ft (3.7 m) long by 5.5 ft (1.65 m) wide by 2.3 ft (0.70 m) deep with 140˚/320˚ long axis. Ungulate scat and 0.50-caliber shells are present nearby, but no military impacts were observed. The floor of the excavated pit consists of sediment with pāhoehoe pebbles and cobbles. Excavated cobbles and boulders are discretely clustered around the southwest, north, and northeast edges of the feature while some cobbles are present in the interior of the feature. There is no evidence of bashing on the excavated material or on the lip of the excavated pit, which would be expected if the pit was anthropogenic in origin. Alternatively, the possibility exists that the excavated pit was formed naturally by a methane gas explosion that occasionally occurs with older lava flows that are near the edges of younger lava flows.[a]

Site T-022613-02 is a circular-shaped excavated pit, located at the base of the k4 ‘a‘ā flow and at the edge of the Klo pāhoehoe flow. This site is located approximately 111.5 ft (34 m) from the proposed Pioneer Trail. Excavated cobbles and boulders are distributed along the west, north, and northeast edges of the feature, and the pit floor consists of sediment with pāhoehoe pebbles and cobbles. The excavated material is one course high, and there is no evidence of bashing on the excavated material or on the lip of the excavated pit. The excavated pit measures 4 ft (1.2 m) long by 2.3 ft (0.7 m) wide by 2.3 ft (0.70 m) deep and with 130˚/310˚ long axis. Military debris includes 0.50-caliber shells located near the feature, but no impacts were observed.

Site T-022613-03 is a circular-shaped cairn situated on top of a grayish colored ‘a‘ā boulder and is located on the dark-brown k4 ‘a‘ā flow. This site is approximately 128 ft (39 m) from the proposed Pioneer Trail. The feature is stacked three courses high with cobbles and boulders. The cairn measures 3 ft (0.95 m) long by 2.9 ft (0.90 m) wide by 1.5 ft (0.46 m) high and with 70˚/250˚ long axis. The difference in color between the boulder and the surrounding ‘a‘ā renders the cairn highly visible and may have functioned as a route marker.

Of the three potential cultural sites identified, none is recommended as eligible for the NRHP, and all can be avoided during construction. Thus, no direct impacts to cultural resources are anticipated.

4.12.5.1 Proposed Action. Impacts for the Proposed Action are as follows:

- Proposed LZs 1, 2, 3, and 4: The field survey determined that no cultural or archaeological resources would be directly affected within the LZs.

- Pioneer Trail: The field survey determined that two potential cultural resources are located within approximately 115 ft (35 m) of the proposed Pioneer Trail and another approximately 128 ft (39 m) from the proposed trail. Steps to prevent disturbance of these sites during construction would prevent direct impacts to cultural resources during the Proposed Action.

- Linking Trails: The field survey determined that no cultural resources or archaeological sites would be directly affected within the area of the linking trails.

- Flight Paths: No direct impacts to cultural resources or culturally important areas would result from the use of the proposed flight paths over this area. All flights would remain within the boundary of the PTA, and the flight hours would not be increased due to the Proposed Action.

4.12.5.2 Alternative 1 – Alternative Trail Location. The field survey determined that no cultural resources or archaeological sites would be directly affected within the area of the existing

a. Personal communication from J. Taomia, U.S. Army Garrison PTA Hawai‘i, June 10, 2013.

alternate trail located on PTA. This alternative would have the fewest potential impacts to cultural resources.

4.12.5.3 Alternatives 2, 3 and 4. Implementing Alternatives 2, 3, and 4 was found to have no direct impact to cultural resources regarding the proposed LZs, linking trails, and flight paths, because no cultural resources were identified for these locations.

Implementing Alternatives 2, 3, and 4 was found to have less-than-significant direct impacts to cultural resources regarding constructing the Pioneer Trail, because steps to prevent disturbance of two nearby potential cultural resources during construction activities would prevent direct impacts to occur.

Thus, overall, impacts of implementing Alternatives 2, 3, and 4 were found to be similar to the Proposed Action and found to be less than significant.

4.12.6 Summary of Indirect Impacts

Indirect and cumulative impacts may occur for all Action Alternatives except the No Action Alternative. Indirect and cumulative impacts to the quality and frequency of cultural beliefs and practices could occur from access restrictions by practitioners to culturally important resources. However, all LZs and trails for the Proposed Action are located on PTA; therefore, access would not be restricted in areas that are culturally significant. In addition, indirect and cumulative impacts may occur from the introduction of audible and visual elements by military helicopters. Introduction of such elements could result in the alteration of the character of all or part of culturally important properties.

Indirect and cumulative impacts are rendered less than significant through the following:

- All flights would stay within the boundary of the PTA, and no additional flight hours are planned due to the any of the Action alternatives.

- As detailed in Subsection 4.8, Noise, cultural practitioners in the areas near PTA may experience and perceive noise as a distraction/annoyance under all Action Alternatives. However, the extent and magnitude of the distraction would be dependent on the distance the practitioner is from the noise source (PTA) at any point in time during use of the LZs. Modeled average noise levels were compatible with current recreational land uses, as outlined in Army Regulation 200-1 (U.S. Army 2007b). Noise from flights using the proposed LZs would be expected to be of short duration and should not obstruct or curtail practitioner activities. Because all flights are to be conducted within the boundary of the PTA, the potential impacts to practitioners would be minimized to levels that are less than significant.

- Surveys of LZs revealed no historic properties to alter or destroy.

- Cultural awareness training would be completed by all personnel, with particular emphasis on intangible resources and their importance to Native Hawaiians.

Practitioners near PTA may see helicopters in the area, depending on where the cultural practitioner is located at the time. However, flights and landings are of short duration and would not result in obstructing the cultural practitioners’ views or practices.

For some Native Hawaiians, any flights in the vicinity of Mauna Loa would be perceived as causing significant impacts; however, those Native Hawaiians who believe that cultural practices can exist alongside secular activities would see that compliance with regulations and careful planning and implementation can ensure less-than-significant impacts to the culturally significant lands. Mitigation efforts to ensure that impacts are less than significant include providing cultural awareness training for all personnel, with particular emphasis on intangible resources and their importance to Native Hawaiians.

4.13 Human Health and Safety

This subsection presents the evaluation of impacts of the Action Alternatives on the human health and safety ROI, as discussed in Subsection 3.13.2.1, Hazardous Materials, and Subsection 3.13.2.2, Depleted Uranium.

4.13.1 Impact Methodology

The alternatives were reviewed for the potential use of hazardous materials and generation of hazardous waste during construction and operations. The alternatives were assessed for compliance with applicable SOPs and health and safety plans in order to avoid potential hazards. The locations of potential DU-impacted areas at PTA were evaluated to determine whether the Action Alternatives posed risks associated with potential exposure to DU based on findings of the *Final Pohakuloa Training Area Firing Range Baseline Human Health Risk Assessment for Residual Depleted Uranium* (Cabrera Services 2010).

The locations of the Action Alternatives were compared with public accessibility to determine whether the potentially affected areas pose the potential of hazards to the public from construction. The existing safety programs and SOPs regarding construction and operational activities were reviewed.

The potential for wildfires resulting from the Action Alternatives was evaluated based on the IWFMP (U.S. Army 2003).

4.13.2 Factors Considered for Impact Analysis

Significant impacts on human health and safety resulting from the Action Alternative were evaluated based on the following criteria:

- The likelihood of a hazardous substance release from construction vehicles or helicopters
- Exposure of construction workers, pilots, or recreational users to hazardous materials or hazardous waste
- Exposure of construction workers, pilots, or recreational users to DU in excess of the Nuclear Regulatory Commission’s annual dose limit of 1 millisievert (or 100 mrem)
- Ability for the public to access areas with active construction and operational activities
- Exposure of construction workers and pilots to hazards not covered under existing safety programs and SOPs
- Type of vegetative fuels present at the LZs
- Use of weapons during training activities
- Implementation of the IWFMP (U.S. Army 2003).

4.13.3 Summary of Impacts

Human health and safety issues are discussed in detail in Section 3.13, Human Health and Safety. Hazardous materials used during all Action Alternatives would include construction vehicle and helicopter fuels and oils. Hazardous waste generation is not identified or expected as part of the proposed activities. Exposure to DU is not anticipated, because the Action Alternatives are not conducted in the DU Radiological Control Area (RCA) identified at PTA. Impacts from construction activities are addressed under existing safety procedures and SOPs. Because the Action Alternatives are all located on PTA, impacts from construction and operational activities on the public should be minimal. Wildfire preventive measures are addressed in the IWFMP (U.S. Army 2003). Impacts for the Action Alternative are summarized in Table 4-20 and discussed below.

4.13.4 Hazardous Materials

Potential release of, and human exposure to, petroleum oil and lubricants (POL) associated with construction equipment and vehicle use exists during construction of the LZs and their access and linking trails for the Proposed Action. Impacts from POL use and the potential for releases associated with construction activities would be short-term, because construction activities are expected to last approximately 40 days. Long-term impacts are associated with helicopter use of the LZs. As outlined in Section 3.12.1 (Region of Influence), Army Regulation 200-1 (U.S. Army 2007d) and Department of the Army Pamphlet 200-1 (U.S. Army 2002) list requirements for Army personnel and contractors regarding POL use and spill response. All Army personnel and their contractors are required to follow these standards. In addition, refueling and maintenance activities associated with helicopter use are performed in designated facilities within PTA. Therefore, the impacts on human health from accidental releases and exposure to POL would be less than significant.

4.13.4.1 Alternative 1 – Alternative Trail Location. The potential for release of, and human exposure to, POL under Alternative 1 would be similar to the Proposed Action, because Alternative 1 and the Proposed Action are nearly the same scale and duration. Therefore, the impacts on human health from accidental releases and exposure to POL would be the same as was found under the Proposed Action: less than significant.

4.13.4.2 Alternative 2 – Construction of Only One LZ. The potential for release of, and human exposure to, POL associated with construction equipment and vehicle use exists during construction of the one LZ and access trail under Alternative 2. This potential would be similar to, but slightly less than, the Proposed Action. The potential for an actual release or exposure decreases as the duration of construction decreases. Construction of Alternative 2 is 5 days less than the Proposed Action and would potentially have the lowest potential for a release. The impacts on human health from accidental releases and exposure to POL would be less than the impacts found under the Proposed Action, which was determined to be less than significant.

4.13.4.3 Alternative 3 – Construction of Only Two LZs. The potential for release of, and human exposure to, POL associated with construction equipment and vehicle use exists during construction of the two LZs, access trail, and linking trails under Alternative 3. This potential would be similar to, but slightly less than, the Proposed Action. The potential for an actual release or exposure decreases as the duration of construction decreases. Construction of Alternative 3 is 2 days less than the Proposed Action. The impacts on human health from accidental releases and exposure to POL would be less than the impacts found under the Proposed Action, which was determined to be less-than-significant.

Table 4-20. Summary of impacts on human health.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
High likelihood of hazardous substance release	<SI	<SI	<SI	<SI	<SI	NI
Hazardous materials or waste exposure	<SI	<SI	<SI	<SI	<SI	NI
Radiation exposure in excess of regulatory exposure levels	<SI	<SI	<SI	<SI	<SI	NI
Public access to active construction and operational areas	<SI	<SI	<SI	<SI	<SI	NI
Exposure to health and safety hazards not covered under existing plans and SOPs	<SI	<SI	<SI	<SI	<SI	NI
Wildfire ignition	<SI	<SI	<SI	<SI	<SI	NI

4.13.4.4 Alternative 4 – Construction of Only Three LZs. The potential for release of, and human exposure to, POL associated with construction equipment and vehicle use exists during construction of the three LZs, access trail, and linking trails under Alternative 4. This potential would be similar to, but slightly less than, the Proposed Action. The potential for an actual release or exposure decreases as the duration of construction decreases. Construction of Alternative 4 is 1 day less than the Proposed Action. The impacts on human health from accidental releases and exposure to POL would be less than the impacts found under the Proposed Action, which was determined to be less than significant.

4.13.5 Depleted Uranium

Areas within PTA designated as DU RCAs are shown in Figure 4-16. These areas were identified from an aerial and visual radiation survey performed at PTA in 2008 and show the areas likely impacted by DU, which was a component of the Davy Crockett weapon system used during the 1960s. None of the Action Alternatives is located within any DU RCAs, making exposure to DU unlikely. In addition, the baseline risk assessment (Cabrera Services 2010) performed to assess potential exposure to DU at PTA showed that construction worker exposure to DU would result in a maximum dose of 4×10^{-4} mrem annually, well below the Nuclear Regulatory Commission's maximum allowable annual dose of 100 mrem. It is important to note the construction worker scenario assessed in the baseline risk assessment included exposure to 714 rounds of DU (the maximum total number of rounds expected to have been fired at PTA during the 1960s) over the course of 3 years for 250 days per year (Cabrera Services 2010). This exposure duration is much greater than the exposure duration for the construction workers, pilots, and recreational users associated with the Proposed Action and Action Alternatives; therefore, radiation doses associated with the Proposed Action and Action Alternatives would be much lower than the dose calculated in the baseline risk assessment. As a result, impacts from DU exposure for all Action Alternatives are less than significant.

4.13.6 Construction Hazards

Construction activities would include transport of construction vehicles to and from the LZs and any associated access or linking trails in addition to construction of the LZs and trails. Construction of a pinnacle feature is also proposed on LZ 4. Impacts associated with construction activities would be short-term, because construction activities are expected to last approximately 40 days.

As previously discussed, the Army has regulations in place to address safety issues associated with construction activities in EM 385-1-1, *Safety and Health Requirements Manual* (U.S. Army Corp of Engineers 2008). This manual is based on Chapter 29 of the *Code of Federal Regulations*, Section 1926 (29 CFR § 1926), which delineates the U.S. Department of Labor's Occupational Safety and Health Regulations for Construction. The manual addresses evaluation and control of issues such as slips, trips, falls, vehicle use, and inclement weather. Section 8 of EM 385-1-1 specifically addresses accident prevention and includes requirements to prevent public access to construction sites. All Army personnel and their contractors are required to follow these standards during construction activities. The existing policies regarding construction activities reduce the impacts on human health from construction activities to less than significant.

4.13.6.1 Alternative 1 – Alternative Trail. Construction activities for Alternative 1 would be similar to the Proposed Action, because Alternative 1 and the Proposed Action are nearly the same scale and duration of action. As previously discussed, the Army has regulations in place to address safety issues associated with construction activities . Therefore, the impacts on human health from construction activities would be the same as was found under the Proposed Action: less than significant.

4.13.6.2 Alternative 2 – Construction of Only One LZ. Construction activities for Alternative 2 would be similar to the Proposed Action. However, the potential for health and safety issues to occur may vary among Action Alternatives because of the duration of construction activities. The longer an alternative's duration in the construction phase, the higher the potential for health and safety issues to occur. Given potential increases with duration, Alternative 2 would have the lowest potential for health and safety impacts of the Action Alternatives, because its duration is the shortest. Because the Army has regulations in place to address safety issues associated with construction activities and because Alternative 2 would have a shorter duration than the Proposed Action, the impacts on human health from

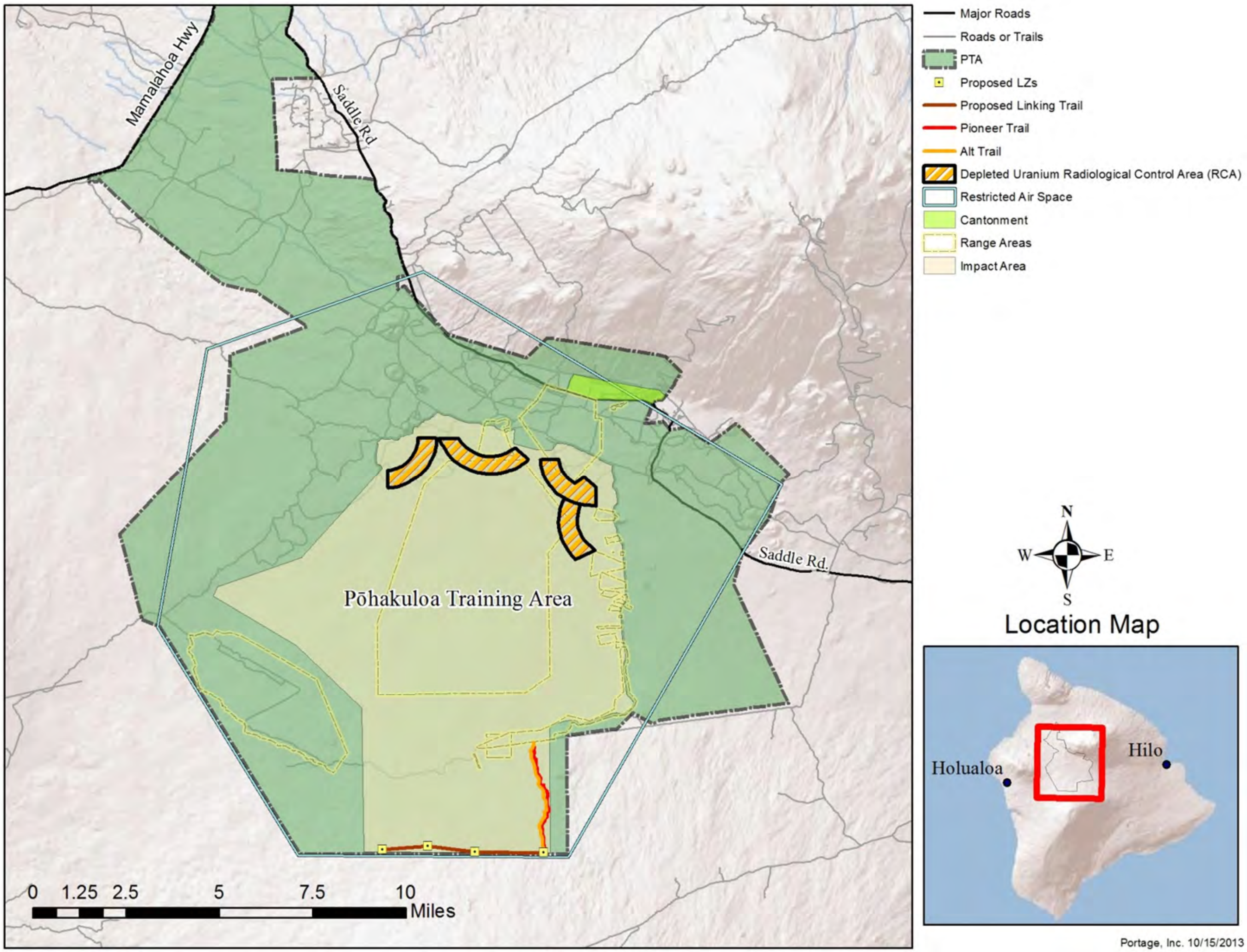

Figure 4-16. DU RCAs.

construction activities would be less than the impacts found under the Proposed Action, which were determined to be less than significant.

4.13.6.3 Alternative 3 – Construction of Only Two LZs. Construction activities for Alternative 3 would be similar to the Proposed Action. As mentioned above, the potential for impacts increase with project duration. Alternative 3 would have a higher potential for impacts than Alternative 2 but less potential than Alternatives 1 and 4 and the Proposed Action, because the duration of Alternative 3 is 38 days. Because the Army has regulations in place to address safety issues associated with construction activities and because Alternative 3 would still have a lower potential than the Proposed Action, the impacts on human health during the construction phase would be less than less than significant.

4.13.6.4 Alternative 4 - Construction of Only Three LZs. Construction activities for Alternative 4 would be similar to the Proposed Action. As mentioned above, the potential for impacts increase with project duration. Alternative 4 would have a higher potential for impacts than Alternative 2 and 3 but less potential than Alternatives 1 and the Proposed Action, because the duration of Alternative 4 is 39 days. Because the Army has regulations in place to address safety issues associated with construction activities and because Alternative 3 would still have a lower potential than the Proposed Action, the impacts on human health during the construction phase would be less than significant.

4.13.7 Operations

Because the operational aspects (number of flights, maneuvers, etc.) of each alternative are similar, the impacts associated with all Action Alternatives are considered similar. The potential for human health and safety impacts to the public from operational activities associated with use of the LZs are unlikely to occur, as stated in Subsection 3.13.3.2, Operational Activities. This is because LZs are located on PTA and the public is unlikely to be at an LZ during operational activities. Recreational users present in the Mauna Loa Forest Reserve are not expected at the LZs, because the existing trail from the Mauna Loa Road to the LZs is inhospitable to most passenger vehicles.

To address human health and safety for personnel and equipment on the LZs, the Army has taken a proactive approach. This includes completion of a risk assessment and a debriefing of each pilot during which hazards, preventive measures, and emergency procedures specific to each training flight are discussed (U.S. Army 2011a). Preventive measures include a flyover and visual inspection of the LZ prior to use to ensure humans are not present on the ground. These preventive measures are currently in use for training activities at existing LZs within PTA, and no incidents involving human health and safety have been documented. Because preventive procedures are in place to anticipate hazards associated with operational activities at the LZs and with limited access for recreational users outside of PTA, the impacts on human health from operational activities for all Action Alternatives are less than significant.

4.13.8 Wildfires

The human health and safety impacts involving wildfire are related to ignition source and fuel availability, not to specific action activities or action durations. All Action Alternatives are bounded under the analysis of the Proposed Action. Impacts from wildfires have been assessed using the likelihood for potential ignition of a wildfire based on the Proposed Action. During construction activities, wildfire ignition sources would include heat or sparks from construction vehicles and the use of cigarettes. A water truck would be onsite during LZ construction to reduce dust generated from construction activities. Dust-suppression activities would also provide fire suppression during construction. In addition, smoking is allowed only in designated areas at PTA; these areas do not include those affected by the Proposed

Action. Operational use of the LZs would not include weapons firing, which has historically been a major cause of fires within PTA.

Fire management areas were identified in Chapter 7 of the IWFMP (U.S. Army 2003), which includes an assessment of PTA. Figure 12 of that plan shows the wildland fire fuel types within the PTA boundary. The map indicates the area affected by the Proposed Action and alternatives consists of lava and is described as follows:

> *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.*

Finally, the availability of wildfire and emergency response personnel and equipment, as discussed in detail in Subsection GHG (Wildfire Management and Prevention), in conjunction with the implementation of the IWFMP (U.S. Army 2003), reduces the risk of the spread of a wildfire should one ignite. This, coupled with the low likelihood of a fire ignition due to the lack of vegetative fuels in the area, results in the less-than-significant impacts from wildfires.

4.14 Socioeconomics/Environmental Justice

This subsection presents the evaluation of impacts of the Action Alternatives on the socioeconomics ROI, as described in Section 3, Affected Environment.

4.14.1 Impact Methodology

Socioeconomics includes sociological and economic conditions such as demographics, regional employment, and economic activity, housing, schools, medical facilities, shops and services, and recreation facilities. The project would result in a significant impact if it substantially affects the economic or social welfare of the community or state. Therefore, a significant socioeconomic impact would occur if the project adversely affected the revenue, employment, or overall economic conditions of the island community or the state as a whole.

Environmental justice focuses on the distribution of race and poverty status in areas potentially affected by implementation of a Proposed Action. "Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (59 FR 32) directs each federal agency to identify and address any disproportionately adverse environmental effects of its activities on minority and low-income populations. The impact analysis presents projected conditions under the Action Alternatives, including the No Action Alternative. Potential disproportionate effects on low-income or minority populations and the potential for increased adverse health effects on children are also assessed to identify environmental justice effects. "Executive Order 13045 – Protection of Children from Environmental Health Risks and Safety Risks" (62 FR 78) requires federal agencies to assess activities that have disproportionate environmental health effects on children.

4.14.2 Factors Considered for Determining Significance of Impacts

Factors considered in determining whether an alternative would have a significant impact on socioeconomics and environmental justice include the extent or degree to which implementation of the alternative would:

- Affect the unemployment rate of the county

- Change total income
- Change business volume
- Affect the local housing market and vacancy rates, particularly with respect to the availability of affordable housing
- Change any social, economic, physical, environmental, or health conditions in such a way as to disproportionately affect any particular low-income or minority group, or disproportionately endanger children.

4.14.3 Summary of Impacts

Impacts from the alternatives on socioeconomics/environmental justice are summarized in Table 4-21 and discussed following the table.

Table 4-21. Summary of potential impacts to socioeconomics and environmental justice.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Economic development	<SI	<SI	<SI	<SI	<SI	NI
Protection of children	NI	NI	NI	NI	NI	NI
Environmental justice	NI	NI	NI	NI	NI	NI

4.14.4 Proposed Action

The construction of the trail, connecting tails, and LZs is estimated to take up to 40 days. This activity would include at least one work crew consisting of heavy equipment operators and support personnel. The total construction cost is estimated to be less than $650,000. The construction would result in a slight increase in short-term, construction-related jobs. Subsequent indirect effects would be produced by increased spending by construction employees. Increased construction employment in Hawaiʻi County would be temporary and less than significant. Long-term minor beneficial impacts would not be expected. The prospective increases in local employment would be beneficial to the ROI; however, the increase would not produce any significant beneficial effects to long-term economic development. The resulting impact on sales and economic development from implementing the Action Alternatives would be less than significant.

There would be no disproportionately high and adverse impacts on low-income or minority groups or environmental health effects on children from construction and operation of the Action Alternatives. All construction activities for the Action Alternatives would occur within the boundaries of the PTA impact area.

4.14.5 Alternative 1 – Alternative Trail

The construction of the alternative trail, connecting tails, and LZs is estimated to take a similar amount of time and cost as much as reported in the Proposed Action (Subsection 4.14.4). Thus, the resulting impact on sales and economic development from implementing Alternative 1 would be the same as the Proposed Action: less than significant.

4.14.6 Alternatives 2, 3, and 4

Construction activity duration and cost would be expected to vary under Alternatives 2, 3, and 4 in relationship to the number of LZs and linking trails being constructed under each alternative. All three alternatives would be expected to take a shorter period of time for construction activities and cost less than either the Proposed Action or Alternative 1. Thus, the resulting impact on sales and economic development from implementing Alternative 2, 3, or 4 would be less than that reported for the Proposed Action, which was determined to be less than significant.

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5. CUMULATIVE IMPACTS

CEQ regulations implementing NEPA require that the cumulative impacts of a Proposed Action be assessed (40 CFR V §§ 1500-1508). A cumulative impact is defined by CEQ as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions” (40 CFR V §1508.7). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR §1508.7). The Army’s NEPA regulations [32 CFR V § 651.34 (f)] also require that cumulative actions, those that have cumulatively significant impacts, be addressed in environmental analyses. CEQ’s guidance for considering cumulative effects states that NEPA documents “should compare the cumulative effects of multiple actions with appropriate national, regional, state, or community goals to determine whether the total effect is significant” (CEQ 1997).

CEQ allows proponents to “incorporate by reference” material when the effect will be to cut down on bulk without impeding agency and public review of the action. The Army completed the *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawai‘i* (U.S. Army 2013a) in March 2013. In it, the Army analyzed cumulative impacts from construction and operations activities of a battle course, located north and west of the proposed additional LZs within PTA, across applicable the ROIs for the various resource areas, which are also similar in location, size, scope, and timeframe to the affected ROIs of this EA. Thus, it is reasonable to anticipate material from that analysis to be incorporated by reference throughout this section. The process of incorporating by reference requires that the material be cited and briefly described and that the material cited itself, i.e., U.S. Army (2013a), be reasonably available to the public. At the conclusion of the analysis, the Army found that the incremental impacts from the Proposed Action (i.e., additional LZs) with other past, present, and foreseeable actions do not rise to the level of significant impact.

This section addresses cumulative effects of the Proposed Action in the context of other actions within the ROI and during the reasonably foreseeable future. Subsection 5.1 presents the methodology used to evaluate cumulative impacts. Subsection 5.2 presents other projects on the island of Hawai‘i that may have cumulative effects when combined with the impacts from the proposed project within this document. Subsection 5.3 identifies and describes the cumulative impacts for each of the resource areas discussed in Sections 3 and 4. Each future project would undergo a NEPA review with more detailed information on potential specific resource area impacts. Effects and impacts are used synonymously throughout this discussion. It should be noted that the additional aircraft associated with the projects listed in the cumulative effects section are not anticipated to use the additional LZs.

5.1 Methodology

The Army considered the scope and ROIs of the Proposed Action as representative of all alternatives when considering cumulative effects. The Army then identified other projects and actions (military and public) that have or may occur in the past, present, or reasonably foreseeable future. The Army selected projects using a number of different methods, including:

- Reviewing projects the Army presented in other recently released Army NEPA documents, including draft documents if the project was still likely to be completed, and projects that were publicized for the preparation of planning documents.
- Reviewing actions recently proposed by other military branches, with emphasis on actions potentially influencing PTA.

- Identifying current training requirements by the Army, Navy Marine Corps, and the Air Force at PTA (U.S. Army 2013a, Chapter 1).
- Reviewing projects recently proposed or implemented by public entities (e.g., Saddle Road Realignment). The Army identified some of these projects during the Infantry Platoon Battle Course EIS planning process through Internet research and public scoping in January 2011.

After the identification of projects, the Army considered whether funding for them was still likely or reasonably forthcoming.

Cumulative impacts are best assessed by resource area (e.g., water resources, air quality, socioeconomic impacts), and impacts may arise from single or multiple actions, or the impacts may result in additive or interactive effects. Interactive effects may, in some cases, be countervailing, where the adverse cumulative effect is less than the sum of the individual effects; or they may be synergistic, where the net adverse cumulative effect is greater than the sum of the individual effects (CEQ 1997). For individual resources, the ROI for cumulative impacts is often larger than the ROI for direct and indirect impacts (identified in Section 3, Affected Environment, of this EA within the subsections covering each resource area). The factors considered in determining the significance of cumulative impacts are often the same as those presented in Section 4, Environmental Consequences, of this EA.

An integral part of the cumulative impacts analysis involved determining whether impacts from the proposed projects would contribute to ongoing or foreseeable resource trends. The cumulative impacts analyses do not assess all expected environmental impacts from regional projects within the ROIs but only those impacts resulting from both a project alternative and other past, present, and reasonably foreseeable future actions that influence a particular resource area. If a quantitative analysis cannot be formalized, the Army assesses qualitatively the potential cumulative impacts.

5.2 Past, Present, and Reasonably Foreseeable Future Projects

Table 5-1 lists 27 projects the Army identified, which, when considering the Proposed Action in this EA, could result in incremental impacts on a number of resource areas. These activities largely involve Army activities at PTA and activities occurring nearby. These projects were identified as presented in the methodology subsection above. Detailed descriptions augmenting the incorporated project descriptions can be found in the cited documents:

- U.S. Army, 2011a, *Final Environmental Assessment High-Altitude Mountainous Environment Training*, 25th Combat Aviation Brigade, September 2011.
- U.S. Army, 2013a, *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawaiʻi*, U.S. Army Environmental Command, March 2013.

Table 5-1. Past, present, and reasonably foreseeable future projects associated with the Proposed Action.

Project Name	Project Location	Project Sponsor	Project Description	Planned Project (Yr)
Deepening of the Kawaihae Deep Draft Harbor	Kawaihae Harbor, Hawai‘i Island	Hawai‘i State	Deepened harbor to allow for increased drafts. The geographic scope was the Kawaihae Harbor located on the west side of the island in the Kohala region. Growing demand for cargo to support the rapidly expanding economy drove the need for the turning basin to be dredged and deepened to accommodate cargo vessel traffic (U.S. Army 2013a).	2008
Air Force Drop Zones	PTA, Hawai‘i	Air Force	Several air-drop corridors were reclassified with the FAA to enhance training and allow for flight operations below the minimum vectoring altitude over drop zones on the islands of O‘ahu and Hawai‘i (U.S. Army 2013a).	2010
Construct Mock Airfield	PTA, Hawai‘i	Navy	Construction of a mock airfield in the PTA impact area; and installation and operation of technology to aid in simulated training exercises. The mock airfield provides realistic structural targets on simulated dense urban terrain at PTA to support carrier air wing with close-air support and strike-warfare training (U.S. Army 2013a).	2010

Table 5-1. (continued.)

Project Name	Project Location	Project Sponsor	Project Description	Planned Project (Yr)
Hydrologic Evaluation and Exploratory Drilling Program	Humuʻula Saddle Region, Hawaiʻi	University of Hawaiʻi's Institute of Geophysics and Planetology	Proposed investigation of the subsurface geology and hydrology of the western Humuʻula Saddle region. The investigation involves the installation of two small-diameter, continuously cored test bores to depths of approximately 1.2 mi (1.9 km) below ground surface (U.S. Army 2013a).	2012
Basing of the MV-22 and H-1 Aircraft in Support of III Marine Expeditionary Force Elements in Hawaiʻi	Oʻahu and Hawaiʻi	Navy	The Navy signed a record of decision for the basing and operation of MV-22 Tiltrotor Osprey aircraft and H-1 helicopters in support of the III Marine Expeditionary Force elements stationed in Hawaiʻi. Marine Corps Base Hawaiʻi (MCBH), Kaneohe Bay, was selected (U.S. Army 2013a).	2012
Saddle Road Realignment	Hilo/Kona, Hawaiʻi	Federal Highway Administration, Hawaiʻi Department of Transportation, Army	Project to straighten, repave, and separate military training from motorists. Approximately 250 mi (402 km) of road will be modernized to meet American Association State Highway and Transportation Officials standards (U.S. Army 2013a).	2012

Table 5-1. (continued.)

Project Name	Project Location	Project Sponsor	Project Description	Planned Project (Yr)
Battle Area Complex	PTA	U.S. Army	Proposal to construct the Battle Area Complex at existing Range 12 for company gunnery training and qualification requirements of selected weapons systems and to support mounted and dismounted infantry platoon tactical live-fire operations (U.S. Army 2013a).	2012
Ammunition Storage	PTA	U.S. Army	Proposal to construct three new earth-covered ammunition bunkers (igloos), totaling 6,750 ft^2 (627 m^2) within the existing ammunition storage facility (U.S. Army 2011a).	2012
Tactical Vehicle Wash Facility	PTA	U.S. Army	Proposal to construct a tactical vehicle wash facility with four wash stations (U.S. Army 2011a).	2012
Implementation of the IWFMP	PTA	U.S. Army	Implement specific guidance, procedures, strategies, and protocols to prevent and suppress wildfires and manage fuel loads (U.S. Army 2011a).	Ongoing
Implementation of the PTA Implementation Plan	PTA	U.S. Army	Implement specific guidance, procedures, strategies, and protocols to protect and enhance endangered species habitat and populations (U.S. Army 2011a).	Ongoing

Table 5-1. (continued.)

Project Name	Project Location	Project Sponsor	Project Description	Planned Project (Yr)
Develop and Use of Military Training Facilities on PTA	PTA, Hawai‘i	Marine Corps	Development of training facilities at PTA, including a military-operations-in-urban-terrain facility, enhancement of three forward operating base sites, and construction of a live-fire grenade/shoot house facility. Facilities to meet current and future training requirements would be joint facilities with shared cost and usage between MCBH, Army units, and other users (U.S. Army 2013a).	Ongoing
Current Army Use of PTA	Hawai‘i	Army	Description of Army activities is found in the PTA EIS, Section 1.3.1.1 (U.S. Army 2013a).	Ongoing
Current Marine Corps Use of PTA	Hawai‘i	Marine Corps	Description of Marine Corps activities is found in in the PTA EIS, Section 1.3.1.1 (U.S. Army 2013a).	Ongoing
Rim of the Pacific Exercises and Current Navy Use of PTA	Hawai‘i	Navy, Joint Forces	Description of Navy activities is found in in the PTA EIS, Section 1.3.1.1 (U.S. Army 2013a).	Ongoing
Current Air Force Use of PTA	Hawai‘i	Air Force	Description of Air Force activities is found in in the PTA EIS, Section 1.3.1.1 (U.S. Army 2013a).	Ongoing

Table 5-1. (continued.)

Project Name	Project Location	Project Sponsor	Project Description	Planned Project (Yr)
‘Āina Mauna Legacy Program	Hawai‘i	DHHL	Homesteading program established to provide economic self-sufficiency of Native Hawaiians through the provision of land granted by the DHHL. This project would serve to preserve lands within the ‘Āina Mauna ecosystem, which is the upper region of the mountain lands that surround and include Mauna Kea (U.S. Army 2013a).	TBD
U.S. Marine Corps MV-22 and Cobra Attack Squadron Training at PTA	PTA	U.S. Marine Corps	Conduct periodic U.S. Marine Corps training requirements (U.S. Army 2011a).	Ongoing from 2013
Infantry Platoon Battle Area	PTA	USAG-HI and U.S. Army Pacific	Construct and use an infantry platoon battle course and a military-operations-in-urban terrain and shoot house, and modernize range and cantonment facilities (U.S. Army 2013a).	2013–2022
Multipurpose Storage Facility	PTA Cantonment Area, Hawai‘i	Marine Corps	Proposed construction of a permanent storage facility at PTA to gain efficiencies in meeting training on mission-essential and required predeployment tasks requirements at the installation (U.S. Army 2013a).	2014
Former Waikoloa Maneuver Area and Nansay Sites	Waikoloa, Hawai‘i	Army	Clearance of munitions and explosives of concern as well as unexploded ordnance on the 135,000-acre (54,633-hectare) former Waikoloa Maneuver Area (U.S. Army 2013a).	2015

Table 5-1. (continued.)

Project Name	Project Location	Project Sponsor	Project Description	Planned Project (Yr)
Range Maintenance Facility	PTA	U.S. Army	Proposed construction of a 15,145-ft^2 (1,407-m^2) consolidated range maintenance complex on a previously developed site in a PTA cantonment (U.S. Army 2011a).	2015
BAAF Runway Realignment	PTA Cantonment Area, Hawai‘i	Marine Corps	Proposed realignment and extension of the BAAF runway, including construction of supporting infrastructure. The airfield operates under substandard conditions due to a relatively short runway, limitations imposed by mountainous terrain, presence of manmade obstructions to the east, winds from the east that increase throughout the day, and maximum tailwind landing restrictions, which impede mission requirements (U.S. Army 2013a).	2018
Rotary Wing Apron, Aircraft Control Tower, Aircraft Maintenance Facility, and other Airfield Improvements	PTA Cantonment Area, Hawai‘i	Marine Corps and Army	Proposed construction at BAAF to enhance PTA’s capability to provide air combat support and maintenance capability to aviation assets. Existing aircraft aprons and maintenance facilities at BAAF are aged and do not meet current requirements for the CAB to utilize the airfield fully at PTA (U.S. Army 2013a).	2018

Table 5-1. (continued.)

Project Name	Project Location	Project Sponsor	Project Description	Planned Project (Yr)
Aerial Gunnery Range (AGR)	PTA General Range Area, Hawai‘i	Army	Proposed construction, operation, and maintenance of an AGR on PTA. The AGR would meet critical collective unit training needs for both active and reserve component aviation units that train on the installation as well as for other military services that may use the range (U.S. Army 2013a).	2022
Ammunition Storage Facility	PTA General Range Area, Hawai‘i	Army	Proposed construction of three concrete oval-arched, primary ammunition igloos at PTA, of standard design, that would be sited adjacent to the eight existing ammunition storage facilities at PTA (U.S. Army 2013a).	2022
Ammunition Storage Facility	PTA General Range Area, Hawai‘i	Marine Corps	Proposed construction of several ammunition storage facilities that would be sited adjacent to existing ammunition storage facilities at PTA. This project is in the planning phase with the Marine Corps and has not been reviewed or approved by the Army (U.S. Army 2013a).	2022

5.3 Summary of Cumulative Impacts

The following analysis is organized by resource area in the same order presented in Sections 3 and 4.

5.3.1 Land Use and Recreation

As discussed in Chapter 3, existing land/designated land uses, such as those in in federal or state resource planning documents and general plans, comprise land use. Land use policy in Hawaiʻi is developed at both the state and local levels; however, land-use planning and regulations are conducted and implemented at the local or county level. Recreational resources are those areas that are designated as recreation areas or areas where people seek out and gather for recreation in urban settings, open spaces, or other natural areas.

The evaluation of cumulative impacts, relative to land use and recreation, considered the recent findings from the evaluation of cumulative effects found in the *Final Environmental Impact Statement for the Construction and Operation of an Infantry Platoon Battle Course at Pōhakuloa Training Area, Hawaiʻi* (U.S. Army 2013a). That EIS analyzed the impact of a construction and operations of a ground-troop training area located west and north of the proposed LZs and within the PTA boundary. The ROI for cumulative effects for land use and recreation in the EIS spanned the island of Hawaiʻi. The proposed LZs construction and operation, from a land-use standpoint, has a number of similarities with the EIS action (i.e., both actions are confined to within the PTA boundary, and both actions do not require land acquisition). Proposed projects within the surrounding area announced since the final EIS was published that might affect land use and recreation were researched and considered.

Cumulative impacts for land use and recreation were assessed based on the existing land-use trends in Hawaiʻi. The impacts of the proposed project were added to the past, present, and reasonably foreseeable future project impacts to determine whether the cumulative impacts of all the projects would contribute to the historical or existing trends in land use and recreation. Project-specific data were relatively limited for all of the cumulative projects reported; thus, the cumulative effects analysis was conducted on a qualitative basis.

5.3.1.1 Land Use.

Less than Significant

Basic land-use designations would not be changed at PTA under the Proposed Action. Land acquisition at PTA would not be required for any of the projects identified in Table 5-1. The area considered for LZ construction would still be available for the Army to use for ongoing military training operations with no expansion of current impact areas at PTA.

Large construction projects, such as the road construction projects listed in Table 5-1, are examples of potential alterations to land use that could contribute to cumulative impacts and that could be cumulatively significant. However, the Army concludes that the Proposed Action/alternatives do not contribute to land-use alterations and thus not to cumulative impacts, because no changes to existing land use would occur.

5.3.1.2 Recreation.

Less than Significant

The impacts on the access to recreation resources, including the Mauna Loa Forest Reserve, would not be curtailed or changed from current conditions. Impacts on the island of Hawai‘i relative to hunting would be the same as current conditions. The Proposed Action/alternatives would not result in significant impacts on recreational lands. Cumulative impacts on recreational land use would also not be significant, because the alternatives do not alter use of land for recreation and thus do not cumulatively impact recreation.

5.3.2 Airspace

Less than Significant

There are no cumulative impacts to airspace from the Action Alternatives. The airspace resource would stay the same as current conditions under the Action Alternatives. Use of the LZs by 10% of the current air traffic on PTA changes the distribution pattern of current operations to the LZs as a destination but not significantly nor cumulatively. The southern area of the PTA, where the proposed LZs would be located, is an area currently in flight use by the Army.

5.3.3 Visual and Aesthetic Resources

Less than Significant

The visual character and quality of the areas within the ROI would not be impacts, because the Proposed Action and alternatives would not change basic land use of the PTA or the surrounding area. The visual sensitivity of these areas would have less-than-significant impacts, because the areas are not identified as designated areas of natural beauty, as defined by the *County of Hawai‘i General Plan* (County of Hawaii 2005), are not readily accessible or are not used by a large number of people. Therefore, any cumulative impacts to visual and aesthetic resources as a result of the Proposed Action or alternatives would not be cumulatively significant.

5.3.4 Air Quality

Less than Significant

Air quality around PTA is generally good. Federal ozone standards were not exceeded in Hawai‘i during the 10 years prior to the Stryker Brigade Combat Team final EIS (USAEC 2008) despite the cumulative emissions from highway traffic, commercial and military aircraft operations, commercial and industrial facility operations, agricultural operations, and construction projects in both urban and rural areas. The Action Alternatives would do little to alter overall vehicle traffic or air traffic activity on Hawai‘i; therefore, air quality impacts are not expected to increase over the current condition. Given historical air quality conditions, the cumulative impact of emissions associated with the Action Alternatives, in combination with other construction projects and continuing emissions from highway traffic and other sources, is not expected to violate state or federal ozone or PM_{10} regulations.

There would be a short-term increase in GHG emissions associated with implementing the construction phase of any of the Action Alternatives, because there would be emissions from construction equipment. Under the operations phase for all Action Alternatives, there would be no increase in emissions over current operations.

In lieu of a regulatory standard, the estimated GHF emissions, particularly the long-lived GHG emissions, were compared to the 2011 total U.S. GHG emissions of 6,702 Tg (million metric tons) carbon dioxide equivalent (EPA 2013c). Because the direct emissions of the Proposed Action were found to be small, the emissions associated with any of the Action Alternatives would be negligible when compared to the 2011 total GHG emissions (6,702 Tg/yr).

5.3.5 Land-Based Traffic

Less than Significant

There would be no significant cumulative impact from construction vehicles driving to the proposed LZ locations under the Action Alternatives. Vehicle ground traffic is not expected to change as a result of the Proposed Action; therefore, cumulatively significant impacts are not anticipated.

5.3.6 Noise

Less than Significant

There are no significant cumulative impacts on the existing noise environment from either construction-vehicle or operational noise associated with the Proposed Action or alternatives. Ten percent of the current number of training flights would use the proposed LZs but are not expected to increase the overall number of flights at PTA. As such, the Proposed Action and alternatives would result in changes to the distribution of noise levels at PTA but would not result in changes to average aviation noise levels. The basing of the MF-22 and H-1 aircraft in support of Navy operations in Hawaiʻi is listed in Table 5-1 and involves the potential for increased flight traffic. MCBH, Kaneohe Bay, located on Oʻahu, was the selected location and therefore does not change the existing noise environment at PTA. The remaining actions involve either short-term construction-related noise or small- and large-arms firing with regard to noise. Construction-related noise is involved in the Proposed Action and alternatives, but increased noise levels would be temporary and would not alter the ambient noise environment over the long-term. The Proposed Action and alternatives do not include small- or large-arms firing, so they do not change the existing impulsive noise source environment.

5.3.7 Water Resources

Less than Significant

There are no significant cumulative impacts on the existing water resources from either the proposed construction activities or the planned training operations associated with the Proposed Action or alternatives. There are no significant cumulative impacts, because there are no surface water bodies, lakes, or streams, and groundwater levels are at great depths. There is not expected to be a significant increase on the demand for water within the ROI, and current water supply methods are expected to remain the same. However, as described in Table 5-1, a proposed investigation of the subsurface geology and hydrology of the western Humuʻula Saddle region would have the potential for a future potable water supply at the PTA. All other actions included in Table 5-1 are expected to have impacts similar to those of the Proposed Action or have mitigation measures in place to avoid impact on water resources.

5.3.8 Soil Resources

Less than Significant

There are no significant cumulative impacts on the existing geology and soil resources from either the proposed construction activities or the planned training operations associated with the Proposed Action or alternatives. There are no significant cumulative impacts, because the area of the proposed construction activities has little developed soil, and therefore potential erosion is minimal. It is anticipated that the potential for geologic hazards would be minimal with engineered controls and the current geologic condition. All other actions included in Table 5-1 are expected to have similar impacts to those of the Proposed Action or have mitigation measures in place to avoid impact on geology and soil resources.

5.3.9 Biological Resources

Less than Significant

Past actions within or near the ROI have had significant impacts on biological resources. Agriculture, land use, military activities, and public works projects have all had some impact on biological resources in the past. Several listed endangered and threatened species have experienced habitat loss from clearing for agriculture and grazing and from wildland fires. In addition to habitat loss, species have experienced mortality from recreational activities.

Current and future actions may contribute to the impacts that are affecting the biological resources within the ROI and the surrounding area. The proposed project and alternatives, and those listed in Table 5-1, have the potential to directly impact threatened and endangered species by mortality or indirectly through habitat loss. The proposed project and Action Alternatives include existing conservation measures to mitigate potential impacts. Because of the mitigation efforts and the lack of resources surrounding the proposed construction sites, cumulative impacts would be less than significant. All other actions included in Table 5-1 are expected to have impacts similar to those of the Proposed Action or have mitigation measures in place to avoid impacts on biological resources.

5.3.10 Cultural Resources

Less than Significant

In ancient times, human activities in the mountain lands of the island of Hawai‘i were mainly for religious or resource-procurement purposes. Hawaiians gathered tool-making materials at stone quarries, caught birds for sustenance and feathers, and buried the dead. Trees were harvested for canoes and heiau images, and other plants were gathered for medicine, ritual practice, and personal adornment. Oral traditions indicate that battles were fought in the area between the people of different districts. Natural resources of importance to Native Hawaiians were impacted beginning in the late 1700s by feral sheep, goat, and cattle grazing. Development of astronomical observatories began at the mountains’ summits in the mid-1900s. The associated infrastructure has had lasting impacts on the island’s cultural resources. U.S. military use of the Hawaiian Islands began in the late 1800s and continues today. Currently, there are several military installations on the Big Island: BAAF, Kīlauea Military Camp, Keaukaha Military Reserve, Kawaihae Military Reserve, and PTA. Tourists and recreationists from around the world have traveled to the island of Hawai‘i to experience its scenic beauty and vistas from the ground, sea, and air (University of Hawai‘i 2009, p. 6-1).

Future activities include the possibility of construction of new astronomical observatories and modifications, including possible expansions, demolitions, and replacements of existing observatories and other scientific research structures. Possible construction activities related to visitation include expansion of visitor centers, parking areas, rest areas, and scenic lookouts (University of Hawaiʻi 2009, pp. 6-8 and 6-11). In addition, military training in the area may continue to accelerate and may result in construction of new, or modifications to existing, infrastructure. If cultural practitioners perceive disruptions from increases in audio and visual impacts from these activities during practices or if practitioners have access increasingly restricted, adding to areas that are currently restricted or even made temporarily restricted, these restrictions and disturbances would be considered cumulative impacts.

Additionally, the cumulative impact of past and possible future activities that is related to direct alteration or destruction of archaeological sites and the character and setting of places of religious and cultural importance to Native Hawaiians would be considered adverse and significant. However, the Army has concluded that the cumulative impacts associated with the Proposed Action or any alternative would be less than significant, and that these alternatives, when considered in combination with other past, present, and reasonably foreseeable future actions, would not be significant, because all flights would remain within the boundary of the PTA and no additional flight hours are planned, noise modeling showed insignificant impacts, the LZs and the associated trails have no historic properties to alter or destroy, and the training would be infrequent and sporadic and leave no lasting impression on the landscape.

5.3.11 Human Health and Safety

Less than Significant

Significant cumulative impacts on human health and safety are not anticipated as a result of the Proposed Action or alternatives. Significant impacts to the ambient air quality and noise environment are not expected under this action and therefore would not adversely affect human health. Additionally, implementation of the IWFMP and the PIP (USAG-HI 2010b) are ongoing, as cited in Table 5-1. These plans outline procedures for reducing the risk of wildfires at PTA as well as safety requirements for protecting human health during operational and emergency response activities.

5.3.12 Socioeconomics and Environmental Justice

Less than Significant

There would be no significant cumulative impact on the socioeconomics of the area resulting from the construction or the operation of the LZs and trails. It is not anticipated that there would be any cumulative impacts on low-income or minority groups or environmental health effects on children from construction and operation of the Proposed Action or alternatives.

6. CONCLUSIONS

This section presents the conclusions derived from the analysis of potential environmental consequences (Section 4) of the Action Alternatives and the No Action Alternative. These conclusions are described below and summarized in Table 6-1.

6.1 Conclusions from No Action Alternative

The impact analysis of the No Action Alternative resulted in the following findings:

- Impacts to land use and recreation are not anticipated under the No Action Alternative. The alternative does not curtail the range of beneficial uses of the environment, result in secondary land-use impacts, or conflict with existing or planned land uses. Additionally, the alternative is not incompatible, and does not conflict, with objectives, policies, or guidance of state and local land-use plans such as the *County of Hawai'i General Plan* (County of Hawai'i 2005), the CZMA, or any special or administrative land-use designations. The alternative does not curtail the range of recreational uses of the environment, disrupt recreational use of land-based resources or conservation areas surrounding PTA, interfere with the public's right of access, prevent long-term recreational use or use during a peak season, impact any scenic vistas associated with recreation areas, or impede or discourage existing recreational activities.

- Impacts to airspace are not anticipated under the No Action Alternative. There would be no reduction in the amount of navigable airspace, no change or modification of the classification of airspace, no change of existing or future military flight use of the airspace, and no creation of obstructions that would impact air navigation.

- Impacts to visual and aesthetic resources are not anticipated under the No Action Alternative. There would be no introduction of physical features and no site alternations conducted under the alternative. The visual resources policies of the *County of Hawai'i General Plan* (County of Hawai'i 2005) would not be affected.

- Impacts to air quality are not anticipated under the No Action Alternative. There would be no increase in emissions or subsequent changes in air quality that would result by not conducting construction or operation activities. Additionally, no GHGs would be emitted through implementation of this alternative.

- Impacts to land-based traffic are not anticipated under the No Action Alternative. The alternative does not increase traffic on public roads such that it would disrupt or alter local circulation patterns; nor would the alternative create any safety hazards on roadways.

- Impacts to noise are not anticipated under the No Action Alternative. There would be no increase in annual average noise levels (ADNL) above the allowable noise thresholds for land-use compatibility as outlined in Army Regulation 200-1 (U.S. Army 2007d). Additionally, no maximum noise level violation of the Hawai'i Community Noise Control Rule (State of Hawai'i 1996a) or noise annoyances would occur.

- Impacts to water resources and soil resources are not anticipated under the No Action Alternative. There would be no change in surface water status over current conditions, no degradation of surface or ground water quality, and no availability or accessibility limits to the beneficial use of surface or ground water. Surface water movement patterns would not be altered, and noncompliance with water quality standards would not occur. There would be no soil loss through either erosion or terrain-altering drainage patterns, no increase in exposure of people or structures to geologic hazards, and no adverse altering of existing geologic conditions or processes.

- Impacts to biological resources are not anticipated under the No Action Alternative. There would be no risk of species habitat loss, injury or death that would result in a "take" directly from the proposed construction or training operations, and no reduction in the population of a sensitive species.

- Impacts to cultural resources are not anticipated under the No Action Alternative. There would be no adverse effect on a historic property, as defined under Section 106 of the NHPA (16 USC 1A § 470 et seq.) and no violation of the provisions in the American Indian Religious Freedom Act (42 USC §§ 1996a and 1996b), ARPA (16 USC 1B §§ 470aa et seq.), or Native American Graves Protection and Repatriation Act (25 USC 32 § 3001 et seq.).

- Impacts to human health and safety are not anticipated under the No Action Alternative. There would be no effects to construction workers, pilots, or the public (primarily recreationists) from hazardous materials, DU exposure, or wildfires with implementation of the alternative.

- Impacts to socioeconomics and environmental justice are not anticipated under the No Action Alternative. There would be no changes in the county's unemployment rate, total income, business volume, local housing market, or vacancy rates with implementation of the alternative. Additionally, there would be no socioeconomic effects on any particular low-income or minority group or children.

The No Action Alternative would result in no changes in the existing environment. The No Action Alternative would not provide an area conducive to, or allow pilots to perform required landing training for, austere environments.

6.2 Conclusions from the Action Alternatives

The impact analysis of Action Alternatives resulted in the following findings:

- Impacts to **land use** and **airspace** are not anticipated under any of the Action Alternatives. Basic land use would not change with any of the Alternative Actions. The Action Alternatives do not involve acquiring land or rezoning land for use and would not result in any changes of current or planned land uses or zonings. Airspace use would not change with implementation of any of the action alternatives.

- Impacts to **recreation** from implementation of any of the Action Alternatives were found to be less than significant with respect to scenic vistas and view planes (as reported in Subsection 4.5, Visual and Aesthetic Resources) and disruption of recreational uses (as reported in Subsection 4.8, Noise). Recreationists using the Mauna Loa Forest Reserve to the south of the LZs would be most likely to be impacted by implementation of any of the Action Alternatives. They may experience short-term increases in noise during the construction phase, and operations activities may be perceived as slight noise annoyances and visual distractions. However, the implementation of any of the Action Alternatives would not significantly impact or result in the cessation of any recreational activities or access by users.

- Impacts to **visual and aesthetic resources** from implementation of any of the Action Alternatives were found to be less than significant through a visual contrast analysis. The LZs and training operations are located entirely within the PTA boundary, and these activities would be compatible with existing land uses in the area, which are also consistent with the County of Hawaiʻi visual resource policies. Training operations would not significantly impact the visual sensitivity from any of the observer points throughout the analysis area. Helicopters would be barely visible from most locations for short durations. The density of helicopters resulting from the proposed training operations would not appear to be greater than the existing density of military and commercial aircraft in the saddle region. Thus, none of the Action Alternatives would obscure views or introduce physical features that are out of character.

- The Action Alternatives were found to have less-than-significant impacts on **air quality**. Based on modeling, the maximum concentration of fugitive dust as $PM_{10}/PM_{2.5}$ from construction activities would be 9.164 $\mu g/m^3$ (24 hr) and 0.040 $\mu g/m^3$ (24 hr), respectively. During operations, the maximum concentration of PM_{10} at 1,093 yd (1,000 m) away from the center of the LZ(s) is anticipated to be less than 17.98 $\mu g/m^3$. These values are below the state and EPA emission thresholds. Because the number of flights would not increase over current operations under the Action Alternatives, there would be no increase in pollutant emissions. Thus, the implementation of any of the Action Alternatives would not significantly impact air quality.

- The Action Alternatives were found to have less-than-significant impacts on **land-based traffic**. Construction vehicles traveling to PTA may temporarily, but not significantly, delay traffic on Saddle Road, because construction vehicles generally travel at slower speeds than passenger vehicles. The presence of heavy equipment traffic could contribute to potential safety hazards as motorists in passenger vehicles encounter flatbed trucks carrying construction equipment, but these conflicts are anticipated to be minor and most noticeable on sections of Saddle Road that have not been improved, on sections that are undergoing reconstruction, or at intersections where construction equipment accesses Saddle Road when traveling to PTA. Traffic involving heavy equipment generally is limited to non-peak commute times to minimize conflicts. Travel on PTA roads is not expected to produce delays or conflicts, because construction activities and military training activities are not anticipated to occur concurrently. Thus, the implementation of any of the Action Alternatives would not significantly impact land-based traffic.

- The Action Alternatives were found to have less-than-significant impacts on **noise** with respect to incompatibilities with current land uses, generating noise levels that exceed community noise control rules, and increasing the likelihood of annoyance from individual noise events. The low number of military flights at PTA, which would not be increased under the Action Alternatives, does not generate ADNL noise contours, which were calculated for this analysis with the CH-47, the helicopter that generates the highest noise level of the helicopters in use at PTA. Therefore, use of the proposed LZs would not alter the existing ADNL levels, and the annual average noise levels from aviation activities would remain compatible with the surrounding land uses. The annoyance assessment did indicate that helicopter use of the proposed LZs may annoy Mauna Loa Forest Reserve recreational users in the immediate vicinity of the LZs. However, the low number of operations would minimize annoyance potential.

- Significant impacts on **water resources** are not anticipated under any of the Action Alternatives. There are no perennial streams or other surface water resources that could potentially be affected. There is the potential for erosion from surface water run-off during construction activities; however, with implementation of BMPs, it is anticipated that these impacts would be less than significant. There would be no impact to water resources from training operations.

- Significant impacts on **soil resources** are not anticipated under any of the Action Alternatives. Site clearing and grading at the proposed LZs and the access trails would expose solidified lava-flow areas and soil to enhanced erosion by water and wind. However, long-term soil loss and erosion would not be significant because of the low availability of soil in the immediate vicinity of the LZs and access trails and their overall management by the Army with the use of BMPs for erosion control measures. Both slope failure and geologic hazards were evaluated, and both were found to have a low probability of occurring. Training operations would not significantly contribute to soil loss. Available soil and rock particles may be moved by rotorwash, but the material movement would be limited to the area of the LZs, at less than 120 ft (36.5 m) from the point of the helicopter landing. Mitigation measures for the soils resource are found in Table 6-2.

- The Action Alternatives were found, with the implementation of mitigation measures, to have less-than-significant impacts on **biological resources** with respect to all issues analyzed. Furthermore, no impacts from implementing the Action Alternatives were found with regard to rotorwash and wildfires. Based on wildlife surveys conducted between April and June 2013, potential habitat for sensitive species is limited to all but a few species in the area of the proposed LZs and access trails because of the lack of available resources needed by wildlife species (e.g., vegetation for food and cover). Impacts to sensitive species from construction activities are anticipated to be low because of the lack of habitat and the implementation of measures to mitigate potential habitat loss and species injury/death. Near the LZs, the potential impact between helicopters and sensitive species is low because of the locations of known bird and bat habitat, the lack of potential habitat near the LZs, established flight procedures, and mitigations to prevent collisions. The potential for transportation of nonnative species is also anticipated to be low because of mitigation measures that would require the cleaning and inspection of aircraft and construction equipment prior to proposed activities. The overall potential impacts from noise to sensitive species are anticipated to be low, because species would not be attracted to noise and would vacate the area until the noise subsides, the duration of noise events will be less than 10 minutes, and mitigation measures to minimize the effects will be implemented. Potential for impacts to sensitive species experiencing habitat loss and death from a wildland fire is not existent because of sparse vegetation available to carry a fire as well as the remoteness of a potential crash with fire event. There is no impact from dust and wind to sensitive species because of the scattered nature of the vegetation over barren rock and the small amount of available particulate matter. Furthermore, potential impacts from wind created by rotorwash from helicopters would not be greater than impacts from the natural wind conditions near the proposed LZs. Mitigation measures for biological resources are shown in Table 6-2.

- The Action Alternatives were found, with the implementation of mitigation measures, to have less-than-significant impacts on **cultural resources**. A survey conducted in February and March 2013 of the LZs and proposed trails of the Action Alternatives revealed no cultural resources directly within the LZs, but the survey did identify three potential cultural sites located on the northern portion of Pioneer Trail. Under the Action Alternatives, no cultural sites would be directly impacted. The only cultural sites identified during the 2013 survey are located a minimum of 111.5 ft (34 m) from the proposed Pioneer Trail and can be avoided during construction activities. No direct impacts would occur from project activities. The noise analysis found that cultural practitioners in areas near PTA may experience and perceive noise as a distraction/annoyance under all Action Alternatives. However, the extent and magnitude of the distraction would be dependent on the distance the practitioner is from the noise source (PTA) at any point in time during use of the LZs. Modeled average noise levels were compatible with current recreational land uses, as outlined in Army Regulation 200-1 (U.S. Army 2007d). Noise from flights using the proposed LZs would be expected to be of short duration and should not obstruct or curtail practitioner activities. Because all training operations are to be conducted within the boundary of the PTA, the potential impacts to practitioners would be minimized to levels that are less than significant. Mitigation measures for cultural resources are shown in Table 6-2.

- The Action Alternatives were found to have less-than-significant impacts on **human health and safety**. Potential release of, and human exposure to, POL associated with construction equipment and vehicle use exists with implementation of any of the Action Alternatives. However, exposure to potential impacts would be short-term, because construction activities are not expected to exceed the duration of the Proposed Action, which is estimated to last approximately 40 days. Long-term impacts are associated with helicopter use of the LZs. However, refueling and maintenance activities associated with helicopter use are performed in designated facilities within PTA following requirements in Army Regulation 200-1 (U.S. Army 2007d) and Department of the Army Pamphlet 200-1 (U.S. Army 2002), which is anticipated to result in low potential for exposures. DU and radiation exposure potential for the Action Alternatives was reviewed and compared with the baseline risk assessment conducted in 2010. It was found that potential exposure to DU for all Action Alternatives was low. The Action Alternatives are located entirely within PTA, and the public is unlikely to be at the LZs or trails during construction or operational activities. Construction safety is addressed through Army requirement and procedure documents, which reduces the potential for construction activity impacts as well as public access to construction sites. Additionally, recreational users present in the Mauna Loa Forest Reserve are not expected at the LZs either during construction or operation periods, because the existing trail from the Mauna Loa Road to the LZs is inhospitable to most passenger vehicles. Impacts associated with potential for wildfires were found to be low. During construction activities, wildfire ignition sources would include heat or sparks from construction vehicles and the use of cigarettes. A water truck would be present onsite during LZ construction primarily for dust suppression but would also be available for wildfire suppression if needed. The lack of vegetation in the area of the Action Alternatives to carry a wildfire keeps the potential for wildfire extremely low. Operational use of the LZs would not include weapons firing, which has historically been a major cause of fires within PTA.

- The Action Alternatives were found to have less-than-significant impacts on **socioeconomics and environmental justice** with respect to economic development. While construction would result in a slight beneficial increase in the short term, e.g., construction-related jobs, the increase would not produce any significant beneficial effects on long-term economic development.

6.3 Mitigation Measures

Mitigation measures such as conservation recommendations and BMPs for the Action Alternatives are shown in Table 6-2.

Table 6-1. Summary of overall impacts.

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Land Use						
Curtails the range of beneficial uses of the environment	NI	NI	NI	NI	NI	NI
Involves substantial secondary impacts such as population changes or effects on public facilities	NI	NI	NI	NI	NI	NI
Conflicts with existing or planned land uses on or around the site	NI	NI	NI	NI	NI	NI
Conflicts with CZMA policies	NI	NI	NI	NI	NI	NI
Conflicts, or is incompatible, with the objectives, policies, or guidance of state and local land-use plans	NI	NI	NI	NI	NI	NI
Conflicts, or is incompatible, with special land-use designations (i.e., NNL status for Mauna Kea)	NI	NI	NI	NI	NI	NI

Table 6-1. (continued).

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Recreation						
Curtails the range of recreational uses of the environment	NI	NI	NI	NI	NI	NI
Substantially affects scenic vistas and view planes	<SI	<SI	<SI	<SI	<SI	NI
Disrupts recreational use of land-based resources, such as parks or recreational paths, or interferes with the public's right of access	NI	NI	NI	NI	NI	NI
Disrupts recreational use of conservation areas surrounding PTA	<SI	<SI	<SI	<SI	<SI	NI
Prevents long-term recreational use or use during a peak season or impedes or discourages existing recreational activities	NI	NI	NI	NI	NI	NI
Airspace						
Reduces the amount of navigable airspace	NI	NI	NI	NI	NI	NI
Changes or modifies the classification of any airspace	NI	NI	NI	NI	NI	NI

Table 6-1. (continued).

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Changes existing or future military flight use of the airspace	NI	NI	NI	NI	NI	NI
Creates an obstruction to air navigation. Curtails the range of beneficial uses of the environment	NI	NI	NI	NI	NI	NI
Visual and Aesthetic Resources						
Introduces physical features that are out of character with adjacent developed areas	NI	NI	NI	NI	NI	NI
Obscures or changes viewing areas	<SI	<SI	<SI	<SI	<SI	NI
Inconsistent with County of Hawai‘i visual resources policies	NI	NI	NI	NI	NI	NI
Air Quality						
PM_{10} emissions	<SI	<SI	<SI	<SI	<SI	NI
Pollutant emissions	NI	NI	NI	NI	NI	NI
Impacts to visibility	<SI	<SI	<SI	<SI	<SI	NI

Table 6-1. (continued).

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Land-Based Traffic						
Increases traffic on public roads such that it would disrupt or alter local circulation patterns	<SI	<SI	<SI	<SI	<SI	NI
Causes safety hazards on roadways	<SI	<SI	<SI	<SI	<SI	NI
Noise						
Increases in ADNL resulting in incompatibility with current land uses	<SI	<SI	<SI	<SI	<SI	NI
Maximum noise levels exceeding community noise control rules	<SI	<SI	<SI	<SI	<SI	NI
High likelihood of annoyance from individual noise events	<SI	<SI	<SI	<SI	<SI	NI
Water Resources						
Impacts on watersheds and water supply	NI	NI	NI	NI	NI	NI
Surface water impacts	<SI	<SI	<SI	<SI	<SI	NI
Groundwater impacts	NI	NI	NI	NI	NI	NI
Wastewater impacts	NI	NI	NI	NI	NI	NI

Table 6-1. (continued).

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Soil Resources						
Loss of soil (from erosion)	<SI	<SI	<SI	<SI	<SI	NI
Conflicts with current regulations and statues	NI	NI	NI	NI	NI	NI
Alters existing geologic conditions	NI	NI	NI	NI	NI	NI
Exposure to geologic hazards	<SI	<SI	<SI	<SI	<SI	NI
Biological Resources						
Impacts from site clearing and grading	<SI	<SI	<SI	<SI	<SI	NI
Impacts from helicopter-caused fire	NI	NI	NI	NI	NI	NI
Impacts from nonnative species	<SI	<SI	<SI	<SI	<SI	NI
Impacts from noise	<SI	<SI	<SI	<SI	<SI	NI
Impacts from collisions with helicopters	<SI	<SI	<SI	<SI	<SI	NI
Impacts from wind from helicopters	NI	NI	NI	NI	NI	NI

Table 6-1. (continued).

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Cultural Resources						
Cultural resources – inadvertent landings resulting in the physical destruction, damage, or alteration of all or part of the property	<SI	NI	<SI	<SI	<SI	NI
Beliefs/practices – access restrictions that could isolate the property or alter the character of the property's setting when that character contributes to the property's qualifications for the NRHP	NI	NI	NI	NI	NI	NI
Beliefs/practices – introduction of visual, audible, or atmospheric elements, due to the presence of military helicopters, that could impact the quality or frequency of cultural practices and beliefs. For some Native Hawaiians, any flights in the vicinity of Mauna Loa will be perceived as	<SI	<SI	<SI	<SI	<SI	NI

Table 6-1. (continued).

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
causing significant impacts. However, alternative design features and mitigations lessen the level of significance.						
Human Health and Safety						
High likelihood of hazardous substance release	<SI	<SI	<SI	<SI	<SI	NI
Hazardous materials or waste exposure	<SI	<SI	<SI	<SI	<SI	NI
Radiation exposure in excess of regulatory exposure levels	<SI	<SI	<SI	<SI	<SI	NI
Public access to active construction and operational areas	<SI	<SI	<SI	<SI	<SI	NI
Exposure to health and safety hazards not covered under existing plans and SOPs	<SI	<SI	<SI	<SI	<SI	NI
Wildfire ignition	<SI	<SI	<SI	<SI	<SI	NI

Table 6-1. (continued).

Impact Issues	Proposed Action	Alternative 1 – Alternate Trail Location	Alternative 2 – Construction of Only One LZ	Alternative 3 – Construction of Only Two LZs	Alternative 4 – Construction of Only Three LZs	No Action Alternative
Socioeconomics and Environmental Justice						
Economic development	<SI	<SI	<SI	<SI	<SI	NI
Protection of children	NI	NI	NI	NI	NI	NI
Environmental justice	NI	NI	NI	NI	NI	NI

NI = No impact.

<SI = Less than significant.

S/MI = Significant but can be mitigated to less than significant.

S = Significant.

Table 6-2. Mitigation measures.

Biological Resources
Conduct the majority of flight operations during the day to allow birds to roost at night.
Clean and inspect aircraft and construction equipment prior to proposed activities.
Mark locations for known species, identify potential nesting habitat prior to construction activities, and observe construction operations to avoid any potential incidental deaths.
During training operations, discontinue use of specific LZs for a period when the presence of nesting birds is observed within 330 ft (100 m) of an LZ.
Cultural Resources
Conduct cultural awareness training for all personnel involved in training, with particular emphasis on intangible resources and their importance to Native Hawaiians.
Soil Resources
Conduct erosion and sediment control inspections and maintenance practices.
Regularly remove built-up sediment from erosion-control features.

7. CONSULTATION AND COORDINATION

Table 7-1 lists persons who were contacted or consulted for information to develop this EA.

Table 7-1. Persons and agencies contacted or consulted.

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Table 8-1 presents the names of individuals who prepared this EA and their area, or areas, of responsibility and their respective organizations.

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Appendix A

Section 7 Consultation

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Colorado State University

Tiana Lackey <tiana@rams.colostate.edu>

FW: Supplemental material for 2013-I-0363 LZ project at PTA (UNCLASSIFIED)

1 message

Peshut, Peter J CIV (US) <peter.j.peshut.civ@mail.mil> Wed, Oct 30, 2013 at 2:31 PM
To: Tiana Lackey <tiana@rams.colostate.edu>

Classification: UNCLASSIFIED
Caveats: NONE

Hi Tiana,

Below is the official correspondence for concurrence on the supplemental ALZ submittal.

Fast!

Tim says this is adequate.

Please file for the Admin Record.

Thanks.

Peter J. Peshut, PhD
Manager, Natural Resources Office
Pohakuloa Training Area
P.O. Box 4607
Hilo, HI 96720

808-969-1966 (Office)
808-430-5614 (Cell)

-----Original Message-----
From: Langer, Tim [mailto:tim_langer@fws.gov]
Sent: Wednesday, October 30, 2013 1:28 PM
To: Peshut, Peter J CIV (US)
Cc: loyal_mehrhoff@fws.gov; Shwedo, Eric P LTC USARMY (US); Jess Newton
Subject: Re: Supplemental material for 2013-I-0363 LZ project at PTA (UNCLASSIFIED)

Dear Peter,

Thank you for your thorough and forthright information affecting an informal ESA consultation we completed August 2013 (Service tracking # 2013-I-0363). I am appending this supplemental information to the administrative record for that project. The changes you discuss in your attachment (entitled "USFWS Supplemental Letter for LZ NLAA (2013-I-0363) 2013 10 29.pdf") do not alter our concurrence that the proposed action may affect, but is not likely to adversely affect, listed species or designated critical habitat pursuant to resource protections afforded by the Endangered Species Act.

DEPARTMENT OF THE ARMY
HEADQUARTERS,
UNITED STATES ARMY GARRISON
PŌHAKULOA
PO BOX 4607
HILO, HAWAII 96720-0607

IMHW-PTA-ZA

29 October 2013

Loyal Mehrhoff, PhD, Field Supervisor
US Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Mona Boulevard, Room 3-122, Box 50088
Honolulu, HI 96850

Re: Supplemental material regarding 4 proposed aviation landing zones at Pohakuloa Training Area, Island of Hawaii

Dear Dr. Mehrhoff,

On 09 July 2013 the US Army Garrison - Pohakuloa (Army) sent a letter to the US Fish and Wildlife Service (Service) requesting concurrence with the determination that 4 new aviation landing zones (LZs) at Pohakuloa Training Area (PTA) are not likely to adversely affect the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), threatened Hawaiian catchfly (*Silene hawaiiensis*), or candidate Band-Rumped Storm Petrel (*Oceanodroma castro*). On 09 August 2013, the Service issued a letter concurring that the proposed project may affect, but is not likely to adversely affect these species. This concurrence satisfies Army requirements under section 7 of the Endangered Species Act, unless:

1) The project description changes;
2) New information reveals that the proposed project may affect listed species in a manner or to an extent not considered;
3) A new species or critical habitat is designated that may be affected by the proposed action.

On 27 August 2013, a Draft Environmental Assessment (EA) was issued for the LZs proposed for use by the 25th Combat Aviation Brigade and the Army National Guard, Hawaii (Portage 2013). The Draft EA includes changes to the project description. This letter summarizes those changes and potential effects to biological resources.

The PTA Natural Resources Office (NRO) completed a Memorandum for Record *Biological Surveys for Landing Zones at Pohakuloa Training Area, Island of Hawaii* on 09 July 2013 (Peshut et al. 2013). Please refer to the Memorandum for Record for a description of proposed training operations at the LZs, methods and results for biological surveys conducted by the Army, and potential impacts to plants and animals protected by the Endangered Species Act and Migratory Bird Treaty Act. The 09 July 2013 Memorandum for Record was provided to the Service as an enclosure to the Army's letter requesting concurrence with the "not likely to adversely affect" determination for the Hawaiian Petrel, Hawaiian catchfly, and Band-Rumped Storm Petrel.

List of Aircraft

Peshut et al. (2013) assessed effects to biological resources from use of the LZs by all classes of fixed and rotary wing aircraft from all branches of service. The Draft EA does not include use of the LZs by US Marine Corps rotary wing aircraft (e.g., UH-1 Iroquois, AH-1 Cobra, CH-53E Super Stallion) or any type of fixed wing aircraft. The scope of the Draft EA is limited to rotary wing aircraft of the 25th Combat Aviation Brigade and Army National Guard, Hawaii. The complete list of aircraft included in the Draft EA is as follows:

- OH-58D Kiowa
- AH-64 Apache
- UH-60 Black Hawk
- CH-47 Chinook
- UH-72A Lakota

All aircraft not included in the above list are hereby removed from consideration in the project description.

Of the listed aircraft, the largest is the CH-47 Chinook which represents the "worst-case scenario" regarding effects to biological resources at the LZs. All other proposed aircraft are smaller and will produce less noise and rotorwash effects than the CH-47 Chinook. The CH-47 Chinook was included in the assessment conducted by Peshut et al. (2013); therefore, no additional effects to biological resources are expected from this change to the project description.

If additional aircraft are proposed for use at the LZs in the future, consultation will be re-initiated under section 7 of the Endangered Species Act.

Trail Between the LZs

Peshut et al. (2013) noted that the inter-connecting trails between the LZs will only be used for the bulldozer to travel to the LZs, the blade of the bulldozer will not hit the ground between LZs, and that the bulldozer will only travel over the trail once to access the LZ and once to leave the LZ. The Draft EA states that "a single-lane access trail would be bulldozed south from Hilo-Kona Hwy to access the LZs. The bulldozer would level the new LZs and create a trail linking them while traveling to each location. Construction equipment will include one 4WD supervisor vehicle, one fuel truck, one water truck, and less than five pieces of heavy equipment that could include various combinations of bulldozers, graders, and excavators". The Draft EA also states that "the bulldozer would soften the lava by driving over it multiple times. Once softened, the trail would then be leveled and smoothed. The softening process is estimated to take four passes with final leveling and smoothing occurring on a fifth pass. It is estimated that it would take one week or less to complete both access and linking trail construction. Completion of linking trail construction is estimated at three days".

According to the Draft EA, "the primary purpose of the access and linking trails would be to only provide a means to transport heavy equipment to the LZs for leveling the LZs. There are no plans or foreseeable uses for either the access or linking trails that result from the proposed action outside of what is being presented in this EA. However, the trail could provide a means of access for emergency and rescue personnel, if necessary, during flight and landing training".

This change to the proposed action could potentially affect nesting Band-Rumped Storm Petrel (BSTP) colonies near the LZs. Eggs, chicks, and/or adult petrels could be injured or killed if occupied burrows collapse under the construction equipment. However, based on data in-hand (refer to Peshut et al. 2013) and the current body of knowledge within the scientific community, nesting BSTP colonies at the LZs or along interconnecting trails are unlikely. Although BSTP calls were recorded near the LZs, recording characteristics suggest individuals were transiting the area. Because nesting site characteristics for BSTP are poorly understood and given the remote possibility that undetected burrows may be present in the area, the Army will guide the trail alignment and mark openings potentially suitable for BSTP colonies. The trail alignment will be walked by PTA NRO staff and the construction contractor prior to construction, and "no go" areas will be flagged. Therefore, no additional effects to potential BSTP nesting colonies are expected from this change to the project description.

Concrete Footings for Stacked Containers

Peshut et al. (2013) described the use of "concrete footings for several stacked containers" during the construction of the LZs. The Draft EA does not include construction of any concrete footings or the stacking of containers on the LZs. All references to concrete footings and stacked containers are hereby removed. No effects to biological resources are expected from this change to the project description.

Thank you for reviewing this supplemental material regarding 4 proposed LZs at PTA. The Army concludes that there is no change to the determination of "may affect, but not likely to adversely affect" for the Hawaiian Petrel, Hawaiian catchfly, or Band-Rumped Storm Petrel as a result of changes to the project description for the LZs. We request your concurrence that there is no change to this determination.

The point of contact for questions or further clarification is Dr. Peter Peshut 808-969-1966, peter.j.peshut.civ@mail.mil. Alternatively, I am also available at 808-969-2407, eric.p.shwedo.mil@mail.mil. Please do not hesitate to contact either of us to discuss this matter further.

Sincerely,

ERIC P. SHWEDO
Lieutenant Colonel, US Army
Commander, US Army Garrison-Pohakuloa

References

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Portage, Inc. 2013. 25th Combat Aviation Brigade and Army National Guard, Hawaii aviation landing zones draft environmental assessment. Idaho Falls (ID): Portage. 214 p.

It is a pleasure, as always, working with such an excellent conservation partner as PTA. Continued successes to you and your natural resources program! Tim.

Tim Langer, Ph.D.
Recovery Biologist, Hawaii and Maui Nui Team

United States Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850
(808) 792-9462

On Wed, Oct 30, 2013 at 8:11 AM, Peshut, Peter J CIV (US) <peter.j.peshut.civ@mail.mil> wrote:

Classification: UNCLASSIFIED
Caveats: NONE

Aloha Loyal and Tim,

During the Draft EA process for this project, a few things were tweaked
(aircraft eliminated, and some errors corrected).

Attached is a supplemental submittal.

Please call or write if you wish to discuss further.

Best regards,

Peter J. Peshut, PhD
Manager, Natural Resources Office
Pohakuloa Training Area
P.O. Box 4607
Hilo, HI 96720

808-969-1966 (Office)
808-430-5614 (Cell)

Classification: UNCLASSIFIED
Caveats: NONE

Classification: UNCLASSIFIED
Caveats: NONE

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

In Reply Refer To:
2013-I-0363
2012-F-0241

Eric P. Shwedo
Lieutenant Colonel, Special Forces
Commander, United States Army Garrison- Pohakuloa
Department of the Army
P.O. Box 4607
Hilo, Hawaii 96720-0607

AUG 09 2013

Subject: Informal Consultation for Four New Landing Zones, Pohakuloa Training Area, U.S. Army, Hawaii

Dear Colonel Shwedo:

Thank you for your letter dated July 9, 2013, requesting our concurrence with your determination that the new landing zones project at Pohakuloa Training Area (PTA), island of Hawaii, will not adversely affect the endangered Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*), threatened Hawaiian catchfly (*Silene hawaiiensis*), or candidate band-rumped storm petrel (*Oceanodroma castro*). The findings and recommendations in this consultation are based on (1) your correspondence we received on July 11, 2013; and (2) other information available to us. A complete administrative record is on file in our office. This response is in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*).

Project Description
Within the centrally located Impact Area at PTA, the Army is proposing to add four new helicopter landing zones (LZs) for aviation training by the Combat Aviation Brigade of the U.S. Army 25th Infantry Division and other military units. All classes of fixed wing and rotary wing aircraft from all Services will potentially conduct aviation training at the PTA LZs. Fixed wing aircraft will typically involve the FA-18 Hornet and will rarely include the AV-8B Harrier, F-15 Eagle, F-16 Fighting Falcon, F-22 Raptor, and F-35 Lightning. Common rotary wing aircraft will include the UH-1 Iroquois, AH-1 Cobra, OH-58 Kiowa, and AH-64 Apache, with rare use of the CH-53E Super Stallion, UH-60 Black Hawk, and CH-47 Chinook. The sizes of the four proposed LZs are 115 x 115 ft (35 x 35 m) (LZs 1 and 2), 295 x 295 ft (90 x 90 m) (LZ 3), and 525 x 525 ft (160 x 160 m) (LZ 4). Each of these LZs is on a young barren aa lava flow. LZ 4 will be accessed via a narrow vehicle trail (Pioneer Trail); an alternate trail is also proposed in case modifications to the original trail become necessary. For surface modification (crushing, grading, and leveling), there will also be a construction access route between the LZs that will be

utilized by a bulldozer when traveling from one LZ to the next. No off-site material will be required other than concrete for footings for several stacked containers.

Surveys for ESA species
The PTA Natural Resources Office (NRO) conducted surveys for plants and animals protected under the Endangered Species Act (ESA) and the Migratory Bird Treaty Act (MBTA) in April 2013. For the avifaunal surveys, the "action area" was defined as the area of greatest extent potentially impacted by aviation operations at the LZs and a reasonable noise level threshold of concern for disturbance of bird species. The 80 decibel contour was selected as the reasonable noise level threshold of concern and, thus, avifaunal surveys were conducted in a 2,000 ft (610 m) radius area from the perimeter of each LZ. Avifaunal presence and habitat use in the general vicinity of the LZs was conducted on April 17 and 18, 2013. No ESA listed species or colony presence were observed or detected during these surveys.

The botanical survey area comprised a buffer of 330 ft (100 m) from the perimeter of each of the 4 LZs and a 66-ft (20-m) buffer from all construction routes and access trails. As a result, the botanical survey area (including LZ buffers and access trail buffers) encompassed 230 total ac (95 ha). Botanical surveys were conducted on April 17, 18, 22, and 23, 2013. The LZs are composed almost entirely of aa lava and are very sparsely vegetated. No federally-listed plant species were recorded within the LZs, access trails, or buffers. Four locations of Hawaiian catchfly were recorded within the construction access route between LZ 2 and LZ 4 and one additional Hawaiian catchfly location was found beyond the survey area at LZ 2. There were between one and five individuals of Hawaiian catchfly found at each location.

Conservation Measures
The following measures identified in your letter will be implemented to avoid and minimize effects to Hawaiian catchfly and Hawaiian and band-rumped storm petrels. These conservation measures are considered part of the project description. Any changes to, modifications of, or failure to implement these conservation measures may result in the need to reinitiate this consultation.

Silene hawaiiensis
Hawaiian catchfly locations were marked using fluorescent pink flagging tape that can be easily seen by the bulldozer operator. In addition, an area 130 ft (40 m) wide was surveyed for the access routes. Therefore, *S. hawaiiensis* locations can be avoided by the bulldozer operator.

Hawaiian and band-rumped storm petrels
The PTA NRO will mark suitable openings for avoidance by the bulldozer.

Invasive Plants
On July 15, 2013, Dr. Peter Peshut (PTA NRO) stated over the phone to Dr. Langer (Service) that insipient plant control will also be conducted as part of this project. The bulldozer will be cleaned prior to use and the LZs, access trails, and buffers will be monitored post-construction to detect and eradicate any new invasive plants that may be brought to those areas as part of this project.

Other ESA listed species

This proposed action is a covered activity for Hawaiian geese (*Branta sandvicensis*) and Hawaiian hawk (*Buteo solitarius*) in the 2013 Biological Opinion (Service tracking number 2012-F-0241). In addition, the Service agrees with the Army's determination that this project will have no effect on the Hawaiian hoary bat (*Lasiurus cinereus semotus*).

Summary

We concur that the proposed project may affect, but is not likely to adversely affect, the Hawaiian petrel, Hawaiian catchfly, and band-rumped storm petrel. Unless the project description changes, new information reveals that the proposed project may affect listed species in a manner or to an extent not considered, or a new species or critical habitat is designated that may be affected by the proposed action, no further action pursuant to section 7 of the ESA is necessary.

If you have any questions or concerns regarding this consultation, please contact Dr. Tim Langer, Fish and Wildlife Biologist (phone: 808-792-9462, email: tim_langer@fws.gov).

Sincerely,

for Loyal Mehrhoff
Field Supervisor

cc: Dr. Peter Peshut, Program Manager, Pohakuloa Training Area Natural Resources Office

IMHW-PTA-PWE 09 July 2013

Loyal Mehrhoff, PhD, Field Supervisor
US Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Mona Boulevard, Room 3-122, Box 50088
Honolulu, HI 96850

Re: 1) Informal consultation concurrence request for determining landing zones are not likely to adversely affect the Hawaiian Petrel and *Silene hawaiiensis* at Pohakuloa Training Area, island of Hawaii;

2) Informal conference concurrence request for determining landing zones are not likely to adversely affect the Band-Rumped Storm Petrel at Pohakuloa Training Area, island of Hawaii;

3) ESA-7(c) determination of no effect for landing zones for the Hawaiian Hoary Bat, botanical resources, and avifauna protected under the Migratory Bird Treaty Act at Pohakuloa Training Area, island of Hawaii.

Dear Dr. Mehrhoff,

The US Army Garrison – Pohakuloa (Army) is requesting concurrence from the US Fish and Wildlife Service (US FWS) that proposed aviation training operations at landing zones (LZs) at Pohakuloa Training Area (PTA), island of Hawaii, is **not likely to adversely affect** the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), the threatened Hawaiian catchfly (*Silene hawaiiensis*), and the Band-Rumped Storm-Petrel (*Oceanodroma castro*), which is a candidate species for federal listing.

The Army has also determined that proposed aviation training operations at LZs at PTA, island of Hawaii, will have **no effect** on the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), botanical resources, and avifauna protected under the Migratory Bird Treaty Act (MBTA). Note that the endangered Hawaiian Hawk (*Buteo solitarius*) and the endangered Hawaiian Goose (*Branta sandvicensis*) are not part of this determination. Effects to the Hawaiian Hawk and Hawaiian Goose from aviation training activities at PTA are covered under an existing take statement for the 2013 Biological Opinion (US FWS 2013). Therefore, all effects to these species from the action are covered under previous consultations. Although goose and hawk presence were not noted in the action area, standard operating procedures require helicopter pilots to report air strikes and incidental take.

Biological surveys were conducted to determine the reasonable likelihood that potential impacts will occur to federally-listed threatened and endangered species as a result of aviation training operations at 4 proposed LZs. Five types of surveys were conducted: 1) Avifauna, 2) Botanical, 3) Hawaiian Hoary Bat, 4) Invasive Ants, and 5) Hawaiian Petrels and Band-Rumped Storm Petrels. The enclosed Memorandum For Record, *Biological Surveys for Landing Zones at Pohakuloa Training Area, Island of Hawaii,* dated 09 July 2013, describes proposed aviation training operations at the LZs, methods and results for the biological surveys, and discusses potential impacts to plants and animals protected by the Endangered Species Act (ESA) and the MBTA (Peshut et al. 2013).

The first part of this letter addresses potential effects to the Hawaiian Petrel, *Silene hawaiiensis*, and the Band-Rumped Storm Petrel, from proposed aviation training operations at the LZs. Species descriptions, current state-wide distributions, known populations at PTA, and potential presence and habitat within the action area are provided. Potential direct and indirect effects of the project actions to these species are summarized and support the Army's determination that aviation training operations at the LZs will not likely adversely affect the Hawaiian Petrel, *Silene hawaiiensis*, and the Band-Rumped Storm Petrel.

The second part of this letter addresses potential effects to the Hawaiian Hoary Bat, botanical resources, and avifauna protected under the MBTA, from proposed aviation training operations at the LZs. Based on findings from biological surveys conducted at the LZs, there is no reasonable likelihood that aviation training operations will have a sustained detrimental effect on these species. Surveys results and conclusions are summarized herein.

Landing zone geographic coordinates are given in Table 1. Landing zone locations are shown graphically in Figure 1 and further described in the enclosed Memorandum for Record (Peshut et al. 2013).

Table 1. LZ Geographic Coordinates

Landing Zone	Latitude (N)	Longitude (W)	Elevation (ft)
LZ 1	19° 34’ 54.841”	155° 38’ 22.536”	8320
LZ 2	19° 34’ 59.632”	155° 37’ 18.91”	8591
LZ 3	19° 34’ 51.775”	155° 36’ 13.253”	8762
LZ 4	19° 34’ 50.635”	155° 34’ 38.354”	8936

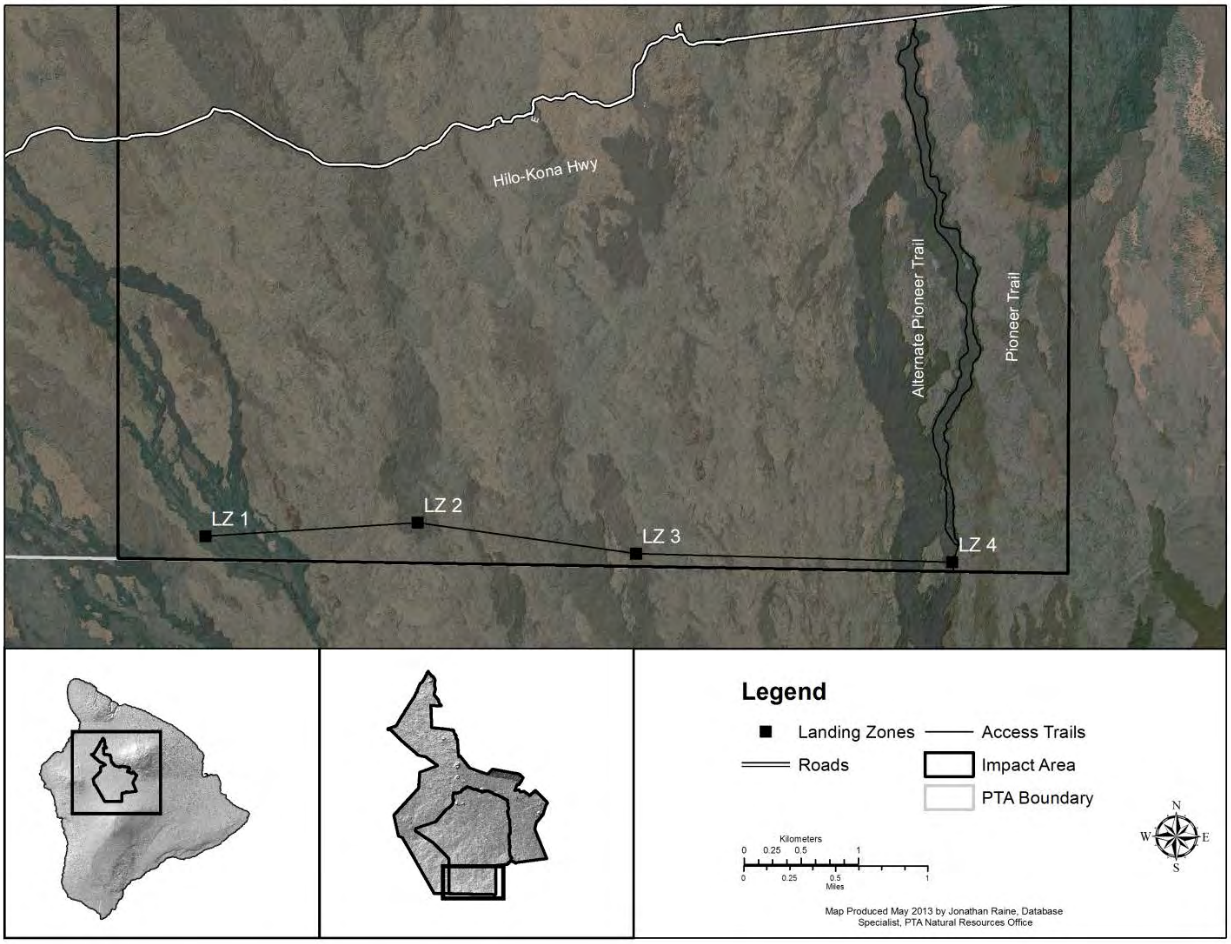

Figure 1. Location of the LZs

1.0 POTENTIAL EFFECTS TO THE HAWAIIAN PETREL IN THE ACTION AREA

1.1 Species Background

Common name: Hawaiian Petrel
Scientific name: *Pterodroma sandwichensis*
Family: Procellariidae
Federal status: Endangered (March 1967)
Recovery Plan: US FWS (April 1983)

Description: The Hawaiian Petrel is a large, nocturnal gadfly petrel that is endemic to Hawaii. Adult males and females have dark grayish heads, wings, and tails, with a slightly more pale back. The forehead and under parts are white and the tail is black. Its bill is black and the legs and feet are mostly pink. Hawaiian Petrels often feed hundreds of miles from colonies, usually foraging with mixed-species feeding flocks, typically over schools of predatory fishes (Mitchell et al. 2005). Hawaiian Petrels nest in colonies and form long-term pair bonds. Pairs return to the same nest site year after year, where females lay a single white egg. Adults feed on squid, fish, and crustaceans which are regurgitated to feed the chicks. As chicks mature, parental care diminishes and adults leave the nest about 2 to 3 weeks before the chicks (Mitchell et al. 2005).

Habitat: Hawaiian Petrel colonies are typically located at high elevation, xeric habitats or wet, dense forests. Nests are located in burrows, crevices, or cracks in lava tubes. The adults arrive and depart at night during the breeding season (March-October). Due to pressure from introduced predators and habitat degradation, modern Hawaiian petrel colonies in Hawaii typically occur above 8200 feet (2500 m) (Mitchell et al. 2005).

Suitable Hawaiian Petrel habitat at PTA has been defined as open pahoehoe lava with lava tubes and blisters suitable for nesting sites. Figure 2 shows potential petrel habitat within the action area. Approximately 48% of this area has been identified as potential habitat (i.e., pahoehoe) and 52% has been identified as unsuitable habitat (i.e., aa).

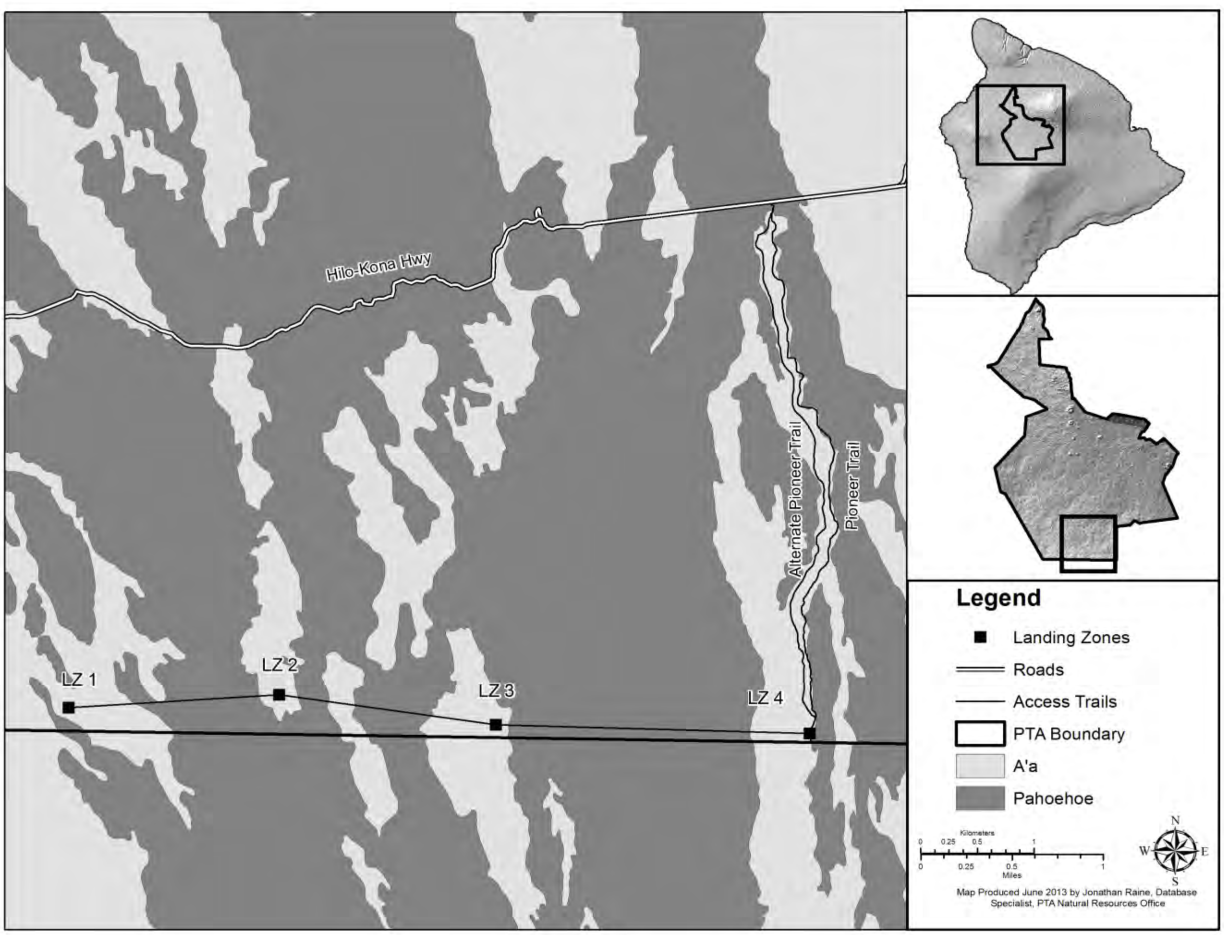

Figure 2. Potential Petrel Habitat within the Action Area

Distribution: Subfossil evidence indicates that Hawaiian Petrels were once common on all of the main Hawaiian Islands, but their distribution is now limited to Maui, Hawaii, and Kauai. Additional populations may exist on Molokai and Lanai, and off the shores of Kahoolawe and Niihau, but there is limited or no survey data for these areas. The pelagic distribution of petrels during the non-breeding season is largely unknown but they remain near the main Hawaiian Islands during the nesting season.

Across the Hawaiian Islands, the total number of Hawaiian Petrels is estimated to be 19,000 (95% CI = 11,000-34,000) with a breeding population between 4500 and 5000 pairs, although inaccessible nesting locations make accurate counts difficult (Spear et al. 1995). Pyle and Pyle (2009) estimate 150 pairs breed on Hawaii Island annually. Since only 85% of the adult population breeds in any given year, it is reasonable to assume the total Hawaii Island nesting population to be ~350 birds.

Extant breeding colonies are located in Hawaii Volcanoes National Park on Mauna Loa (Hu et al. 2001) and possibly on the windward side of Mauna Kea, but no colonies have been confirmed there to date (Day et al. 2003).

Movement Patterns: Island-wide movement patterns and potential flyways for the Hawaiian Petrel are poorly understood. Hawaiian Petrels access inland colonies from February to November with a small period of absence around March and April (Simons 1985). When traveling between the ocean and breeding colonies, bright lights can disorient and blind petrels, causing individuals to collide with objects and fall to the ground where they are susceptible to predators. On other islands with large seabird populations this “fallout” is highest in October when young petrels make their first seaward flight (Telfer 1987).

An island-wide seabird movement study detected no inland flights originating from the west coast (Kona), suggesting the majority of Hawaiian Petrels access Mauna Loa colonies from other directions (Day et al. 2003). Low numbers of seabirds (2.4 birds/hr) were recorded traversing inland at Kawaihae harbor (northwest of PTA); however, Day et al. (2003) speculate these birds likely nest in Kohala.

Known Population at PTA: Archaeological evidence suggests that the Hawaiian Petrel was once common at PTA (Banko 1980). Surveys for petrels at PTA have been on-going since 1992. No colonial activity has been detected and extremely low levels of movement activity have been observed (Cooper et al. 1996, Day et al. 2003). From 1992-1993 a year-long study adjacent to the action area did not aurally detect the Hawaiian Petrel. In 1995, 3 individuals were detected (2 aurally and 1 visually) flying over the eastern portion of PTA. From 1997-2009, aural surveys in TA 2 and TA 23 did not detect the Hawaiian Petrel.

Between 2008 and 2012, the PTA NRO deployed recording equipment annually to 18 survey locations in 2 study sites in Training Areas (TAs) 21 and 23. In 2011, 2 to 5 Hawaiian Petrel calls were recorded in short succession on a single night in TA 23, 1.9 mi (3 km) from the western-most LZ (LZ 1) (Figure 3). This was the only detection of this species in more than 5000 recorded hours in TA 23 (NRO unpublished data). In 2012, a Hawaiian Petrel was recorded on a single night in TA 21, 5.2 mi (8.4 km) from the eastern-most LZ (LZ 4) (Figure 3). This was the only detection from more than 2000 recorded hours in TA 21 (NRO unpublished data). All detections in TA 21 and TA 23 were assessed to emanate from birds transiting the installation due to the short call-time duration on each recording.

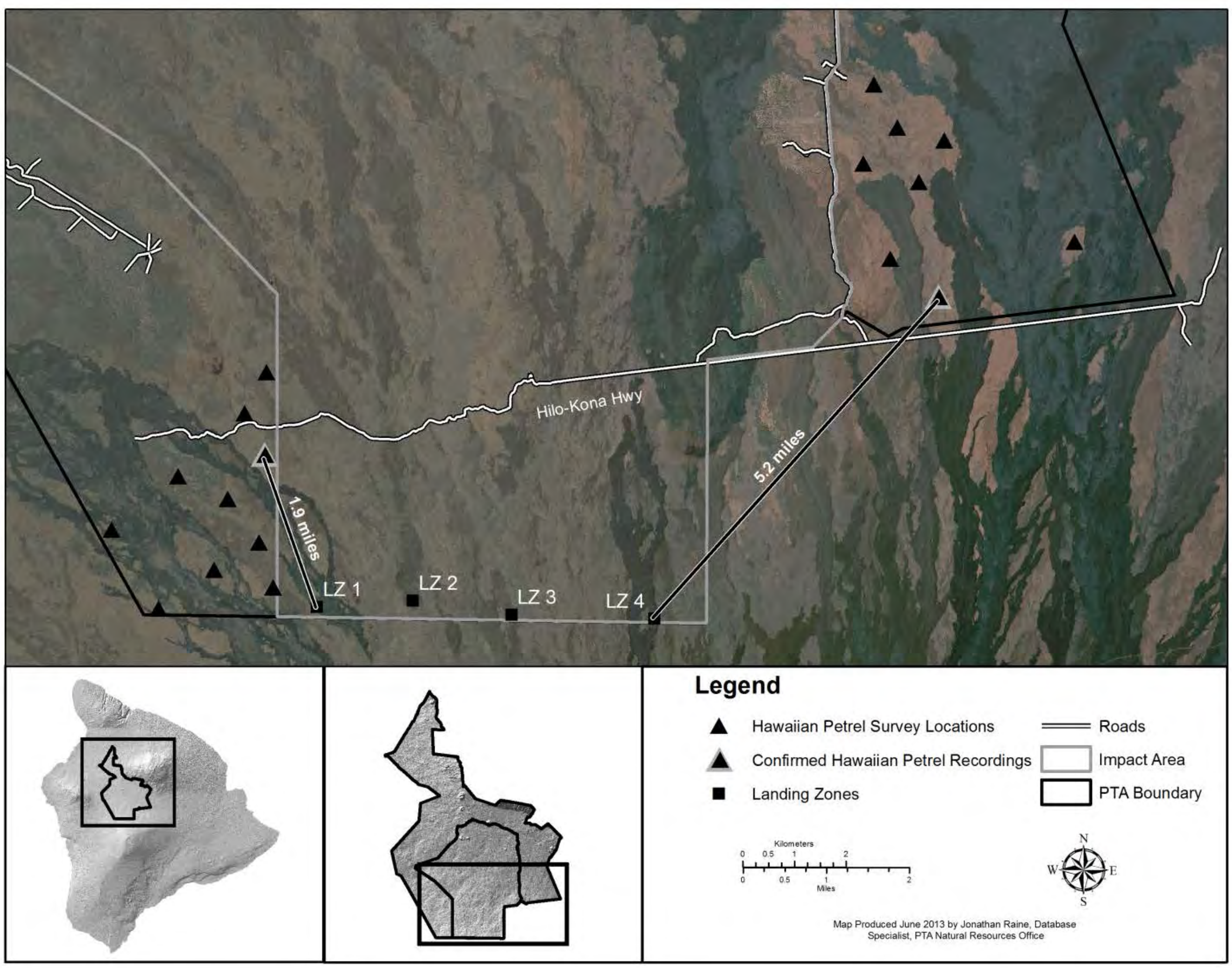

Figure 3. Hawaiian Petrel Survey Locations and Confirmed Recordings 2008-2012

In May and June 2013, Song Meter II (SM) units were deployed via helicopter at the LZs. The SM units were programmed to record all ambient sounds on 4 non-contiguous nights during an 8-night monitoring period. Three SM units were each deployed twice in the action area, for a total of 6 locations (Figure 6). The units were deployed near LZs

1, 2, and 3 (SM locations 1-3) for 8 nights, then were moved to new locations near LZs 3 and 4 for the same length of time (SM locations 4-6). No confirmed Hawaiian Petrel calls were recorded.

1.2 Potential Effects of the Action on the Hawaiian Petrel: Direct, Indirect, and Cumulative

This section describes specific potential direct, indirect, and cumulative effects from military training actions within the action area on the Hawaiian Petrel and associated habitats.

1.2.1 Direct Effects

Potential effects to the Hawaiian Petrel from aviation training operations at the LZs include injury or death from grading and leveling during construction, noise disturbance, and airstrikes. These effects were evaluated based on the expected presence of petrels within the action area during training operations.

If present, impacts to the Hawaiian Petrel could occur when the bulldozer transits potential nesting habitat within the construction access routes between LZs. Eggs, chicks, and/or adults could be injured or killed if occupied burrows collapse under the bulldozer. However, constructing the LZs is not considered to be of concern for petrels. Because the LZs are located on relatively young aa lava, grading and leveling will not impact potential nesting burrows. Although pahoehoe lava with suitable openings for nesting is present along the construction access routes between LZ 2 and LZ 3 and between LZ 3 and LZ 4, no Hawaiian Petrels were detected during surveys, indicating no colonial activity within these areas. Additionally, no visual evidence (e.g., guano, feathers, footprints) indicating recent use was discovered within the suitable openings. Therefore, we conclude the area is unoccupied by nesting Hawaiian Petrels and there will be no impacts from traversing the construction access route with a bulldozer.

All classes of fixed wing and rotary wing aircraft from all services will potentially conduct aviation training operations at the PTA LZs. Action area delineation and petrel surveys were based on a noise contour of 80 dB for the CH-47 Chinook and CH-53E Super Stallion, the 2 loudest aircraft proposed for training operations at the LZs. The literature supports that many bird species live, breed, and raise young in areas with sound levels well over 80 dB (Peshut and Schnell 2011). Birds may flush from nests when sound levels are high (generally >80-100 dB), but generally return to their nests within minutes after the disturbance abates. Also, many studies indicate that birds habituate (display decreasing responses) to loud noises. Refer to the enclosed Memorandum For Record, *Biological Surveys for Landing Zones at Pohakuloa Training Area, Island of Hawaii*

(Peshut et al. 2013), for more details about noise impacts on birds as a result of military training.

Although it is recognized that exceptions are possible among individual species, the 80 dB contour was selected as the reasonable noise level threshold of concern for disturbance of bird species, based on a review of the literature. Given the expected low density of petrels within the action area, noise ≥80 dB is not expected to affect an indeterminably small number of individuals.

In a radar survey of seabirds at PTA, Cooper et al. (1996) detected 5 seabirds (0.05 birds/hr), including 3 Hawaiian Petrels, on the eastern portion of the installation. This movement rate is 6-fold lower than the lowest seabird movement rate found in a similar study by Day et al. (2003) at coastal sites (0.3 birds/hr). Indeed, in 9 of the 14 sites sampled by Day et al. (2003), seabird movement rates were greater than 1.0 bird/hr, with a maximum rate of 25.8 birds/hr at Waipio Valley (northeast of PTA). From these data, we conclude relatively few birds transit PTA. Therefore, very few Hawaiian Petrels are likely to encounter noise at the proposed LZs.

Airstrikes as a result of training operations at the LZs are not considered to be of concern for Hawaiian Petrels. Most training activities are scheduled for daylight hours when helicopters are visible as well as audible to petrels. Petrels that are transiting the saddle region are not expected to be in the vicinity of the LZs during daylight hours. Transiting petrels during nighttime training operations are expected to be minimal because petrel density in the flyway is expected to be low (Cooper et al. 1996). Hawaiian Petrels tend to fly close to the ground when at high elevations, especially within colonies (Swift and Burt-Toland 2009). Bird airstrikes are extremely rare for military aircraft overall, with only 2 airstrikes documented between 2001-2010 for all Army aircraft flights in the state of Hawaii (P. Mansoor, CW4, pers. comm., 2011). Moreover, helicopters are typically slow-moving at the elevations proposed for training activities at the LZs due to reduced aircraft performance (F. Tate, COL, pers. comm., 2011), which further reduces the likelihood of bird airstrikes.

Artificial light sources are known to be hazardous to fledging petrels because they disrupt navigation (Simons and Hodges 1988); however, artificial light sources will not be placed at the LZs, as this is not consistent with realistic combat conditions (F. Tate, COL, pers. comm., 2011). Therefore, no impacts to petrels from artificial light sources are expected.

1.2.2 Indirect Effects

No indirect effects were considered for the Hawaiian Petrel as a result of aviation training operations at the LZs.

1.2.3 Cumulative Effects

There are no future State or public/private actions that are reasonably certain to occur within the action area. Therefore, there are no cumulative effects to Hawaiian Petrels as a result of aviation training operations at the LZs.

1.3 Minimization Measures for Potential Effects to the Hawaiian Petrel

The Hawaiian Petrel was not observed transiting the action area and no petrel colonies were observed during the survey period. Results are considered conclusive with respect to Hawaiian Petrel colonies, and support the proposition that petrel occurrence in the saddle region flyway is infrequent. Open pahoehoe habitat near the LZs is sparse, providing limited suitable habitat for petrel colonies. Additionally, evidence suggests very few Hawaiian Petrels access Mauna Loa colonies via the west coast and the Saddle region (Cooper et al. 1996, Day et al. 2003). Therefore, there are no minimization measures proposed for the Hawaiian Petrel as a result of aviation training operations at the LZs.

1.4 Final Determination for the Hawaiian Petrel

The Army concludes that potential direct and indirect effects resulting from aviation training operations at the LZs are either insignificant or discountable and the Hawaiian Petrel is not likely to be adversely affected. We request your concurrence with our determination.

2.0 POTENTIAL EFFECTS TO *SILENE HAWAIIENSIS* IN THE ACTION AREA

2.1 Species Background

Common name: Hawaiian catchfly
Scientific name: *Silene hawaiiensis*
Family: Caryophyllaceae
Federal status: Threatened (March 1994)
Recovery Plan: US FWS (September 1996)

Description: *S. hawaiiensis* is a sprawling, short-lived shrub with slanting or climbing stems approximately 6 to 16 in (15 to 40 cm) long that arise from an enlarged root, and are generally covered with short, sticky hairs. Leaves are slender, often recurved, and stalkless. The stems are 0.2 to 0.6 in (6 to 15 mm) long and 0.02 to 0.03 in (0.5 to 0.8 mm) wide. Flowers are borne in loosely arranged, elongate, sticky clusters. The calyx is fused, 5-toothed, purple-tinged, and 0.4 to 0.6 in (11 to 14 mm) long. Petals are green-white above and sometimes maroon or maroon-streaked below. Each petal is divided into 2 parts, a 2-lobed expanded blade and a long narrow, stalk-like base.

Habitat: This species typically grows in montane and subalpine dry shrublands on weathered lava and ash, as well as on all ages of lava and cinder substrates.

Distribution: *S. hawaiiensis* is endemic to the island of Hawaii.

Known population at PTA: According to survey and monitoring data, between 1791 – 2760 *S. hawaiiensis* currently exist at PTA. No individuals are known to exist in the Keamuku Maneuver Area.

2.2 Potential Effects of the Action on *Silene hawaiiensis*: Direct, Indirect, and Cumulative

This section describes specific potential direct, indirect, and cumulative effects from military training actions within the action area on *S. hawaiiensis*.

2.2.1 Direct Effects

Potential effects to *S. hawaiiensis* from aviation training operations at the LZs may occur during construction and maintenance of the LZs and access trails, and/or temporary localized disturbance from dust and wind generated from helicopter rotorwash. These impacts were evaluated based on the presence of *S. hawaiiensis* within the action area.

All LZ construction will occur on aa lava flows that are sparsely vegetated and at which no federally-listed plant species were found. Therefore, construction of the LZs will have no impact to federally-listed plant species and minimal impact to common native vegetation.

Four locations of *S. hawaiiensis* were located within the construction access route between LZ 2 and LZ 4, with 1-5 individuals at each location (Figure 4). The majority of the construction access routes are on pahoehoe lava and on which all the *S. hawaiiensis* were found. The routes will be utilized by a bulldozer to travel from one LZ to the next for the purpose of grading and leveling. The blade of the bulldozer will not be in contact with the ground when traveling between LZs. The bulldozer will utilize the access routes twice, once pre-LZ construction and once post-LZ construction. The *S. hawaiiensis* located were marked using fluorescent pink flagging tape that can be easily seen by the bulldozer operator. In addition, an area 130 ft (40 m) wide was surveyed for the access routes. Therefore, the *S. hawaiiensis* locations can be avoided by the bulldozer operator. Retracing the route post-construction will limit potential impacts to *S. hawaiiensis* from the bulldozer.

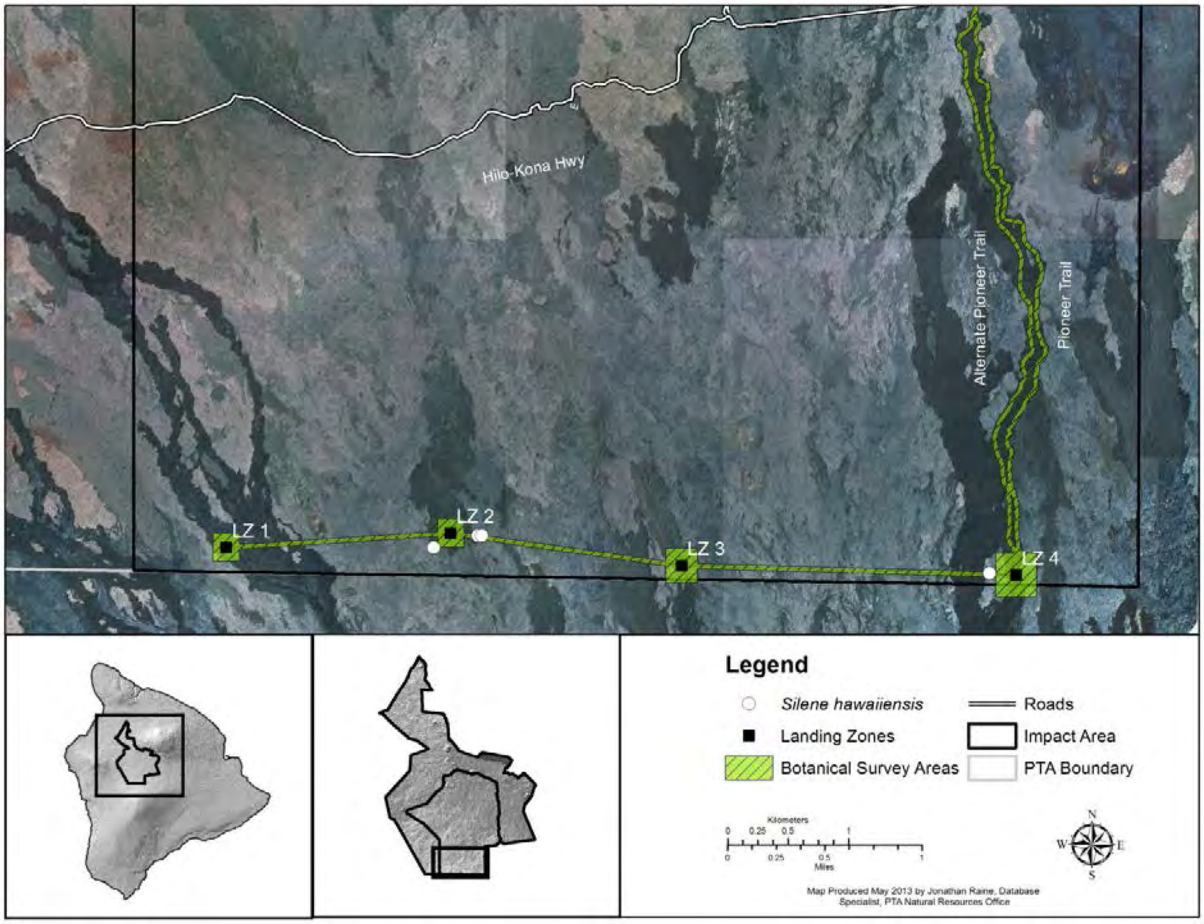

Figure 4. *Silene hawaiiensis* Locations within the Action Area

Wind generated from helicopter approaches and landings at the LZs is not considered to be of concern to *S. hawaiiensis*. Helicopter rotorwash velocities at ground level are within the range of typical wind conditions in the action area. Average wind speeds at the PTA East Remote Automated Weather Station, located 6 mi (10 km) northeast of the LZs, vary from 0-37 mph with gusts up to 50 mph (Meso West 2013). The average wind speed at the National Oceanic and Atmospheric Administration's Mauna Loa Observatory ranges from 11-45 mph with gusts up to 54 mph (A. Colton, pers. comm., 2013). Mauna Kea has an average wind speed of approximately 57 mph (Carrasco and Sarazin 2003) with a maximum recording of 127 mph (Bely 1987).

Known rotorwash profiles for the 2 largest aircraft proposed aviation training at the LZs included the CH-47 Chinook and CH-53E Super Stallion, which were used to characterize wind effects on vegetation. Rotorwash velocity from the CH-47 Chinook at lift-off is up to 127 mph at a distance of 50 ft (15 m) from the aircraft, but this diminishes to the speed of prevailing winds at a distance of 160 ft (49 m) from the aircraft (Leese and Knight 1974). The rotorwash velocity from the CH-53E at lift-off is approximately

180 mph (D. Geltmacher, USMC, pers. comm., 2013). Technical information regarding attenuation of wind speed at lift-off distance for the CH-53E rotorwash was not found, but it is reasonable to expect that rotorwash velocity for this aircraft is slightly higher than the CH-47. However, the area potentially affected by rotorwash velocities from these aircraft is expected to be significantly smaller than the LZ survey buffer area of 330 ft (100 m). The *S. hawaiiensis* locations identified during surveys were outside of this buffer area.

2.2.2 Indirect Effects

No indirect effects were considered for *S. hawaiiensis* as a result of aviation training operations at the LZs.

2.2.3 Cumulative Effects

There are no future State or public/private actions that are reasonably certain to occur within the action area. Therefore, there are no cumulative effects to *S. hawaiiensis* as a result of aviation training operations at the LZs.

2.3 Minimization Measures for Potential Effects to *Silene hawaiiensis*

The *S. hawaiiensis* individuals within the action area represent an insignificant percentage of the known naturally occurring population at PTA. Based on the limited occurrence of *S. hawaiiensis* within the action area, the minimal amount of fine material within the substrate available to generate dust, and the highly localized and short duration of the action, it is unlikely that training activities will affect this species. It is anticipated that the impacts to *S. hawaiiensis* from these training operations will not exceed impacts from natural conditions in the action area. Therefore, there are no minimization measures proposed for *S. hawaiiensis* as a result of aviation training operations at the LZs.

2.4 Final Determination for *Silene hawaiiensis*

The Army concludes that potential direct and indirect effects resulting from aviation training operations at the LZs are either insignificant or discountable and *S. hawaiiensis* is not likely to be adversely affected. We request your concurrence with our determination.

3.0 Potential Effects to the Band-Rumped Storm Petrel in the Action Area

3.1 Species Background

Common name: Band-Rumped Storm Petrel
Scientific name: *Oceanodroma castro*
Family: Hydrobatidae
Federal status: Candidate (May 1989)
Projected Status Determination: FY 2015
Conservation Plan: US FWS (January 2005)

Description: The Band-Rumped Storm Petrel is a medium sized, highly pelagic petrel with an estimated life span of 15-20 years. Adult males and females are primarily blackish-brown and have a sharply defined narrow white band across the rump area. A slightly paler brownish-gray wing bar marks the upper wing coverts, forming a V-shape on the back. The Band-Rumped Storm Petrel feeds far from shore by hovering close to the water surface and scooping up minute food often contacting the water with their feet. The species' breeding biology in Hawaii is not well known, but individuals are assumed to nest in burrows or natural cavities at high-elevation, inland habitats. The Band-Rumped Storm Petrel breeding seasonality is assumed similar to the Hawaiian Petrel. Band-Rumped Storm Petrels lay a single egg per season between May and June and young fledge in October. The species is highly faithful to nesting sites, typically returning to the same site each year. Although little is known about courtship behaviors, birds, probably un-paired juveniles, swoop and call over the colony (Harrison 1990).

Habitat: Band-Rumped Storm Petrel colonies exist on steep heavily-vegetated cliffs and high-elevation barren lava flows, similar to Hawaiian Petrels, where predation pressure is presumably relaxed. Band-Rumped Storm Petrel nests are located in burrows, crevices, or cracks in lava tubes. The species visits cinder cones to swoop and call. Confirmation of nesting colonies remains elusive on Hawaii Island (Slotterback 2002).

Suitable Band-Rumped Storm Petrel habitat at PTA has been defined as open pahoehoe lava with lava tubes and blisters suitable for nesting areas. Additionally, prominent cinder cones at PTA may be important sites for aerial displays and mate attraction. Potential petrel habitat within the action area is shown in Figure 2.

Distribution: Archaeological and subfossil evidence suggest the Band-Rumped Storm Petrel previously inhabited the main Hawaiian Islands and indicates birds nest much closer to the shore than today. Currently, populations are extant on the islands of Kauai, Maui, and Hawaii.

Movement Patterns: Similar to the Hawaiian Petrel, island-wide movement patterns and potential flyways for the Band-Rumped Storm Petrel are poorly understood. Band-Rumped Storm Petrels access inland colonies from February to November with a small period of absence around March and April (Simons 1985). When traveling between the ocean and breeding colonies, bright lights can disorient and blind petrels, causing individuals to collide with objects and fall to the ground where they are susceptible to predators. On other islands with large seabird populations this “fallout” is highest in October when young petrels make their first seaward flight (Telfer 1987).

Previous radar studies have not specifically targeted Band-Rumped Storm Petrels and because the petrel is small and flies erratically at low speeds, it may not leave a clear radar signature (Swift and Burt-Toland 2009). However, an island-wide seabird movement study detected no inland flights for Hawaiian Petrels or Newell’s Shearwaters *(Puffinus newelli)* originating from the west coast (Kona) (Day et al. 2003); therefore, it is assumed Band-Rumped Storm Petrels also rarely access colonies via the west coast. Consistent seasonal activity and documented flight patterns on the southeast flank of Mauna Loa suggests Band-Rumped Storm Petrels approach high-elevation colonies (i.e., above 8850 ft) from the east and southeast coasts (Swift and Burt-Toland 2009). A low number of Band-Rumped Storm Petrels may transit PTA, including the action area, during nightly trips from breeding colonies on Mauna Loa to the sea (Day et al. 2003).

Known Population at PTA: Surveys for the endangered Hawaiian Petrel have been ongoing at PTA since 1992. Band-Rumped Storm Petrels and Hawaiian Petrels have similar habitat requirements and breeding seasons and both species are vocal at colony or display sites (Slotterback 2002); therefore, Hawaiian Petrel survey efforts are adequate to determine presence or absence of the Band-Rumped Storm Petrel at the installation. To monitor presence or absence of petrels at PTA, audio recording units are deployed at 18 monitoring sites located within potential suitable habitat during part of the breeding season (May to August). The detection radius of the audio recording units is approximately 1475 ft (450 m) and monitoring sites are distributed to cover between 44% and 59% of the potential suitable habitat found outside the Impact Area at PTA (NRO unpublished data).

Band-Rumped Storm Petrels are documented using habitat in the saddle region of Hawaii Island (NRO unpublished data). At PTA, the species was recorded between 2008-2012 (May-August) in Training Areas 21 and 23 at least once at 17 of the 18 monitoring sites (Figure 5). Generally, Band-Rumped Storm Petrels are first detected at

PTA in late May and call activity is detected more frequently in TA 21 than TA 23. In TA 21, call detections increase through June and remain steady until August when monitoring is completed. Additionally, call activity occurs throughout the sample period (i.e., between 1915 h and 2315 h). The closest distances between the western-most (LZ 1) and eastern-most (LZ 4) LZs and Band-Rumped Storm Petrel detections in the southwest and southeast are 0.6 mi (1 km) and 5.2 mi (8.4 km), respectively.

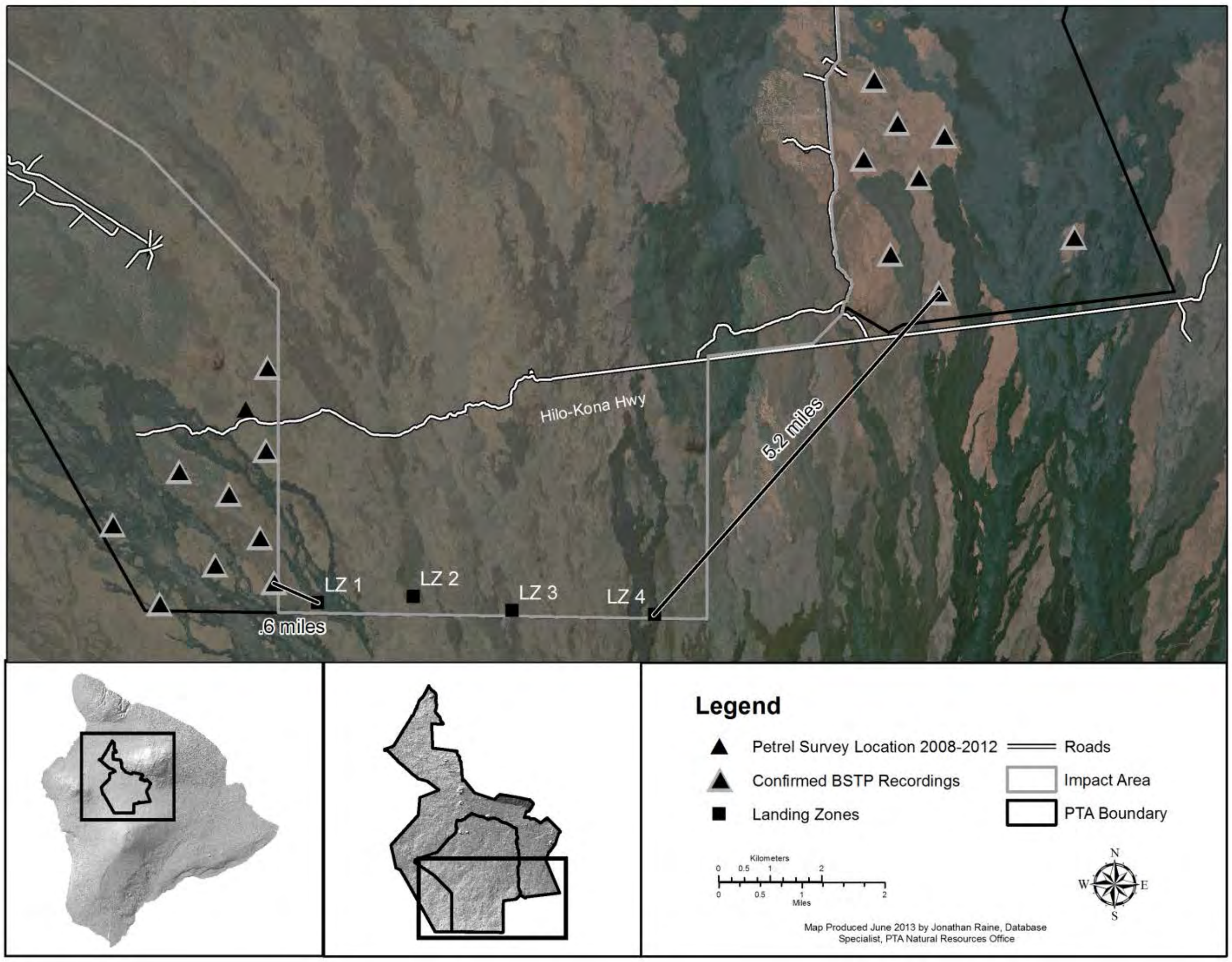

Figure 5. Band-Rumped Storm Petrel (BSTP) Survey Locations and Confirmed Recordings 2008-2012

In May and June 2013, Song Meter II (SM) units were deployed via helicopter at the LZs. The SM units were programmed to record all ambient sounds on 4 non-contiguous nights during an 8-night monitoring period. Three SM units were each deployed twice in the action area, for a total of 6 locations (Figure 6). The units were deployed near LZs 1, 2, and 3 (SM locations 1-3) for 8 nights, then were moved to new locations near LZs 3 and 4 for the same length of time (SM locations 4-6). Band-Rumped Storm Petrel calls were recorded at SM locations 1, 4, 5, and 6 over 4 different nights. Call detections were dispersed over the sample period with the earliest detection at 2103 h and the latest at 2304 h (Figure 8). However, activity is highly clustered and multiple calls are often recorded within short time intervals (e.g., 1 minute). Additionally, periods of inactivity intersperse call clusters and range from 10 to 60 minutes with 20 minutes between active periods. Overall, activity levels are relatively low in the area surrounding the LZs. Lastly, the short intervals and attenuated signal strength between the majority of calls suggest the birds were transiting the area.

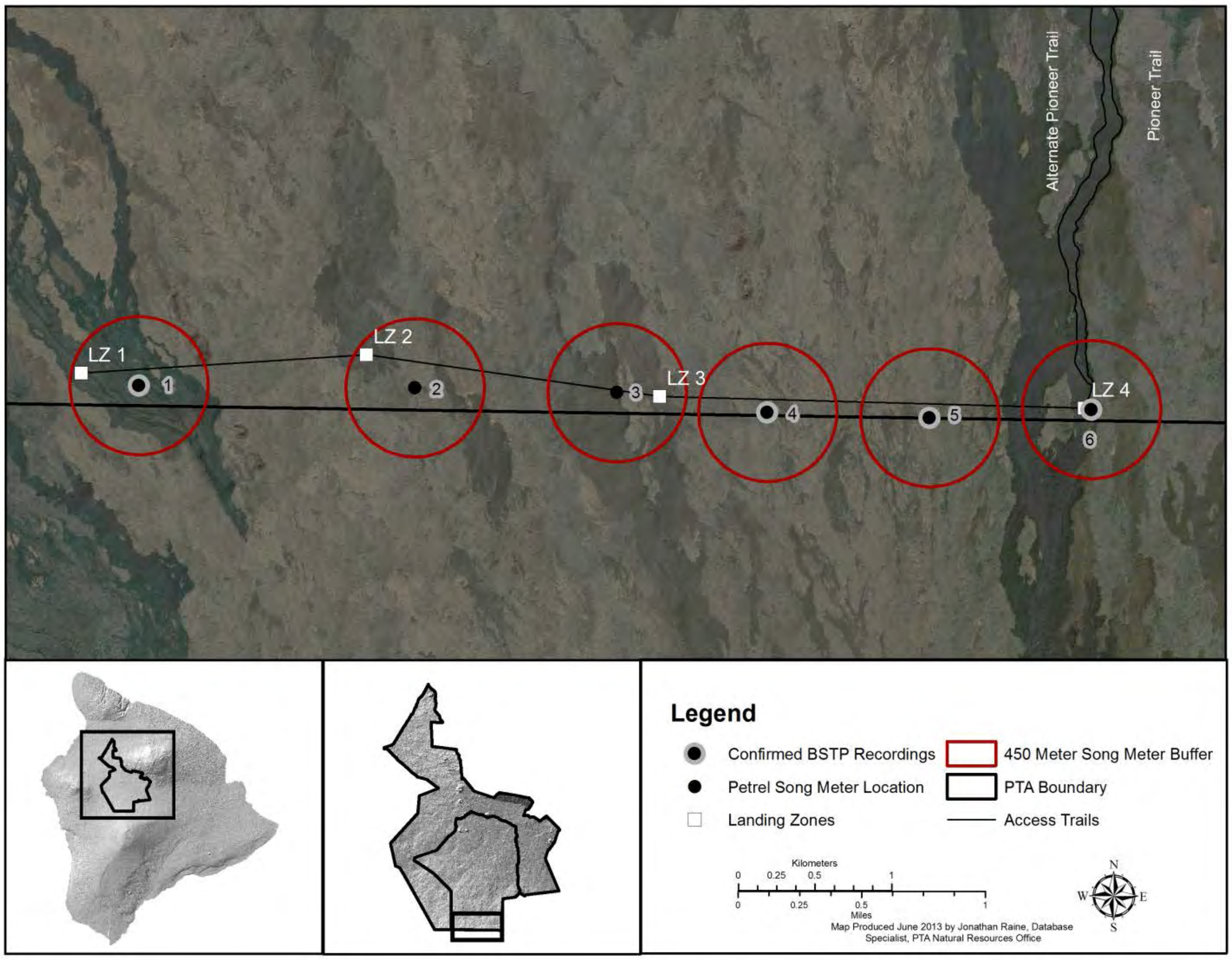

Figure 6. Petrel Survey Area and Confirmed Band-Rumped Storm Petrel (BSTP) Recordings in 2013

Band-Rumped Storm Petrels are documented within Hawaiian Petrel colonies in the National Park, and also at Red Hill cabin along the Mauna Loa summit access trail at ~3000 m elevation. Additionally, National Park personnel recovered a Band-Rumped Storm Petrel carcass from the National Oceanic and Atmospheric Administration access road on Mauna Loa proximate to the PTA boundary (D. Hu, pers. comm., 2011). Call activity suggests Band-Rumped Storm Petrels are present in portions of TA 21 and TA

23 seasonally; however, at this time it is unclear how the petrels are using habitat at PTA. It can be assumed that the species uses the saddle region as a flyway to nesting habitat on the northeast rift zone on Mauna Loa, within the Hawaii Volcanoes National Park.

3.2 Potential Effects of the Action on the Band-Rumped Storm Petrel: Direct, Indirect, and Cumulative

This section describes specific potential direct, indirect, and cumulative effects from military training actions within the action area on the Band-Rumped Storm Petrel and associated habitats. Band-Rumped Storm Petrels have habitat requirements and breeding seasons similar to Hawaiian Petrels (Slotterback 2002) and potential impacts are expected to be the same for these species.

3.2.1 Direct Effects

Potential effects to the Band-Rumped Storm Petrel from aviation training operations at the LZs include injury or death from grading and leveling during construction, noise disturbance, and airstrikes. These effects were evaluated based on the expected presence of petrels within the action area during training operations.

If present, impacts to the Band-Rumped Storm Petrel could occur when the bulldozer transits potential nesting habitat within the construction access routes between LZs. Eggs, chicks, and/or adults could be injured or killed if occupied burrows collapse under the bulldozer. However, constructing the LZs is not considered to be of concern for petrels. Because the LZs are located on relatively young aa, grading and leveling will not impact potential nesting burrows. Pahoehoe lava with suitable openings for nesting is present along the construction access routes between LZ 2 and LZ 3 and between LZ 3 and LZ 4 (Figure 7).

Figure 7. Pahoehoe Lava with Suitable Openings for Potential Petrel Nesting Burrows

Band-Rumped Storm Petrels were detected on 4 of 8 sampling nights and calls were recorded at monitoring locations 1, 4, 5, and 6 (Figure 8). Calls were detected in suitable nesting habitat along the construction access route. Activity was highly clustered with calling activity lasting from 1 to 7 minutes. Call clusters were typically interspersed by periods of inactivity lasting from 10 to 60 minutes with an average of 20 minutes between active periods. The minimal duration of calls within a cluster and the relatively long inactive periods between call clusters suggests petrels sporadically occupy the area possibly while in transit. Overall call activity was relatively low indicating no colonial activity in these areas.

Although the recordings suggest petrels are moving through the area, Band-Rumped Storm Petrel nest site preferences and identifying characteristics are poorly understood on Hawaii Island. Survey techniques for identifying Hawaiian Petrel burrows may be insufficient to detect Band-Rumped Storm Petrel nesting activity (Swift and Burt-Towland 2009). Therefore, undetected Band-Rumped Storm Petrel burrows may be present along the construction access route. To avoid impacts from bulldozer operations to unidentified burrows within the construction access route, the NRO will mark suitable openings in the lava for avoidance.

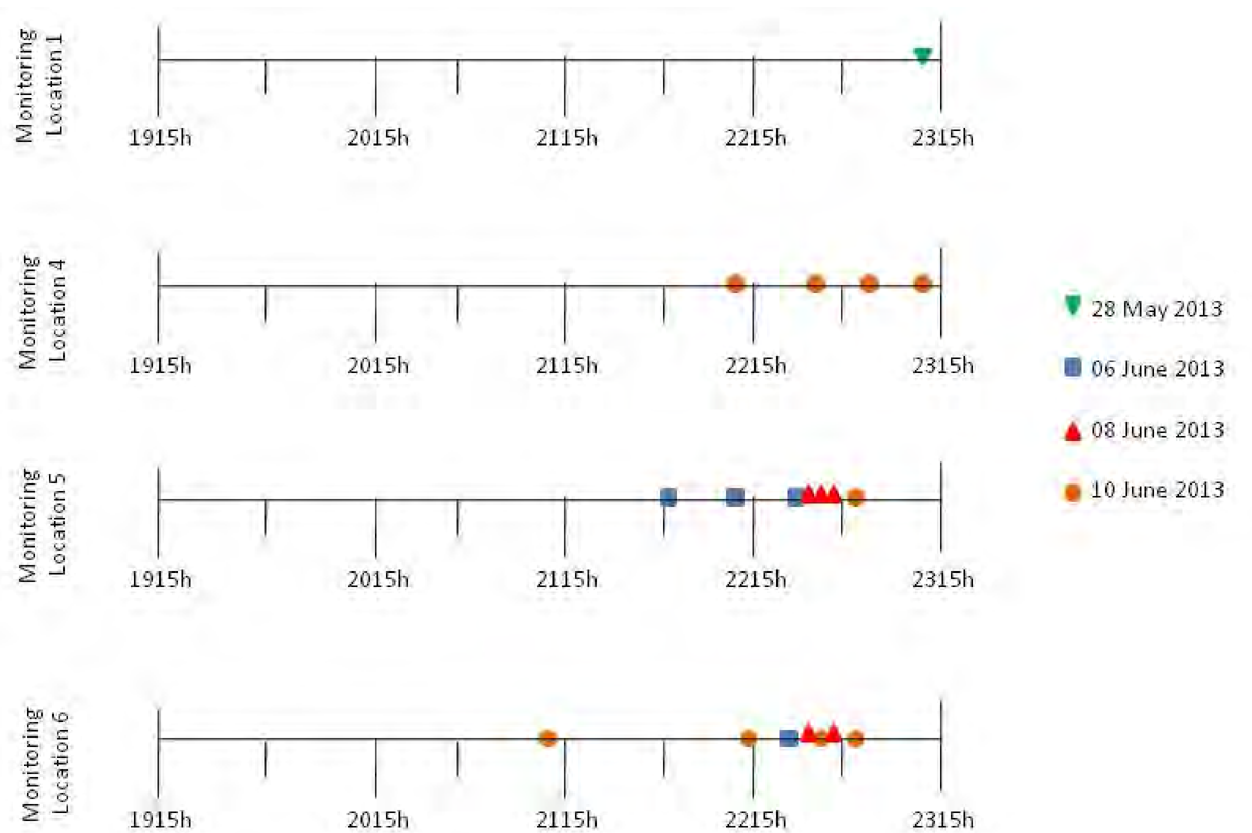

Figure 8. Band-Rumped Storm Petrel Recording Cluster Calling Activity (1 min) Timeline 1915 h to 2315 h

All classes of fixed wing and rotary wing aircraft from all services will potentially conduct aviation training operations at the PTA LZs. Action area delineation and petrel surveys were based on a noise contour of 80 dB for the CH-47 Chinook and CH-53E Super Stallion, the 2 loudest aircraft proposed for aviation training operations at the LZs. The literature supports that many bird species live, breed, and raise young in areas with sound levels well over 80 dB (Peshut and Schnell 2011). Birds may flush from nests when sound levels are high (generally >80-100 dB), but generally return to their nests within minutes after the disturbance abates. Also, many studies indicate that birds habituate (display decreasing responses) to loud noises. Refer to the enclosed Memorandum For Record, *Biological Surveys for Landing Zones at Pohakuloa Training Area, Island of Hawaii* (Peshut et al. 2013), for more details about noise impacts on birds as a result of military training.

Although it is recognized that exceptions are possible among individual species, the 80 dB contour was selected as the reasonable noise level threshold of concern for disturbance of bird species, based on a review of the literature. Given the expected low density of petrels within the action area, noise ≥80 dB is not expected to affect an indeterminably small number of individuals.

In a radar survey of seabirds at PTA, Cooper et al. (1996) detected 5 seabirds (0.05 birds/hr), including 3 Hawaiian Petrels, on the eastern portion of the installation. This movement rate is 6-fold lower than the lowest seabird movement rate found in a similar study by Day et al. (2003) at coastal sites (0.3 birds/hr). Indeed, in 9 of the 14 sites sampled by Day et al. (2003), seabird movement rates were greater than 1.0 bird/hr, with a maximum rate of 25.8 birds/hr at Waipio Valley (northeast of PTA). Additionally, monitoring data from the action area detected Band-Rumped Storm Petrels transiting the area near the LZs. From these data, we conclude relatively few birds transit PTA. Therefore, very few Band-Rumped Storm Petrels are likely to encounter noise at the proposed LZs.

Airstrikes as a result of aviation training operations at the LZs are not considered to be of concern for Band-Rumped Storm Petrels. Most training activities are scheduled for daylight hours when helicopters are visible as well as audible to petrels. Petrels that are transiting the saddle region are not expected to be in the vicinity of the LZs during daylight hours. Transiting petrels during nighttime training operations are expected to be minimal because petrel density in the flyway is expected to be low (Cooper et al. 1996). Band-Rumped Storm Petrels generally fly upslope within in 33 ft (10 m) of the ground (Swift and Burt-Toland 2009). Bird airstrikes are extremely rare for military aircraft overall, with only 2 airstrikes documented between 2001-2010 for all Army aircraft flights in the state of Hawaii (P. Mansoor, CW4, pers. comm., 2011). Moreover, helicopters are typically slow-moving at the elevations proposed for LZs due to reduced aircraft performance (F. Tate, COL, pers. comm., 2011), which further reduces the likelihood of bird airstrikes.

Artificial light sources are known to be hazardous to fledging petrels because they disrupt navigation (Simons and Hodges 1988). Artificial light sources will not be placed at the LZs, as this is not consistent with realistic combat conditions (F. Tate, COL, pers. comm., 2011). Therefore, no impacts to petrels from artificial light sources are expected.

3.2.2 Indirect Effects

No indirect effects were considered for the Band-Rumped Storm Petrel as a result of aviation training operations at the LZs.

3.2.3 Cumulative Effects

There are no future State or public/private actions that are reasonably certain to occur within the action area. Therefore, there are no cumulative effects to Band-Rumped Storm Petrels as a result aviation training operations at the LZs.

3.3 Minimization Measures for Potential Effects to the Band-Rumped Storm Petrel

The Band-Rumped Storm Petrel was recorded within the action area; however, call recording characteristics suggest the individuals were transiting the area. Open pahoehoe habitat near the LZs is sparse, providing limited suitable habitat for petrel colonies. Although potential effects to the Band-Rumped Storm Petrel as a result of aviation training operations at the LZs are unlikely, nesting site characteristics for Band-Rumped Storm Petrels are poorly understood and it is possible that undetected burrows may be present in the construction access route. Therefore, the NRO will mark suitable openings for avoidance by the bulldozer.

3.4 Final Determination for the Band-Rumped Storm Petrel

The Army concludes that potential direct and indirect effects resulting from aviation training operations at the LZs are either insignificant or discountable and the Band-Rumped Storm Petrel is not likely to be adversely affected. We request your concurrence with our determination.

4.0 Determination of No Effect for the Hawaiian Hoary Bat, Botanical Resources, and Avifauna Protected Under the MBTA

4.1 Hawaiian Hoary Bat

4.1.1 Survey Results

Surveys to assess potential available treeland roosting habitat and potential foraging habitat for the federally-listed Hawaiian Hoary Bat were conducted 17 and 18 April 2013, to determine the potential for bat presence in the general vicinities of the LZs. These surveys were coincidental with surveys for avifauna protected under the MBTA. The Hawaiian Hoary Bat survey area was based on the 80 dB noise contour used for the avifauna surveys. This area was selected as a reasonable noise level threshold of concern for disturbance of bird and bat species (see Peshut et al. Memorandum For Record 09 July 2013). Observations on bat habitat type were recorded between each of the avifauna monitoring stations.

Out of 5 possible Hawaiian Hoary Bat habitat types that occur in this area of PTA, only 2 were recorded in the action area: 1) Barren Lava and 2) *Styphelia-Dodonaea* Shrubland.

4.1.2 Conclusions

Potential impacts to the Hawaiian Hoary Bat as a result of training operations at the LZs include noise disturbance and direct impact with aircraft.

Neither of the Hawaiian Hoary Bat habitat types in the action area is considered potential available treeland roosting habitat; therefore, daytime presence of roosting bats is considered to be improbable and no daytime noise impact to the Hawaiian Hoary Bat is expected. *Styphelia-Dodonaea* Shrubland is considered potential available foraging habitat for the Hawaiian Hoary Bat. It is possible that foraging bats transit across the action area during nighttime hours; however, given the expanse of barren lava at the LZs, the number of transiting bats is expected to be very low. Moreover, nighttime exercises constitute only a small part of aviation training operations. The density of insects near the LZs is expected to be low because of the sparse vegetation, and it is therefore likely that foraging opportunities for bats in the action area are limited.

Airstrikes as a result of training operations at the LZs are not considered to be of concern for the Hawaiian Hoary Bat. Bat presence within the LZ area is expected to be limited to rare and infrequent transiting bats, and bat density in the LZ area is expected to be extremely low. The potential for a helicopter collision with the Hawaiian Hoary Bat is unlikely because the bats are solitary, are only active from sunset to sunrise, only roost in trees in forested areas, and are not expected to depend upon the habitat around the LZs for resources. Most training activities at these LZs are scheduled for daylight hours when bats are roosting in the forested areas of the island. Additionally, airstrikes are extremely rare for military aircraft in the State of Hawaii overall, with only two airstrikes (birds) documented between 2001-2010 for all Army aircraft flights (P. Mansoor, CW4, pers. comm., 2011). If transiting bats are present during aviation training operations in the action area, bats are expected to vacate the immediate vicinities of the aircraft and the LZs.

4.2 Botanical Resources

4.2.1 Survey Results

Surveys were conducted to determine the presence of federally-listed plant species and assess overall vegetation in the vicinity of the LZs on 17, 18, 22, and 23 April 2013. The botanical survey area for the LZs comprised a buffer of 330 ft (100 m) from the perimeter of each of the 4 LZs, and a 66-ft (20-m) buffer from all construction routes and access trails. Survey area dimensions were based on areas potentially impacted by helicopter rotor wash using the height and distance of aircraft from the LZs, along an anticipated line of aircraft approach (see see Peshut et al. Memorandum For Record 09 July 2013). All locations of federally-listed threatened and endangered plant species and/or species of concern were recorded when found during the surveys. Locations of common native and introduced plant species were also recorded.

One federally-listed threatened plant species, *Silene hawaiiensis*, was located within the action area (see Section 2.0 for a discussion of direct and indirect effects to this species from the action). No other federally-listed or candidate plant species were located within the action area.

4.2.2 Conclusions

Potential impacts to botanical resources as a result of aviation operations at the LZs may occur during construction of the LZs and access trails, and/or during temporary localized disturbance from dust and wind generated from helicopter rotorwash.

Construction of the LZs will have no impact to federally-listed or candidate plant species and minimal impact to common native vegetation. All LZ construction will occur on aa lava flows that are sparsely vegetated. A bulldozer will utilize construction access routes to travel from one LZ to the next for the purpose of grading and leveling, and likely impact common native vegetation. The blade of the bulldozer will not be in contact with the ground when traveling between LZs. The bulldozer will utilize the access routes twice, once pre-LZ construction and once post-LZ construction.

Retracing the route post-construction will limit the impact to common native vegetation. In addition, this is a one-time event so impacts to common native vegetation will be minimized.

The impact to botanical resources due to wind generated by helicopter rotorwash at the LZs is considered negligible. Aviation training operations will produce 10 minutes of wind disturbance per LZ per landing event. The highest rotorwash velocities from the CH-47 Chinook are within 50 ft (15 m) of the LZ perimeter, and diminish to ambient wind conditions 160 ft (49 m) from the aircraft (Leese and Knight 1974). Rotorwash velocities for the CH-53E Super Stallion are expected to be slighter higher; however, vegetation at the LZs is extremely sparse and includes few common native or introduced species. Aviation training operations will produce little or no dust at the LZs and the highly localized and short duration winds generated from aircraft rotorwash are not likely to permanently impact the sparse vegetation in the action area.

4.3 MBTA Protected Avifauna

4.3.1 Survey Results

Surveys were conducted to determine avifauna presence and habitat use in the general vicinity of the LZs on 17 and 18 April 2013. The surveys were conducted in a 2000 ft (610 m) radius area from the perimeter of each LZ. This area extent was selected based on a noise contour of 80 dB for the CH-47 Chinook and CH-53E Super Stallion, the 2 loudest aircraft proposed for aviation training operations (see Peshut et al. Memorandum For Record 09 July 2013). The survey area was extended from the perimeter of the LZs to account for potential noise effects from aircraft landing at the edge of the LZ (i.e., worst-case scenario). The avifauna species selected for surveys were prioritized based on species' status under the ESA and the MBTA.

Two MBTA protected species were detected during the surveys: Apapane (*Himatione sanguinea*) and Omao (*Myadestes obscurus*).

4.3.2 Conclusions

Potential impacts to Apapane and Omao as a result of aviation training at the LZs include noise disturbance, wind generated from helicopter rotorwash, and direct impact with aircraft.

The impact to Apapane and Omao due to noise is considered negligible. Aviation training operations at the LZs will produce up to 10 minutes of noise disturbance per landing event, with the highest noise levels ~100 dB within 330 ft (100 m) of the LZ perimeters. The literature supports that many bird species live, breed, and raise young in areas with sound levels well over 80 dB (Peshut and Schnell 2011). Birds may flush from nests when sound levels are high (generally >80-100 dB), but generally return to their nests within minutes after the disturbance abates. Also, many studies indicate that birds habituate (display decreasing responses) to loud noises.

Similarly, increased winds due to rotorwash is not likely to significantly impact nesting Apapane and Omao. Rotorwash from the largest aircraft proposed for training operations (CH-47 Chinook and CH-53 Super Stallion) will first be felt on the ground when the aircraft is 330 ft (100 m) from the perimeter of the LZs. Potential Apapane and Omao habitat exists within 330 ft (100 m) of the LZs where noise and rotorwash could affect birds; however, winds generated by the CH-47 Chinook and CH-53E Super Stallion at take-off affect relatively small areas and are short in duration. Additionally, helicopter-generated winds are not significantly higher than natural gusty wind conditions on Mauna Loa. Overall densities of Apapane and Omao within the action area were extremely low. If present within the action area during training operations, it is expected that individuals will temporarily vacate the area during the disturbance.

Airstrikes as a result of training operations are not likely to affect Apapane and Omao in the action area. Most training activities are scheduled for daylight hours when helicopters are visible and audible to birds. Apapane and Omao in the vicinity of the LZs during nighttime operations are expected to be minimal. Bird airstrikes are extremely rare for military aircraft in Hawaii overall, with only 2 airstrikes documented between 2001-2010 for all Army aircraft flights in the state of Hawaii (P. Mansoor, CW4, pers. comm., 2011). Moreover, helicopters are typically slow-moving at the elevations proposed for these training operations because of unpredictable air mass stability and decreased air density, which affect aircraft performance (F. Tate, COL, pers. comm., 2011). Apapane and Omao are expected to vacate the immediate vicinities of the aircraft and LZs if present during training operations.

4.4 Final Determination for the Hawaiian Hoary Bat, Botanical Resources, and MBTA Protected Avifauna

Based on field surveys and supporting documents, the Army concludes that aviation training operations at the LZs will have no appreciable effect on the Hawaiian Hoary Bat, botanical resources, and avifauna protected under the MBTA within the action area. This assessment and supporting documents satisfy Army responsibilities under Section 7(c) of the ESA at this time. The Army will continue to remain aware of any change in the status of these species or critical habitat, and will be prepared to re-evaluate potential project impacts if necessary.

Thank you for our considering our determination of **not likely to adversely affect** for the Hawaiian Petrel, *Silene hawaiiensis*, and the Band-Rumped Storm-Petrel, and our determination of **no effect** for the Hawaiian Hoary Bat, botanical resources, and avifauna protected under the MBTA, for proposed aviation training operations at LZs at PTA. The point of contact for questions or further clarification is Dr. Peter Peshut 808-969-1966, peter.j.peshut.civ@mail.mil. Alternatively, I am also available at 808-969-2407, eric.p.shwedo.mil@mail.mil. Please do not hesitate to contact either of us to discuss this matter further.

Sincerely,

ERIC P. SHWEDO
Lieutenant Colonel, US Army
Commander, US Army Garrison-Pohakuloa

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IMHW-PTA-PWE 09 July 2013

MEMORANDUM FOR RECORD

SUBJECT: Biological Surveys for Landing Zones at Pohakuloa Training Area, Island of Hawaii

INTRODUCTION

In support of 4 proposed helicopter landing zones (LZs) for aviation training by the Combat Aviation Brigade of the US Army 25th Infantry Division and other military units, the Pohakuloa Training Area (PTA) Natural Resources Office (NRO) conducted surveys for plants and animals protected under the Endangered Species Act (ESA) and the Migratory Bird Treaty Act (MBTA). The surveys were conducted during April to June 2013. Survey objectives were to assess the potential for impacts to occur to biological resources as a result of aviation training at the LZs.

The NRO conducted 5 types of biological surveys:

1) Avifauna;
2) Botanical;
3) Hawaiian Hoary Bat;
4) Invasive Ants;
5) Hawaiian Petrel and Band-Rumped Storm Petrel.

This memorandum presents technical findings for each survey.

For the purposes of the biological surveys, the "action area" is defined as the area of greatest extent potentially impacted by aviation operations at the LZs; i.e., the limits of the avifauna surveys. The avifauna survey area was based on a reasonable noise level threshold of concern for disturbance of bird species. Refer to the avifauna section below for more information regarding noise disturbance and the justification for the survey area delineation.

PROJECT DESCRIPTION

The primary mission of PTA is to enhance the combat readiness of training units by providing a quality joint combined arms facility that offers logistical, administrative, and service support for up to regiment or brigade-level combat teams. The installation provides a safe, modernized, major training area for the US Army Pacific and other US Pacific Command military units.

PTA is an important tactical training area for Mission Essential Task List training and provides resources and facilities for active and reserve component units that train on the installation throughout the year. PTA is the largest live-fire range and training complex belonging to the US Army Pacific. Assets are geared toward live-fire and maneuver training on ranges, dismounted maneuver training, and artillery live-fire. The 25th Infantry Division is the principal live-fire and maneuver user of the installation. Additional users include the Hawaii Army National Guard, US Marine Corps, US Navy, US Air Force and International Allied Forces.

Aviation Training at Landing Zones

The need for well-prepared aviation brigades to conduct combat operations in Afghanistan led the US Army Forces Command to prioritize the development of standardized training for high-altitude (up to 14,000 ft or 4270 m) conditions. This type of training was developed to ready pilots for success in combat operations as part of their train-up for deployment under Operation Enduring Freedom (USAG-HI 2011). High altitude aviation training incorporate elements of the National Guard's school for individual mountain helicopter training taught in Gypsum, Colorado, with helicopter training conducted by individual Army Combat Aviation Brigades (CABs) as part of their regular training operations for the past several years (Gould 2010).

Army helicopters are a crucial means of transport for ground forces and supplies and for air assaults on remote Taliban-occupied villages and cave complexes located in the northern mountainous provinces along the Afghan-Pakistan border and in the northern and western mountainous regions of Afghanistan (Gould 2010). Aviation brigades that deploy to mountainous regions of Afghanistan must have confidence in their ability to conduct aviation operations at high altitudes, where aircraft performance and power can be significantly different than at lower elevations (USAG-HI 2011). The proposed LZs and training opportunities will enable helicopter air crews to be successful in the combat theater to support the operational and mission requirements of the 25th CAB (25th Infantry Division) set forth by the Department of the Army and the Department of Defense. This training is critical to save the lives of aircrews and the soldiers they transport while deployed.

All classes of fixed wing and rotary wing aircraft from all services will potentially conduct aviation training at the PTA LZs. Fixed wing aircraft will typically involve the FA-18 Hornet and will rarely include the AV-8B Harrier, F-15 Eagle, F-16 Fighting Falcon, F-22 Raptor, and F-35 Lightning. Common rotary wing aircraft will include the UH-1 Iroquois, AH-1 Cobra, OH-58 Kiowa, and AH-64 Apache, with rare use of the CH-53E Super Stallion, UH-60 Black Hawk, and CH-47 Chinook.

PROJECT LOCATION

Pohakuloa Training Area

PTA is located in the saddle region of Hawaii Island between Mauna Kea, Mauna Loa, and Hualalai volcanoes (Figure 1). At 132,800 ac (53,750 ha), it is the single largest US Army holding in the State of Hawaii. The United States first used this area in 1942 for military maneuvers during World War II and PTA was formally established as an Army installation in 1956. The installation is bordered on the north by Mauna Kea State Park, Mauna Kea Forest Reserve, and Parker Ranch, to the east and south by Hawaii State lands, and to the west by Kamehameha School lands and State lands. PTA comprises 4 main areas: Cantonment, Bradshaw Army Airfield, training areas including the Keamuku Maneuver Area (KMA), and an Impact Area.

PTA is classified as subalpine, tropical, dryland forest, one of the rarest ecosystems in the world. The installation contains 19 federally-listed threatened and endangered plant and animal species. Average annual rainfall is approximately 15 in (38 cm), varying from 4 to 16 in (10 to 41 cm) across the installation (Shaw and Castillo 1997). Typically, most precipitation falls during the winter months (November through February) in conjunction with Kona storms. In other months, there can be prolonged periods of little or no rainfall. The average annual temperature is 55° F (12.8° C) with little monthly fluctuation (Shaw and Castillo 1997). The growing season at PTA is essentially year-round.

PTA varies in elevation from approximately 4100 to 8700 ft (1250 to 2650 m). The installation has 10 soil types reflecting the volcanic geology of the area. Approximately 80% of the installation is covered by young volcanic substrates with the greatest soil development in the northern portion of the installation (Shaw and Castillo 1997). Soils are typically thin and poorly developed, which is characteristic of extremely young volcanic substrate. There are no surface streams, lakes, or other bodies of water at PTA due to low rainfall, porous soils, and lava substrates. Sparse rainfall, fog drip, and occasional frost are the main sources of moisture that sustain plants and animals in the dryland habitat of Pohakuloa.

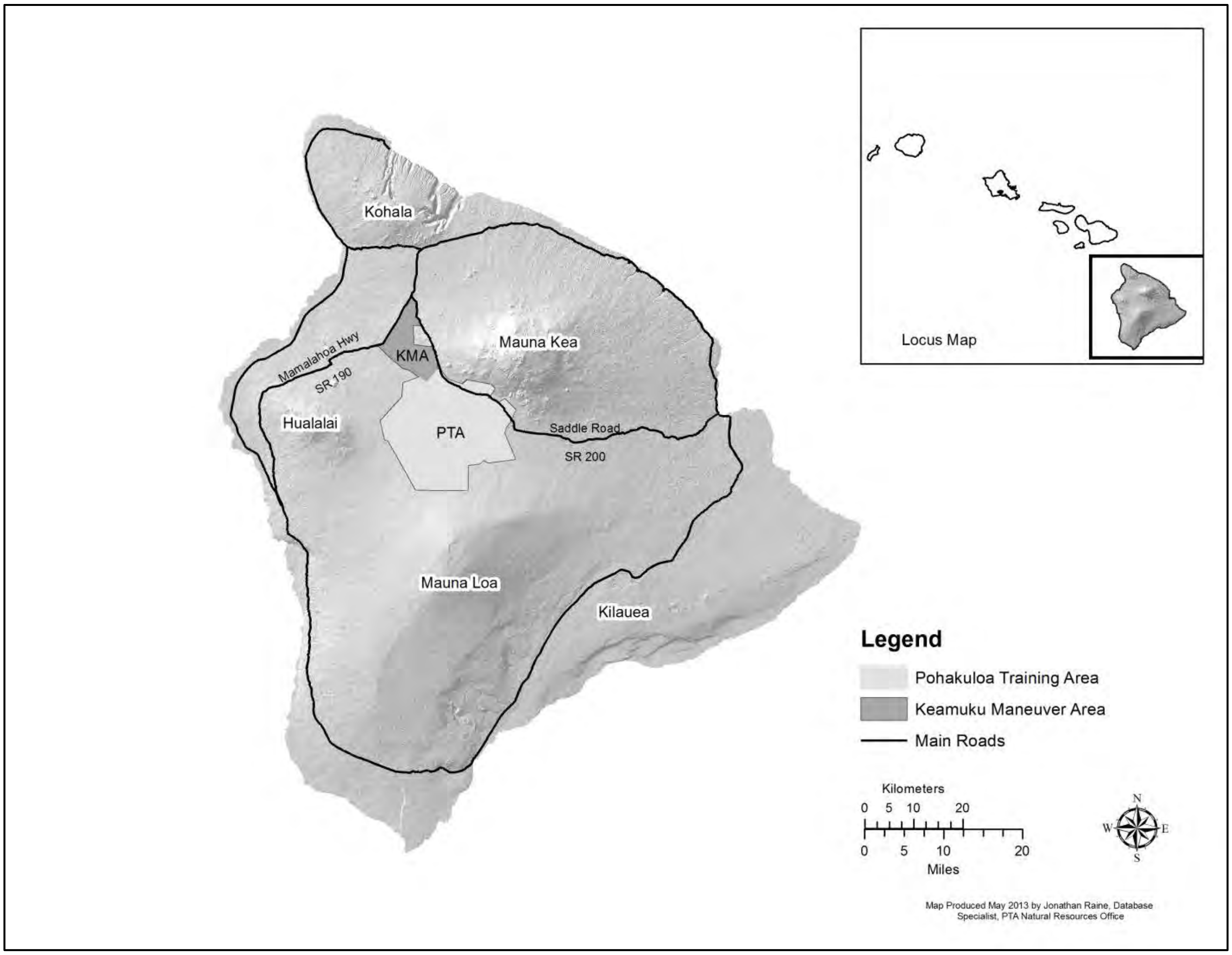

Figure 1. PTA and KMA Location on Hawaii Island

Impact Area

A centrally located Impact Area covers 51,050 ac (20,650 ha) of PTA (Figure 2). Approximately 20 ranges and artillery points are oriented to discharge munitions into the Impact Area. The installation has 23 training areas covering 57,220 ac (23,150 ha) including 22 live-fire and 4 non live-fire fixed ranges, 7 airborne drop zones, and 113 surveyed field artillery and mortar firing points. A helicopter gunnery range (Range 15) and a close air support and bombing range (Range 16) are overlaid within the Impact Area. Additional fixed ranges and firing positions have been developed in the southern portion of the Impact Area for limited and restricted training activities, such as convoy live-fire and aerial exercises.

The Impact Area defines the physical location where all munitions lose ballistic energy and descend to earth. Some munitions fail to detonate upon impact, potentially creating perilous, unstable, unexploded ordnance (UXO). The Impact Area at PTA is a designated high-hazard area due to accumulated UXO. At this time it is not feasible to reduce UXO hazards in the Impact Area. Access to high hazard areas is prohibited unless specifically authorized by Range Operations, per 25th ID(L) and US Army, Hawaii Regulation No. 210-6 (USAG-HI 1999). The ranges for PTA are arranged so that the range firing lines and target mechanisms are outside the Impact Area wherever possible.

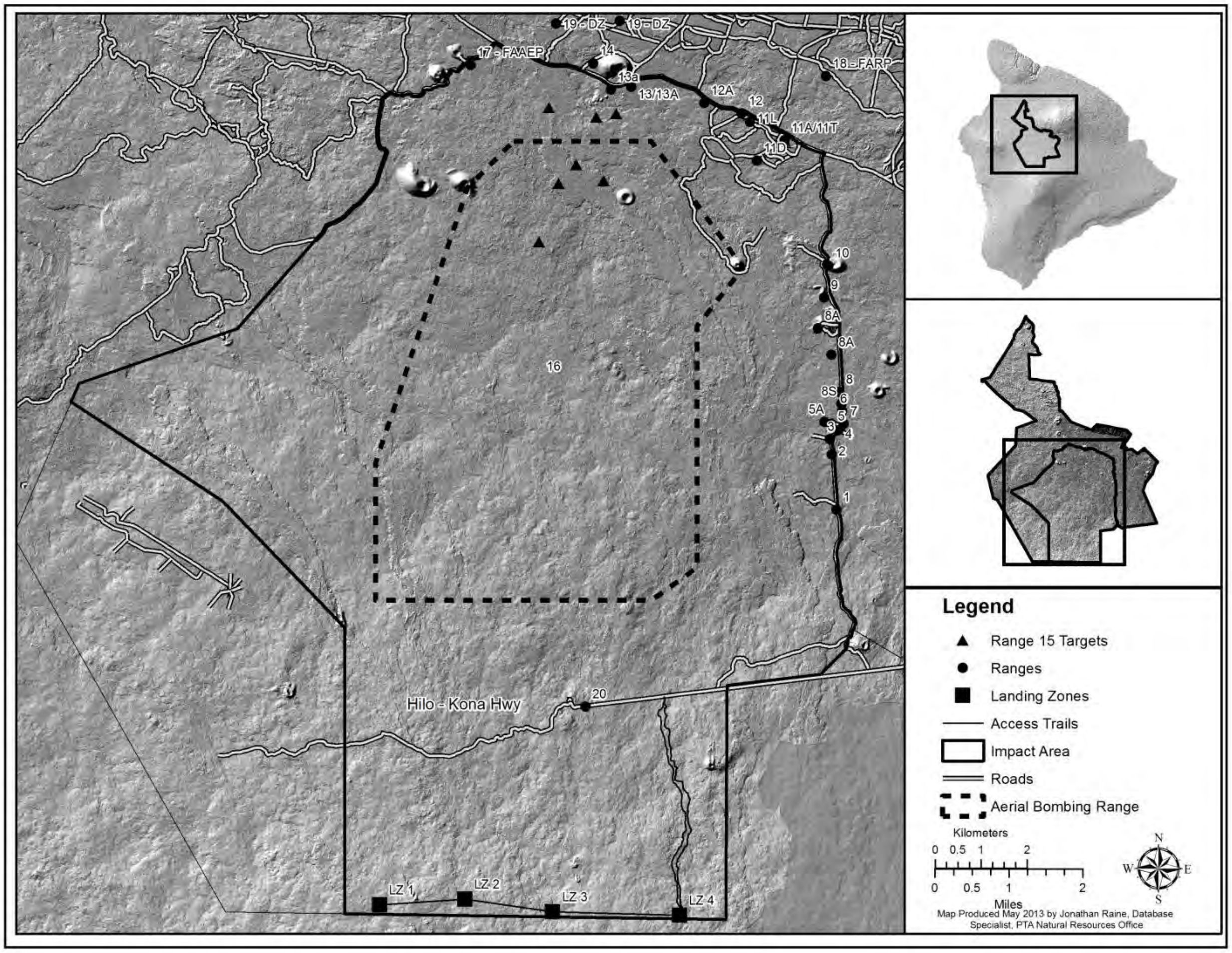

Figure 2. PTA Impact Area

Landing Zones

Four LZs are proposed for aviation training at PTA: LZs 1 and 2 are 115 x 115 ft (35 x 35 m), LZ 3 is 295 x 295 ft (90 x 90 m), and LZ 4 is 525 x 525 ft (160 x 160 m). The LZs are located in the PTA Impact Area on a young barren aa lava flow (Figures 2 and 3). LZ 4 will be accessed via a narrow vehicle trail (Pioneer Trail); an alternate trail is also proposed in case modifications to the original trail become necessary (Figure 3). For surface modification (crushing, grading, leveling) there will also be a construction access route between the LZs that will be utilized by a bulldozer when traveling from one LZ to the next. Only the area within the LZ footprints will be modified (dimensions above). No off-site material will be required other than concrete for footings for several stacked containers.

Landing zone geographic coordinates are given in Table 1. Landing zone locations are shown graphically in Figure 3.

Table 1. LZ Geographic Coordinates

Landing Zone	Latitude (N)	Longitude (W)	Elevation (ft)
LZ 1	19° 34' 54.841"	155° 38' 22.536"	8320
LZ 2	19° 34' 59.632"	155° 37' 18.91"	8591
LZ 3	19° 34' 51.775"	155° 36' 13.253"	8762
LZ 4	19° 34' 50.635"	155° 34' 38.354"	8936

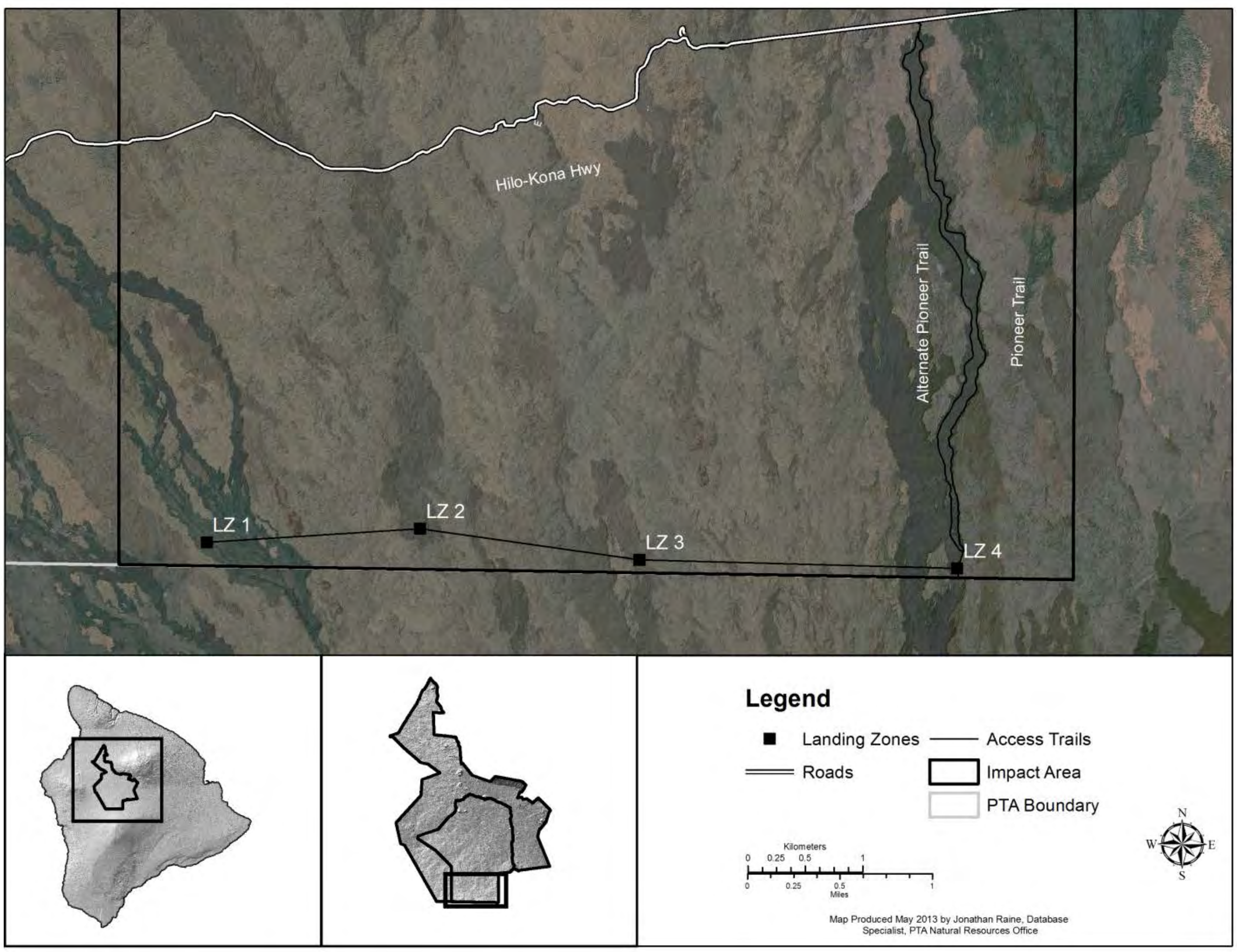

Figure 3. Location of the LZs

Substrate in the action area is variable and consists of approximately 52% aa and 48% pahoehoe lava (Figure 4). Approximately 70% of the lava within the action area is less than 1500 years old and has very little vegetative cover. The remaining 30% of the lava supports small stature native shrubs such as kukaenene (*Coprosma ernoidioides),* kupaoa (*Dubautia ciliolata*), ohelo (*Vaccinium reticulatum),* and pukiawe *(Leptecophylla tameiameiae)*. Shrub cover is sparse (≤ 10%), with most shrubs less than 3 ft (1 m) in height, and confined to cracks in the lava where soil and organic matter have accumulated. Very few trees or shrubs greater than 3 ft (1 m) tall are present within the action area.

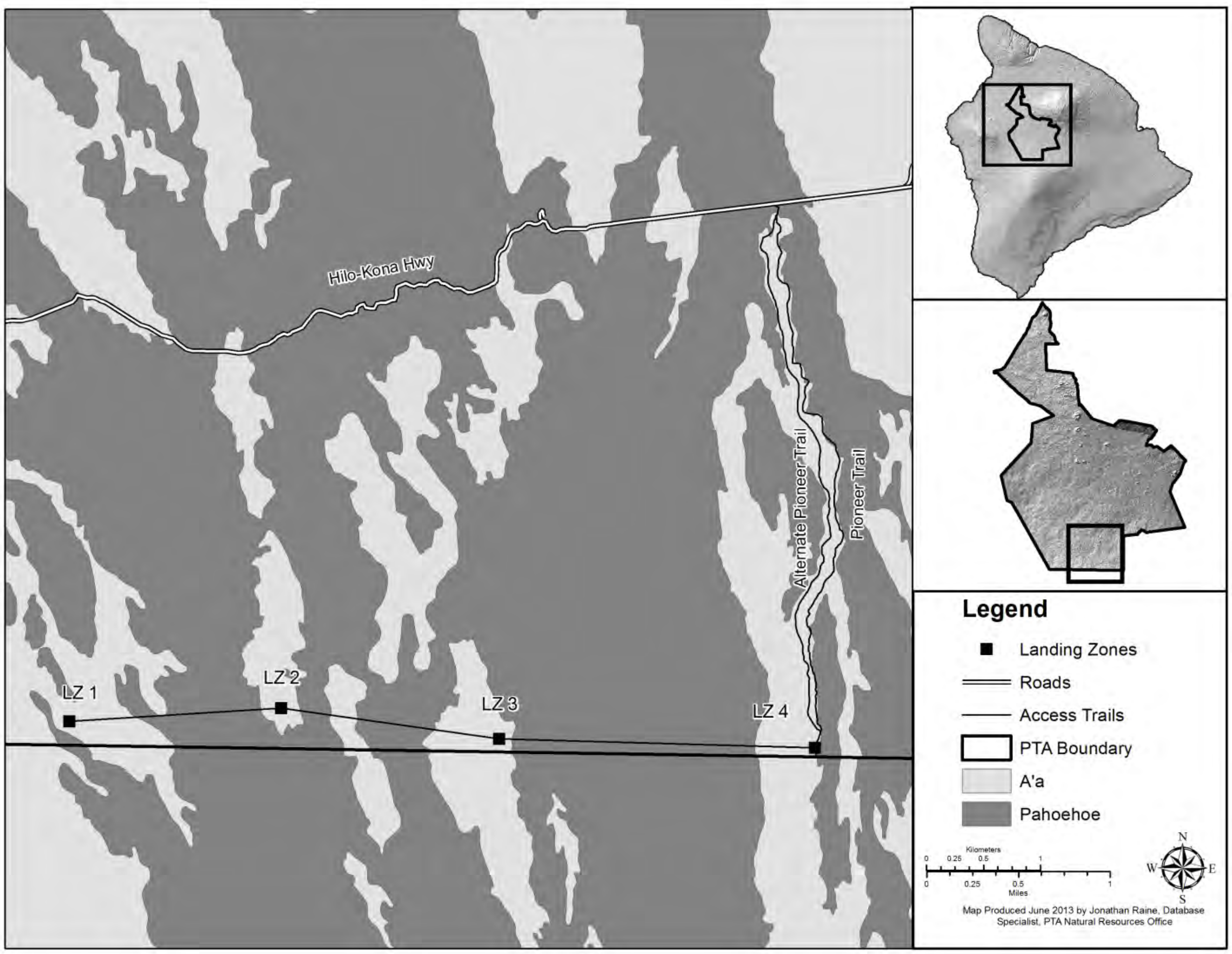

Figure 4. Lava Substrate in the Action Area

AVIFAUNA

Potential Impacts

Potential impacts to avifauna (birds) as a result of aviation training at the LZs include noise disturbance, wind generated from helicopter rotorwash, and direct impact with aircraft. These impacts were evaluated based on the expected presence of avifauna within the action area during training operations.

Survey Methods

The potential for noise disturbance was raised as a concern during previous ESA consultations for military training activities at PTA. The US FWS suggested that wildlife within the 60 decibel (dB) noise contour might be negatively impacted by helicopter operations. A basis for using the 60 dB contour could not be justified from a review of the relevant scientific literature. Bowels and Wisdom (2005) indicated that a 60 dB (A) rule (hourly A-weighted L_{eq}) for birds was originally established to prevent masking of species-typical songs. They concluded that there is little evidence to support the effectiveness of the 60 dB (A) rule for all noise related impacts, and recommended that there should be further research prior to the 60 dB (A) rule becoming widely used for ESA consultations.

Numerous studies on noise impacts to wildlife, including over flights from military aircraft such as helicopters, have been conducted in past decades (see Appendix A - Annotated Bibliography from the Memorandum for Record, *Hawaiian Avifauna Surveys for HAMET Environmental Assessment*, Peshut and Schnell 2011). Although results cannot always be applied across species, studies demonstrate that various species, from wading birds to raptors, co-exist with loud noises. Although there is debate in the literature as to the effects from noise on the fitness of birds, many studies focus only on behavioral responses, which may not indicate physiological responses or animal fitness. The literature supports that many bird species live, breed, and raise young in areas with sound levels well above 80 dB (Peshut and Schnell 2011). Birds may flush from nests when sound levels are high (generally >80-100 dB), but generally return to their nests within minutes after the disturbance abates. Also, many studies indicate that birds habituate (display decreasing responses) to loud noises.

Although it is recognized that exceptions are possible among individual species, the 80 dB contour was selected as the reasonable noise level threshold of concern for disturbance of bird species for the purposes of the avifauna surveys. The surveys were conducted in a 2000 ft (610 m) radius area from the perimeter of each LZ. This area extent was selected based on a noise contour of 80 dB for the CH-47 Chinook and CH-53E Super Stallion, the 2 loudest aircraft proposed for aviation training at the LZs. At a slant distance of 2000 ft (610 m), the CH-47 Chinook produces noise at the 77 dB level and the CH-53E Super Stallion produces noise at the 81 dB level (US Army 2010). Therefore, the survey area based on a 80 dB noise contour is adequate to determine noise impacts to avifauna in the action area. The survey area was extended from the perimeter of the LZs to account for potential noise effects from aircraft landing at the edge of the LZ (i.e., worst-case scenario).

For each LZ, there were 2 3280-ft (1-km) transects each containing 8 monitoring stations (Figure 5). Transects were spaced 1640 ft (500 m) apart and monitoring stations were located at 490 ft (150 m) intervals along each transect to ensure maximum coverage within the survey area (Scott et al. 1986). There were a total of 64 monitoring stations, and the combined avifauna survey area covered 625 ac (255 ha).

The avifauna species selected for surveys were prioritized based on species' status under the ESA and the MBTA. The avifauna survey counting method is based on the US Fish and Wildlife Service (US FWS) Hawaiian Forest Bird Variable Circular-Plot method (Reynolds et al. 1980, Scott et al. 1986). Using this method, 1 observer conducts counts at each station along a single transect. Each station is monitored for 6 minutes during a 4.5 hour sampling period (0630 h to 1100 h). Detection type (aural, visual, or combined) and the horizontal distance from the station to the bird are recorded for every species observed. Weather conditions, wind speed, and cloud cover are also noted. Counts are not conducted on days when the weather is not within established guidelines (Reynolds et al. 1980).

During avifauna surveys, observations of Hawaiian Goose (*Branta sandvicensis*) sign were recorded between each monitoring station. Observers were instructed to look for feathers, feces, or other indicators of Hawaiian Goose presence.

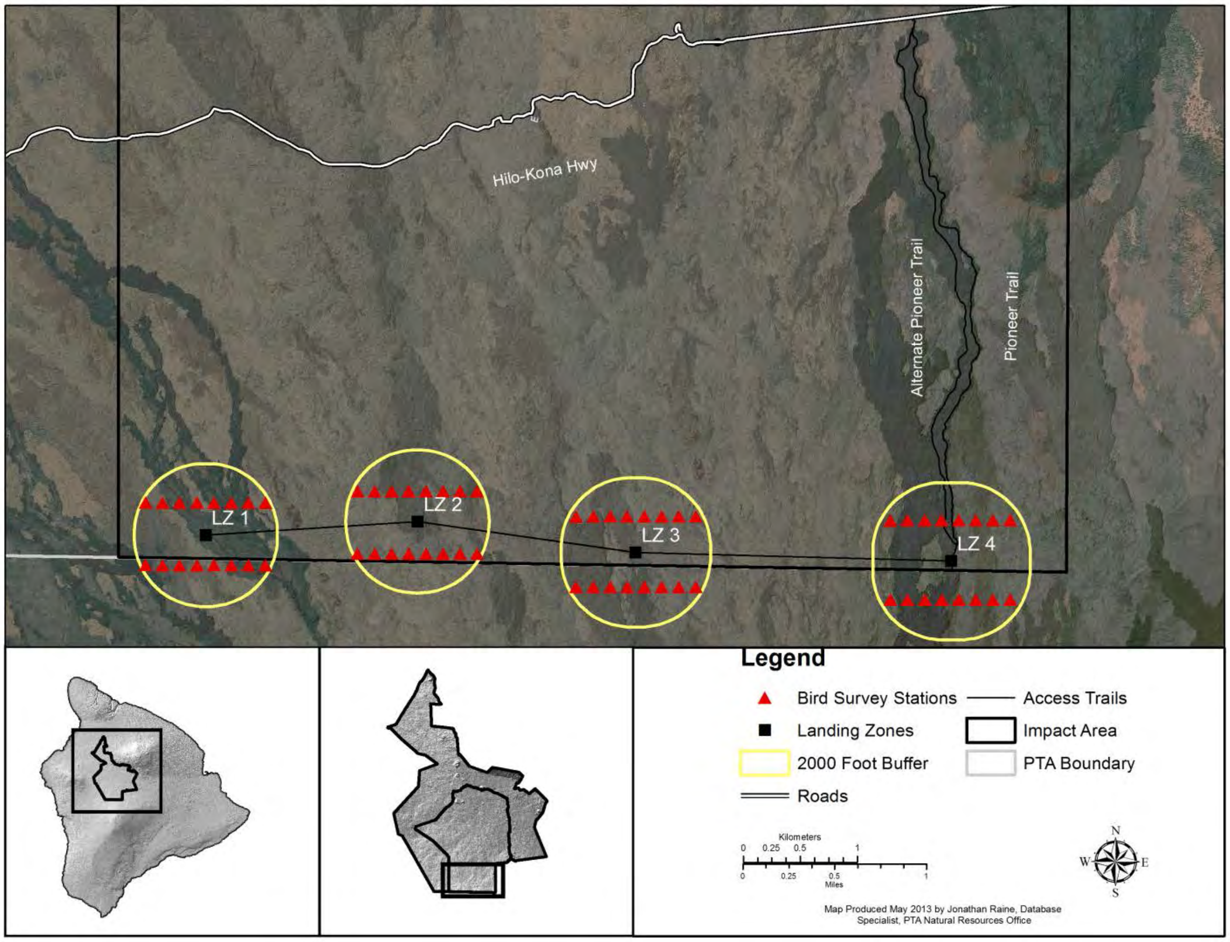

Figure 5. Avifauna Survey Locations

Results

Surveys were conducted to determine avifauna presence and habitat use in the general vicinity of the LZs on 17 and 18 April 2013. The survey team from within the PTA NRO consisted of Lena Schnell, MSc (candidate), and Martha Kawasaki, BSc. A total of 8 transects with a combined 64 stations were surveyed. Counts took place between 0630 h and 1100 h. Results are summarized in Table 2.

Table 2. Avifauna Survey Results

Common Name	Scientific Name	Quantity	Origin	Status
Apapane	*Himatione sanguinea*	34	Endemic	MBTA-Protected
Omao	*Myadestes obscurus*	12	Endemic	MBTA-Protected
Chukar	*Alectoris chukar*	1	Introduced	Not Protected

Avifauna detections per species at the 4 LZs were as follows:

- LZ 1: 17 Apapane, 5 Omao, 1 Chukar
- LZ 2: 12 Apapane, 2 Omao
- LZ 3: 1 Apapane, 5 Omao
- LZ 4: 4 Apapane

No Hawaiian Goose sign was observed along any of the avifauna survey transects.

Discussion

Airstrikes as a result of training operations are not likely to affect avifauna in the action area. Most training activities are scheduled for daylight hours when helicopters are visible and audible to birds. Avifauna in the vicinity of the LZs during nighttime operations are expected to be minimal. Bird airstrikes are extremely rare for military aircraft in Hawaii overall, with only 2 airstrikes documented between 2001-2010 for all Army aircraft flights in the state of Hawaii (P. Mansoor, CW4, pers. comm., 2011). Moreover, helicopters are typically slow-moving at the elevations proposed for these training operations because of unpredictable air mass stability and decreased air density, which affect aircraft performance (F. Tate, COL, pers. comm., 2011).

Numerous studies on noise impacts to wildlife, including over flights from military aircraft such as helicopters, have been conducted in past decades. Although results cannot always be applied across species, studies demonstrate that various species, from wading birds to raptors, co-exist with loud noises. Although there is debate in the literature as to the effects from noise on the fitness of birds, many studies focus only on behavioral responses, which may not indicate physiological responses or animal fitness.

No ESA listed species were detected during surveys of the action area. Two MBTA protected species were detected during the surveys: Apapane (*Himatione sanguinea*) and Omao (*Myadestes obscurus*). Apapane were mostly associated with barren aa lava flows, and Omao with sparsely vegetated pahoehoe lava flows.

Apapane is the most common of the Hawaiian honeycreepers and is found on all major islands. The main food source for Apapane is nectar from ohia (*Metrosideros polymorpha)* blossoms, but this species also feeds on fruits and insects. The population on Hawaii Island is estimated at over 1 million (Scott et al. 1986). Breeding season is year-round with a nesting peak between February and June. Males feed females away from the nest during short incubation recesses. Nests inside lava tubes are documented and Apapane sometimes use old Omao nest sites and material (Fancy and Ralph 1997).

Omao is the most common of Hawaii's thrush species and is endemic to Hawaii Island with an estimated population of 170,000 (Scott et al. 1986). Populations are found in the Hamakua-Puna (eastern) and Kau (southern) regions of the island. A separate population exists in alpine scrub on Mauna Loa. Omao eat insects and fruits from many native plants. In the Mauna Loa scrub, birds perch on elevated "sentry" rocks within their territories. Sentry rocks are recognizable by green growth as a result excreted wastes from perched birds. These sentry rocks are easy to spot and are good indicators of areas used by Omao. This species likely maintains year-round core feeding areas while roosting and nesting within larger home ranges (Wakelee and Fancy 1999). In the alpine scrub, Omao will nest on the ground in lava formations and in lava tubes. Breeding activity occurs almost year-round with peak nesting from April to July. The female incubates the eggs alone and spends an average of 40 minutes per hour on the nests with recesses averaging 6.5 minutes.

Aviation training at the LZs is not expected to negatively impact the island-wide Apapane or Omao populations on Hawaii Island; however, training operations could potentially impact individual Apapane and Omao within the action area. Although no sentry rocks were observed, Omao were clearly present and regularly encountered within appropriate habitats in the action area. At least 1 Omao pair was observed flying between high points and singing, indicating territorial behavior. No clear indication of territorial or breeding behavior was observed for Apapane. It is likely both Apapane and Omao use habitat within the action area for feeding and nesting, but impacts from training operations are expected to be minimal because neither species appears to be present in high numbers within this sparsely vegetated habitat.

Increased winds due to rotorwash is not likely to significantly impact nesting Apapane and Omao. Rotorwash from the largest aircraft proposed for training operations (CH-47 Chinook and CH-53E Super Stallion) will first be felt on the ground when the aircraft is approximately 330 ft (100 m) from the LZs (see botanical section below for more discussion on rotorwash effects at ground level). Potential Apapane and Omao habitat exists within 330 ft (100 m) of the LZs where noise and rotorwash could affect birds; however, winds generated by the CH-47 Chinook and CH-53E Super Stallion at take-off affect relatively small areas and are short in duration. Additionally, helicopter-generated winds are not significantly higher than natural gusty wind conditions on Mauna Loa (see the botanical section below for more details on wind speeds generated by aircraft, areas of impact, and natural wind conditions on Mauna Loa). Training operations are expected to last up to 10 minutes per helicopter approach, landing, and take-off. Apapane and Omao are expected to vacate the immediate vicinities of the aircraft and LZs if present during training operations.

Potential impacts to Apapane and Omao as a result of training operations at the LZs are unlikely; however, the Army has indicated that the use of the LZs will be suspended for a period to be defined by the PTA NRO if the presence of nesting birds within 330 ft (100 m) of the action area is verified (e.g., incidental observation). Although efforts to reduce or eliminate impacts to known nesting sites will be conscientiously pursued by the Army, there is always the potential for accidents. The US Congress has amended the MBTA to provide for the accidental death of MBTA species due to military training (Stump Act and Defense Reauthorization Act). Therefore, there is no regulatory liability in the unlikely event of the accidental death of nesting Apapane and Omao due to training operations.

The following ESA and MBTA protected species may occur in the action area but were not detected during surveys:

- Hawaiian Goose (*Branta sandvicensis*);
- Hawaiian Hawk (*Buteo solitarius*);
- Hawaii Amakihi (*Hemignathus virens*);
- House Finch (*Carpodacua mexicanus*);
- Northern Mockingbird (*Mimus ployglottus*);
- Pacific Golden-Plover (*Pluvialis fulva*);
- Sky Lark (*Alauda arvensis*);
- Barn Owl (*Tyto alba*);
- Hawaiian Short-Eared Owl (*Asio flammeus sandwichensis*).

There are an estimated 500 Hawaiian Geese on Hawaii Island. The largest populations occur at Hawaii Volcanoes National Park (~210), Puu Anahulu (~110) and Hakalau National Wildlife Refuge (~100). Smaller populations also occur at Shipman (~50) and Kahuku Ranch (~10) (Hawaiian Goose Recovery Action Group, pers. comm., 2010). The Hawaiian Goose has been observed at PTA's Range 01 Complex, approximately 6 mi (10 km) from the LZs (Figure 6). The species is known to use the Range 01 Complex for occasional roosting as well. Although surveys did not detect the Hawaiian Goose or Hawaiian Goose sign (e.g., feathers, feces) at the LZs, it is reasonable to assume that geese may have some undetermined presence in the sparsely vegetated habitat within the action area. The Hawaiian Goose is known to exploit open pahoehoe lava flows that contain food resources such as *C. ernodeoides*, *D. ciliolata, L. tameiameiae*, and *V. reticulatum* that occur near the LZs.

Aviation training operations are not expected to adversely affect the Hawaiian Goose within the action area or at the Range 01 Complex. Noise levels from aircraft are expected to remain below 70 dB (A) at the Range 01 Complex during training exercises. It is improbable that geese occupy any sites to a significant extent within the action area. In the unlikely event that Hawaiian Geese are near the LZs during a training event, it is assumed that individuals will depart the area as a helicopter approaches if noise levels become uncomfortably loud or disruptive (US FWS 2008). Although some studies indicate geese are sensitive to helicopter noise (Ward et al. 1999), this species is routinely found during flocking season in noisy habitats such as edges of highways (Saddle Road, Hawaii), airport runways (Kauai), and live-fire ranges (PTA). Historically, Hawaiian Geese at PTA are already exposed to noise from routine CAB and other helicopter exercises. In addition, under certain conditions geese within PTA and KMA may be less than 50 ft (15 m) from detonations, including grenades, mortars, artillery shells, tube-launched wire-guided missiles, bombs, loud voices, fire suppression and training-related helicopters, without adverse impact (US FWS 2008).

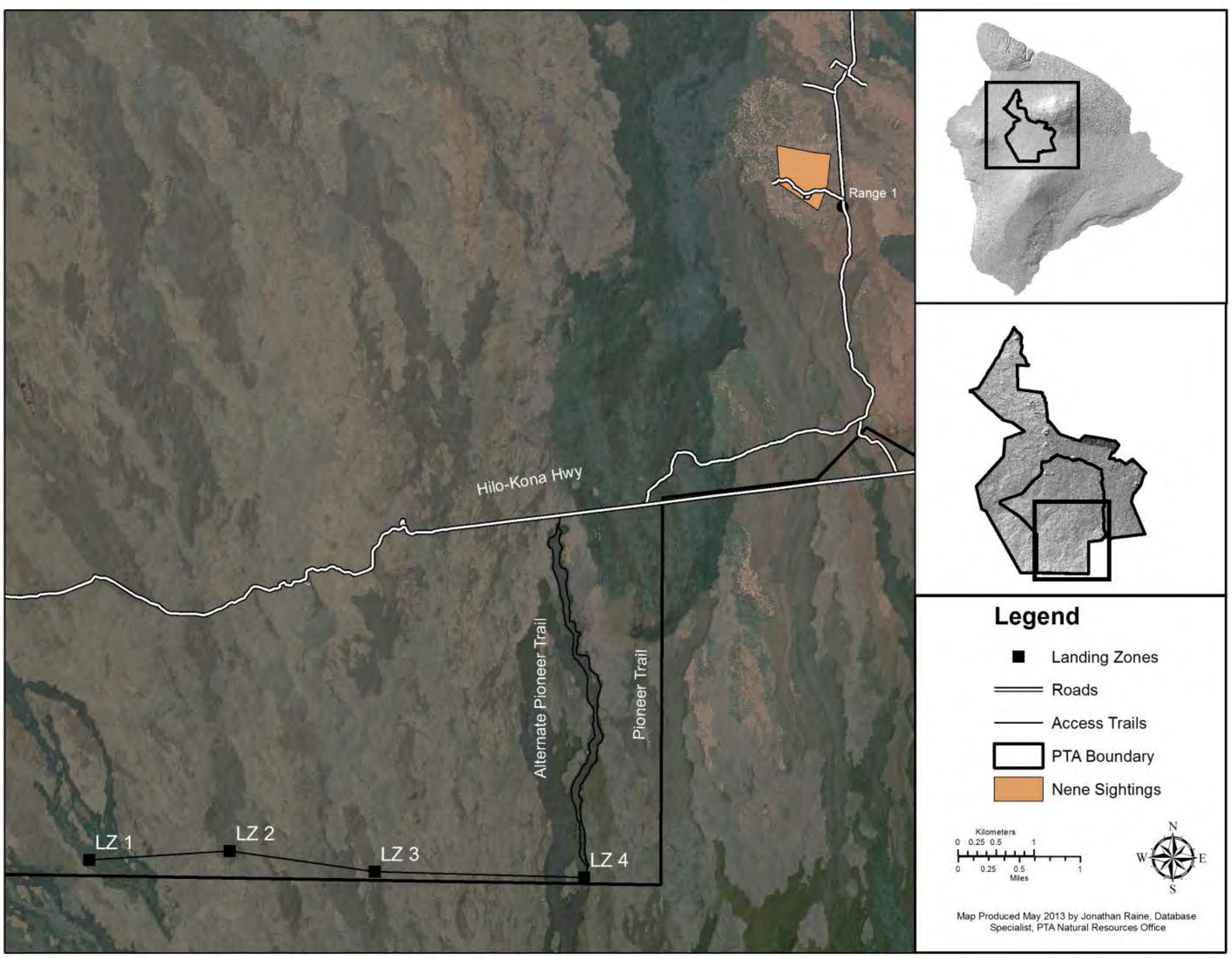

Figure 6. Hawaiian Goose Sightings at the Range 01 Complex

Aviation operations at the LZs are not likely to affect the Hawaiian Hawk. No hawks were seen during surveys within the action area. Sighting records indicate that there is a gap in the hawk's range, in the region between Mauna Kea and Mauna Loa, from Puu Huluhulu and PTA on the east, westward to Puu Waawaa (Banko 1980). This gap includes the proposed LZs. Hawaiian Hawk population density for the action area is therefore expected to be zero or near zero (Klavitter 2000).

Aviation operations at the LZs are not expected to affect the Hawaii Amakihi, House Finch, Northern Mockingbird, Pacific Golden-Plover, or Sky Lark populations on Hawaii Island. These species were not detected during surveys at the LZs, although they may use habitat within the action area occasionally to forage. If birds are present during training operations, it is expected that individuals will vacate the area temporarily during high levels of activity and noise and return after the disturbance.

Aviation operations at the LZs are not expected to affect the island-wide Barn Owl or Hawaiian Short-Eared Owl populations; however, owls have good hearing between 1-7 KHz and are able to discriminate well between frequencies within this range (Beason 2004). Therefore, loud, low frequency noise within this range (e.g., from aircraft rotorwash near the LZs) may affect individual Barn Owls or Hawaiian Short-Eared Owls. Potential effects to owls are expected to be minimal, since no nests were discovered within the action area. There is no suitable cover for the Hawaiian Short-Eared Owl to construct nests near the LZs so breeding within the action area is highly unlikely. In addition, studies have suggested that owl species may not be as sensitive to loud, low frequency noise, as once believed (Delaney et al. 1999). Similar to other avifauna species of this survey, owls may use habitat within the action area occasionally to forage but it is expected that they will temporarily vacate the area while noise levels are high and return to the area once noise levels have abated.

BOTANICAL

Potential Impacts

Potential impacts to vegetation as a result of aviation operations at the LZs may occur during construction of the LZs and access trails, and/or during temporary localized disturbance from dust and wind generated from helicopter rotorwash. These impacts were evaluated based on the presence and types of vegetation within the action area.

Survey Methods

Surveys were conducted to determine the presence of federally-listed plant species and assess overall vegetation in the action area. The botanical survey area comprised a buffer of 330 ft (100 m) from the perimeter of each of the 4 LZs, and a 66-ft (20-m) buffer from all construction routes and access trails. A total of 56 transects spaced 66 ft (20 m) apart were surveyed for the combined LZ area (Figure 7). LZ transects varied in length from 770 ft to 1180 ft (235 m to 360 m), with a total combined linear distance of 10 mi (16 km). Construction and access trail transects followed the length of the proposed routes and had a total combined linear distance of 52,165 ft (15,900 m). The botanical survey area (including LZ buffers and access trail buffers) encompassed 230 ac (95 ha).

Survey area dimensions were based on areas potentially impacted by helicopter rotorwash using the height and distance of aircraft from the LZs, along an anticipated line of aircraft approach. Rotorwash effect height is calculated as 1.5x rotor diameter (P. Mansoor, CW4, pers. comm. 2011). For the largest aircraft (worst-case scenario), the CH-53E Super Stallion, the rotorwash is first felt on the ground when the aircraft is 118 ft (36 m) above ground level (AGL). For the second largest aircraft, the CH-47 Chinook, the rotorwash is first felt at the ground surface when the aircraft is 90 ft (27 m) AGL. During aviation training operations, CH-53E aviators will approach the LZs at angles up to 30°, so that aircraft will reach 118 ft (36 m) AGL at 330 ft (100 m) from the perimeter of the LZ. CH-47 aviators will approach the LZs at approximately 15°, so that aircraft will reach 90 ft (27 m) AGL at 330 ft (100 m) from the perimeter of the LZ. Although the rotorwash effect is slightly greater for the CH-53E than the CH-47 due to a larger diameter rotor (79 ft vs. 60 ft) and blade number (7 blades vs. 4 blades), based on the expected approach angle at the LZs the rotorwash effect is essentially the same and vegetation on the ground will not experience rotorwash until the aircraft is 330 ft (100 m) from the perimeter of the LZs.

All other aircraft potentially used at these LZs have smaller rotorwash effect areas. The survey area is based on known rotorwash profiles and it is assumed that the 2 largest aircraft (CH-47 Chinook and CH-53E Super Stallion) represent the greatest potential for rotorwash impact among all rotary wing aircraft proposed for aviation training at the LZs. Therefore, the botanical survey area of 330 ft (100 m) from the outer perimeter of the each LZ includes all surrounding vegetation that could potentially experience helicopter rotorwash.

Because of the sparse vegetation within the action area, the PTA NRO determined that a 66-ft (20-m) spacing of survey transects yielded the optimum balance between coverage and rare plant detection probability. The survey team consisted of experienced field biologists from within the PTA NRO. All locations of federally-listed threatened (T) and endangered (E) plant species and/or species of concern (SOC) were recorded when found during the surveys. Locations of common native and introduced plant species were also recorded.

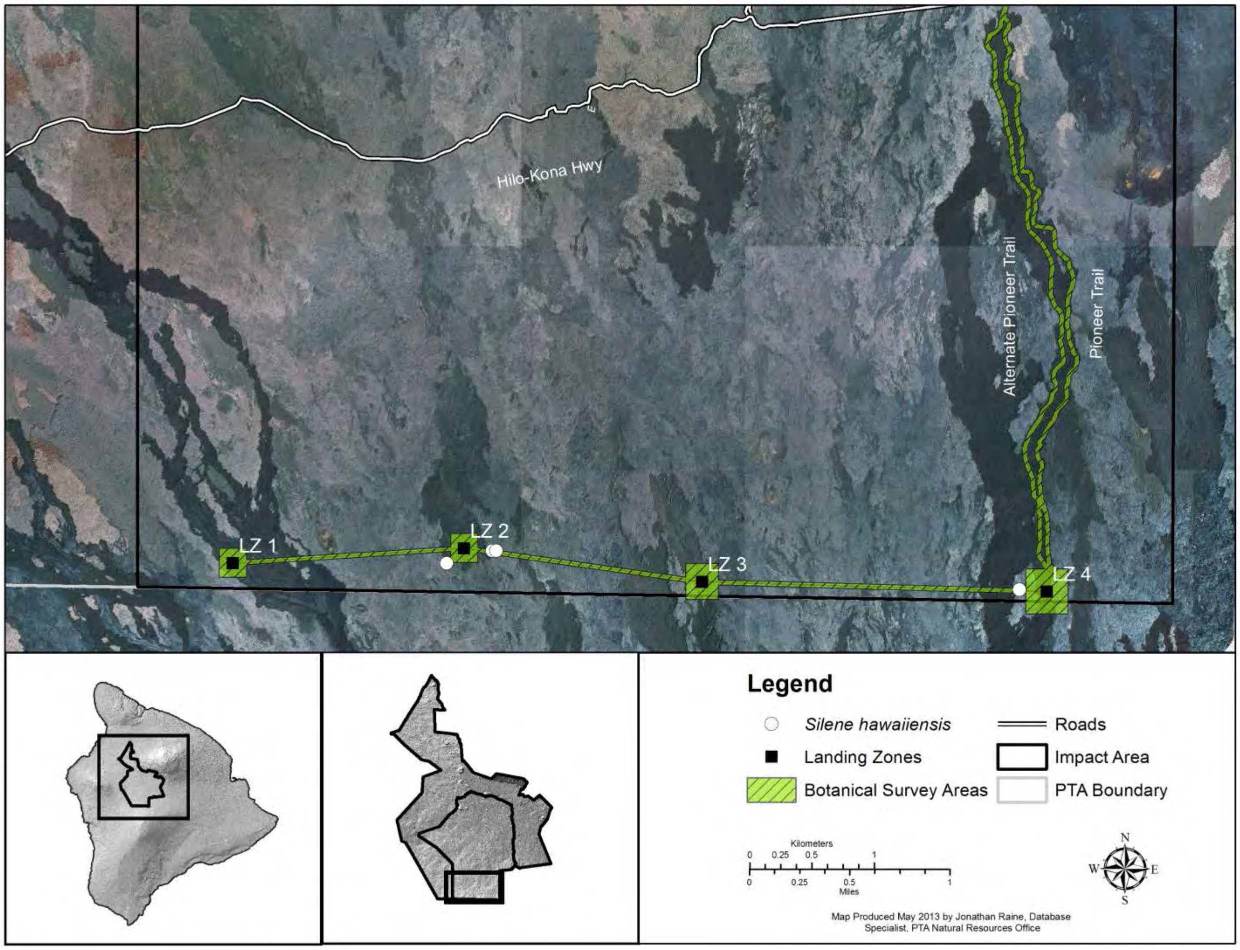

Figure 7. Botanical Survey Locations

Results

Botanical surveys were conducted on 17, 18, 22, and 23 April 2013 at the LZs. The survey team from within the PTA NRO consisted of Steven Evans, MSc, Lena Schnell, MSc (candidate), Rogelio Doratt, MSc, Robert Yagi BSc, Kip Cline, BSc, Heraldo Farrington, BSc, Thomas Kuhlman, BSc, Martha Kawasaki, BSc, and Rachel Moseley, BSc. Weather conditions were favorable and visibility was extremely good for conducting the surveys. The LZs are composed almost entirely of aa lava and are very sparsely vegetated. No federally-listed plant species were recorded within the LZs, access trails, or buffers. Common native and introduced plant species present within the action area are summarized in Table 3.

Four locations of the threatened Hawaiian catchfly (*Silene hawaiiensis*) were recorded within the construction access route between LZ 2 and LZ 4 (Figure 7). One additional *S. hawaiiensis* location was found beyond the survey area at LZ 2. There were between 1-5 individuals found at each location.

Table 3. Botanical Survey Results

Common Name	Scientific Name	Location	Origin[1]	Status
Heupueo	*Agrostis sandwicensis*	LZ, Trail	Endemic	–
Iwaiwa	*Asplenium adiantum-nigrum*	LZ, Trail	Indigenous	–
Maidenhair spleenwort	*Asplenium trichomanes*	Trail	Indigenous	–
Kukaenene	*Coprosoma ernodeoides*	LZ, Trail	Endemic	–
Oahu sedge	*Carex wahuensis*	LZ, Trail	Endemic	–
Hillebrand's flatsedge	*Cyperus hillebrandii*	LZ	Endemic	–
Aalii	*Dodonaea viscosa*	LZ, Trail	Indigenous	–
Kupaoa	*Dubautia ciliolata*	LZ, Trail	Endemic	–
Hairy cat's ear	*Hypochaeris radicata*	LZ, Trail	Introduced	–
Pukiawe	*Leptecophylla tameiameiae*	LZ, Trail	Endemic	–
Kalamoho	*Pellaea ternifolia*	LZ, Trail	Indigenous	–
Ae	*Polypodium pellucidum*	LZ, Trail	Endemic	–
Pawale	*Rumex skottsbergii*	LZ, Trail	Endemic	–
Fireweed	*Senecio madagascariensis*	LZ, Trail	Introduced	–
Hawaiian catchfly	***Silene hawaiiensis***	**Trail**	**Endemic**	**T**
Pamakani	*Tetramolopium humile*	LZ, Trail	Endemic	SOC
Ohelo	*Vaccinium reticulatum*	LZ, Trail	Endemic	–
Southern rockbell	*Wahlenbergia gracilis*	LZ, Trail	Introduced	–

[1]Shaw 1997

Discussion

All LZ construction will occur on aa lava flows that are sparsely vegetated and at which no federally-listed plant species were found. Therefore, construction of the LZs will have no impact to federally-listed plant species and minimal impact to common native vegetation.

Four locations of *S. hawaiiensis* were located within the construction access route between LZ 2 and LZ 4. The majority of the construction access routes are on pahoehoe lava and on which all the *S. hawaiiensis* were found. The routes will be utilized by a bulldozer to travel from one LZ to the next for the purpose of grading and leveling. The blade of the bulldozer will not be in contact with the ground when traveling between LZs. The bulldozer will utilize the access routes twice, once pre-LZ construction and once post-LZ construction. The *S. hawaiiensis* located were marked using fluorescent pink flagging tape that can be easily seen by the bulldozer operator.

In addition, an area 130 ft (40 m) wide was surveyed for the access routes. Therefore, the *S. hawaiiensis* locations can be avoided by the bulldozer operator. The bulldozer is likely to impact common native vegetation when traveling between LZs. Retracing the route post-construction will limit the impact to common native vegetation. In addition this is a one-time event so impacts to common native vegetation will be minimized.

Wind generated from helicopter approaches and landings at the LZs is not considered to be of concern for vegetation. Helicopter rotorwash velocities at ground level are within the range of typical wind conditions in the action area. Average wind speeds at the PTA East Remote Automated Weather Station, located 6 mi (10 km) northeast of the LZs, vary from 0-37 mph with gusts up to 50 mph (Meso West 2013). The average wind speed at the National Oceanic and Atmospheric Administration's Mauna Loa Observatory ranges from 11-45 mph with gusts up to 54 mph (A. Colton, pers. comm., 2013). Mauna Kea has an average wind speed of approximately 57 mph (Carrasco and Sarazin 2003) with a maximum recording of 127 mph (Bely 1987).

Known rotorwash profiles for the 2 largest aircraft proposed aviation training at the LZs included the CH-47 Chinook and CH-53E Super Stallion, which were used to characterize wind effects on vegetation. Rotorwash velocity from the CH-47 Chinook at lift-off is up to 127 mph at a distance of 50 ft (15 m) from the aircraft, but this diminishes to the speed of prevailing winds at a distance of 160 ft (49 m) from the aircraft (Leese and Knight 1974). The rotorwash velocity from the CH-53E at lift-off is approximately 180 mph (D. Geltmacher, USMC, pers. comm., 2013). Technical information regarding attenuation of wind speed at lift-off distance for the CH-53E rotorwash was not found, but it is reasonable to expect that rotorwash velocity for this aircraft is slightly higher than the CH-47. However, the area potentially affected by rotorwash velocities from these aircraft is expected to be significantly smaller than the LZ survey buffer area of 330 ft (100 m).

Based on the extremely sparse vegetation found within the action area, the minimal amount of fine material within the substrate available to generate dust, and the highly localized and short duration of the action, it is not expected that aviation training at the LZs will have any long-term impacts to vegetation in the action area. It is anticipated that the impacts to vegetation from training operations at the LZs will not be greater than impacts from natural conditions in the action area.

HAWAIIAN HOARY BAT

Potential Impacts

Potential impacts to Hawaiian Hoary Bats as a result of aviation training operations at the LZs include noise disturbance and direct impact with aircraft. These impacts were evaluated based on the expected presence of bats within the action area during training operations, determined by the extent of potential available treeland roosting and foraging habitat in the action area.

Survey Methods

Surveys to assess potential available treeland roosting habitat and potential available foraging habitat for the Hawaiian Hoary Bat within the action area were conducted concurrently with the avifauna surveys described above. The survey area was based on the 80 dB noise contour used for the avifauna surveys. As discussed previously, this area was selected as a reasonable noise level threshold of concern for disturbance of bird and bat species.

For each LZ, there were 2 3280-ft (1-km) transects each containing 8 monitoring stations. Observations on Hawaiian Hoary Bat habitat type were recorded between each of the 64 stations. The combined Hawaiian Hoary Bat survey area covered approximately 625 ac (255 ha).

Results

Hawaiian Hoary Bat habitat surveys were conducted in conjunction with avifauna surveys on 17 and 18 April 2013. The survey team from within the PTA NRO consisted of Lena Schnell, MSc (candidate), and Martha Kawasaki, BSc. Out of 5 possible habitat types within this area of PTA, only 2 were recorded in the action area: 1) Barren Lava and 2) *Styphelia-Dodonaea* Shrubland. Neither of these habitat types is considered potential available treeland roosting habitat for the Hawaiian Hoary Bat; however, *Styphelia-Dodonaea* Shrubland is considered potential available foraging habitat. The density of insects near the LZs is expected to be low because of the sparse vegetation, and it is therefore likely that foraging opportunities for bats in the action area are limited.

Discussion

The Hawaiian Hoary Bat is more frequently associated with roosting and foraging within forest structure rather than open habitat (Kepler and Scott 1990, Jacobs 1994). Work conducted by the US Geological Survey Biological Resources Division indicates that bats are widely distributed throughout Hawaii Island in habitats with tree cover, including native and non-native forests, agricultural areas, and even some semi-urban areas (F. Bonaccorso, pers. comm., 2006, Uyehara and Wiles 2009). In a study of 81 bats, Jacobs (1994) observed that 44% foraged in native vegetation (*M. polymorpha* lowland forest) and 25% foraged in either exotic or mixed vegetation. Given the lack of potential available roosting habitat in the action area, daytime presence of roosting bats is considered to be improbable, and therefore no daytime noise impact to the Hawaiian Hoary Bat is expected. It is possible that foraging bats transit across the action area during nighttime hours; however, given the expanse of barren lava at the LZs, the number of transiting bats is expected to be very low. Moreover, nighttime exercises constitute only a small part of aviation training operations.

Airstrikes as a result of training operations at the LZs are not considered to be of concern for the Hawaiian Hoary Bat. Most training activities at these LZs are scheduled for daylight hours when bats are roosting in the forested areas of the island. Moreover, airstrikes are extremely rare for military aircraft in the State of Hawaii overall, with only two airstrikes (birds) documented between 2001-2010 for all Army aircraft flights (P. Mansoor, CW4, pers. comm., 2011).

Available literature and results from PTA NRO surveys support the conclusion that Hawaiian Hoary Bat presence in significant numbers is unlikely in the action area. Extremely low densities of bats during nighttime operations, or complete absence of bats during daytime operations, is to be reasonably expected. The potential for noise or airstrike impacts on bats as a result of training operations at these LZs is therefore considered to be minimal.

INVASIVE ANTS

Potential Impacts

There are no native ant species in Hawaii. The introduction and establishment of invasive ants poses a threat to native biota through competition and predation. Ants disrupt native ecosystem function and are recognized as a major cause of species extinctions world-wide. This is especially important for Hawaii, where native species are particularly vulnerable because they evolved in the absence of native ant species (Cole et al. 1992, Gillespie and Reimer 1993, Krushelnycky and Gillespie 2008). For example, on Haleakala, Maui, the Argentine ant (*Linepithema humile*) has nearly reached the 10,500 ft (3200 m) summit and has drastically altered species assemblages of insect fauna there (Krushelnycky and Gillespie 2008). At PTA, predator ants could potentially decimate native invertebrate populations through direct predation or indirectly through competition for wind-borne detritus (Cole et al. 1992).

Invasive ants may also potentially impact native plant populations at PTA. Ants are known to tend ("farm") alien pests such as aphids and scale insects, which impact plant vigor and may serve as a vector for further spread of plant disease (Messing et al. 2007). Foraging ants may impact fruit development and seed set of rare and native plants. Additionally, ants indirectly affect plant pollination by attacking native arthropods. For example, *L. humile* has been shown to reduce populations of important native pollinators such as *Hylaeus* spp., a ground nesting native bee (Cole et al. 1992).

Several invasive ant species have been documented at PTA (HNHP 1998, Oboyski et al. 2001):

- Argentine ant (*Linepithema humile*);
- Big-headed ant (*Pheidole megacephala*);
- Cardiocondyla ant (*Cardiocondyla venustula*);
- Hypoponera ant (*Hypoponera opaciceps*);
- Pharaoh ant (*Monomorium pharaonis*);
- Singapore ant (*Monomorium latinode*);
- Tiny yellow house ant (*Tapinoma melanocephalum*);
- White-footed ant (*Technomyrmex albipes*).

Survey Methods

Invasive ant surveys were conducted to determine invasive ant presence in the vicinity of the LZs. Surveys are conducted pre- and post-construction to establish if ants were present in the action area prior to training operations at the LZs or if they were introduced via construction or training activities. The invasive ant survey covers the same areas described for botanical surveys; i.e., a buffer of 330 ft (100 m) from each LZ perimeter. Ant bait stations were placed in a 100 x 100 ft (30 x 30 m) grid throughout the LZ survey areas, and at 500 ft (150 m) intervals along access trails (Figure 8). A total of 466 ant bait stations (309 bait stations for the LZs and 157 bait stations for access trails) were deployed throughout the combined survey area of 55 ac (20 ha).

Bait stations were inspected and collected between 1-3 hours after deployment to allow adequate time to attract ants. On all survey days, ant baiting began when ants are expected to have predictable foraging behavior; i.e., when the temperature was at least 50° F (10° C).

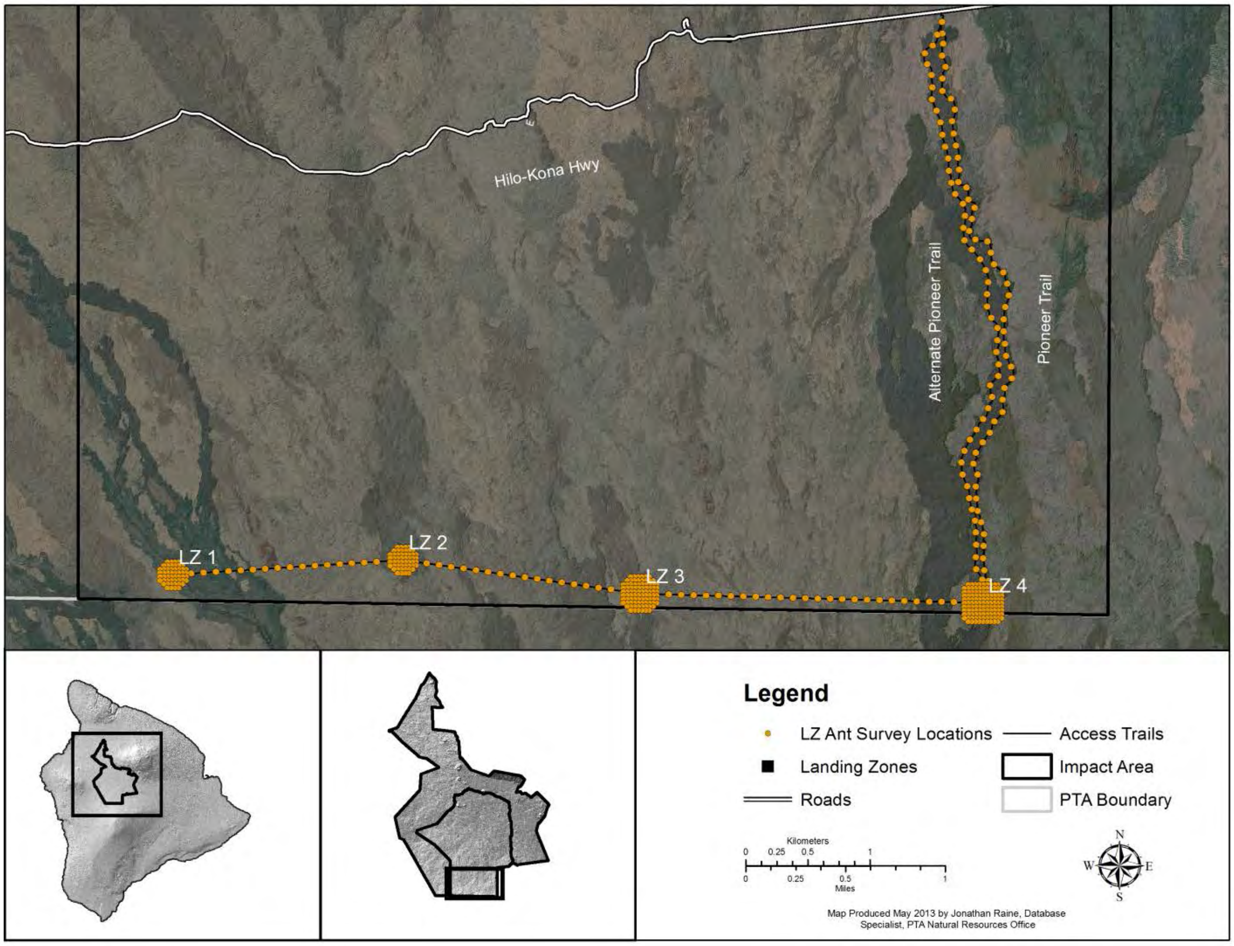

Figure 8. Invasive Ant Survey Locations

Results

Surveys for invasive ants were conducted on 10-12 April 2013 and 22-23 April 2013 at the LZs. The survey team from within the PTA NRO consisted of Steven Evans, MSc, Lena Schnell, MSc (candidate), Rogelio Doratt, MSc, Robert Yagi BSc, Kip Cline, BSc, Heraldo Farrington, BSc, Thomas Kuhlman, BSc, Martha Kawasaki, BSc, and Rachel Moseley, BSc. No ants were found during the survey period. These results are considered conclusive that no ant species presently occur in the action area.

Discussion

The status of ants in the action area is not a direct factor for assessing impacts from aviation training at the LZs. The ant surveys do, however, provide a baseline for further study. Argentine ants are established at Bradshaw Army Airfield, and importation of ants to the action area as a result of military operations is to be avoided. Standard operating procedures require that construction equipment be inspected and cleaned prior to use (USAG-HI 2008). Aircraft inspection and cleaning protocols are also in place and must be implemented prior to missions. Ant survey baseline results will further encourage adherence to existing protocols.

HAWAIIAN PETREL AND BAND-RUMPED STORM PETREL

Potential Impacts

Potential impacts to the Hawaiian Petrel and the Band-Rumped Storm Petrel from aviation training operations at the LZs include injury or death from grading and leveling during construction, noise disturbance, and airstrikes. These impacts were evaluated based on the expected presence of petrels within the action area during training operations.

Suitable Hawaiian Petrel habitat at PTA has been defined as open pahoehoe lava with lava tubes and blisters suitable for nesting sites. Figure 4 shows substrate within the LZ action area. Approximately 48% of this area has been identified as potential petrel habitat (i.e., pahoehoe) and 52% has been identified as unsuitable habitat (i.e., aa). The LZs are located on the northeast slope of Mauna Loa, 10 mi (16 km) from known petrel colonies in Hawaii Volcanoes National Park. Limited investigations suggest that the Hawaiian Petrel and the Band-Rumped Storm Petrel use the saddle region as a flyway from the west coast to the colonies along the Mauna Loa northeast rift zone in the park (Cooper et al. 1996).

Between 2008 and 2012, the PTA NRO deployed recording equipment annually to 18 survey locations in 2 study sites in Training Areas (TAs) 21 and 23. In 2011, 2 to 5 Hawaiian Petrel calls were recorded in short succession on a single night in TA 23, 1.9 mi (3 km) from the western-most LZ (LZ 1) (Figure 9). This was the only detection of this species in more than 5000 recorded hours in TA 23 (NRO unpublished data). In 2012, a Hawaiian Petrel was recorded on a single night in TA 21, 5.2 mi (8.4 km) from the eastern-most LZ (LZ 4) (Figure 9). This was the only detection from more than 2000 recorded hours in TA 21 (NRO unpublished data). All detections in TA 21 and TA 23 were assessed to emanate from birds transiting the installation due to the short call-time duration on each recording.

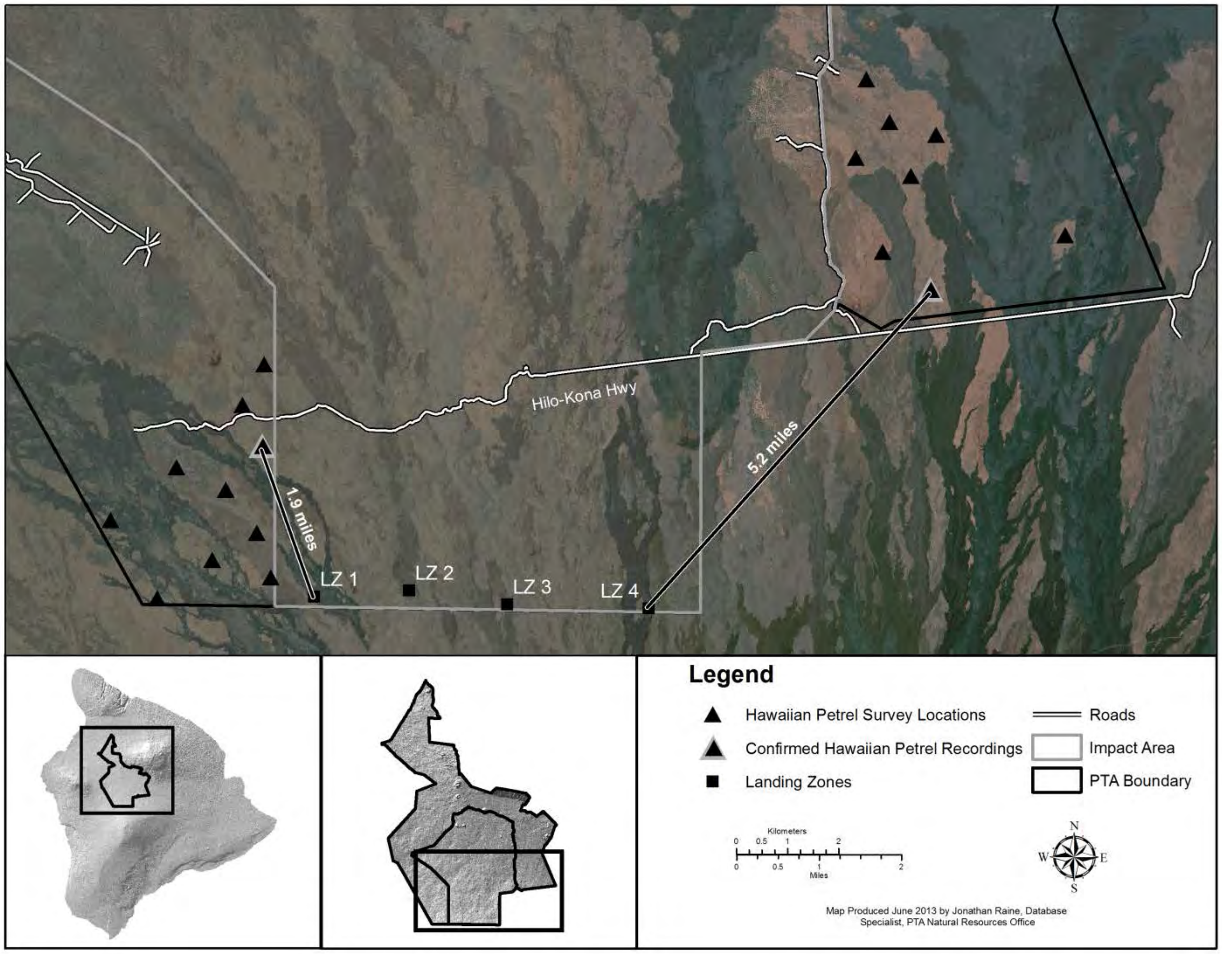

Figure 9. Hawaiian Petrel Survey Locations and Confirmed Recordings 2008-2012

The Band-Rumped Storm Petrel was recorded at PTA between 2008-2012 (May-August) in Training Areas 21 and 23 at least once at 17 of the 18 monitoring sites (Figure 10). Generally, Band-Rumped Storm Petrels are first detected at PTA in late May and call activity is detected more frequently in TA 21 than TA 23. In TA 21, call detections increase through June and remain steady until August when monitoring is completed. Additionally, call activity occurs throughout the sample period (i.e., between 1915 h and 2315 h). The closest distances between the western-most (LZ 1) and eastern-most (LZ 4) LZ and Band-Rumped Storm Petrel detections in the southwest and southeast are 0.6 mi (1 km) and 5.2 mi (8.4 km), respectively.

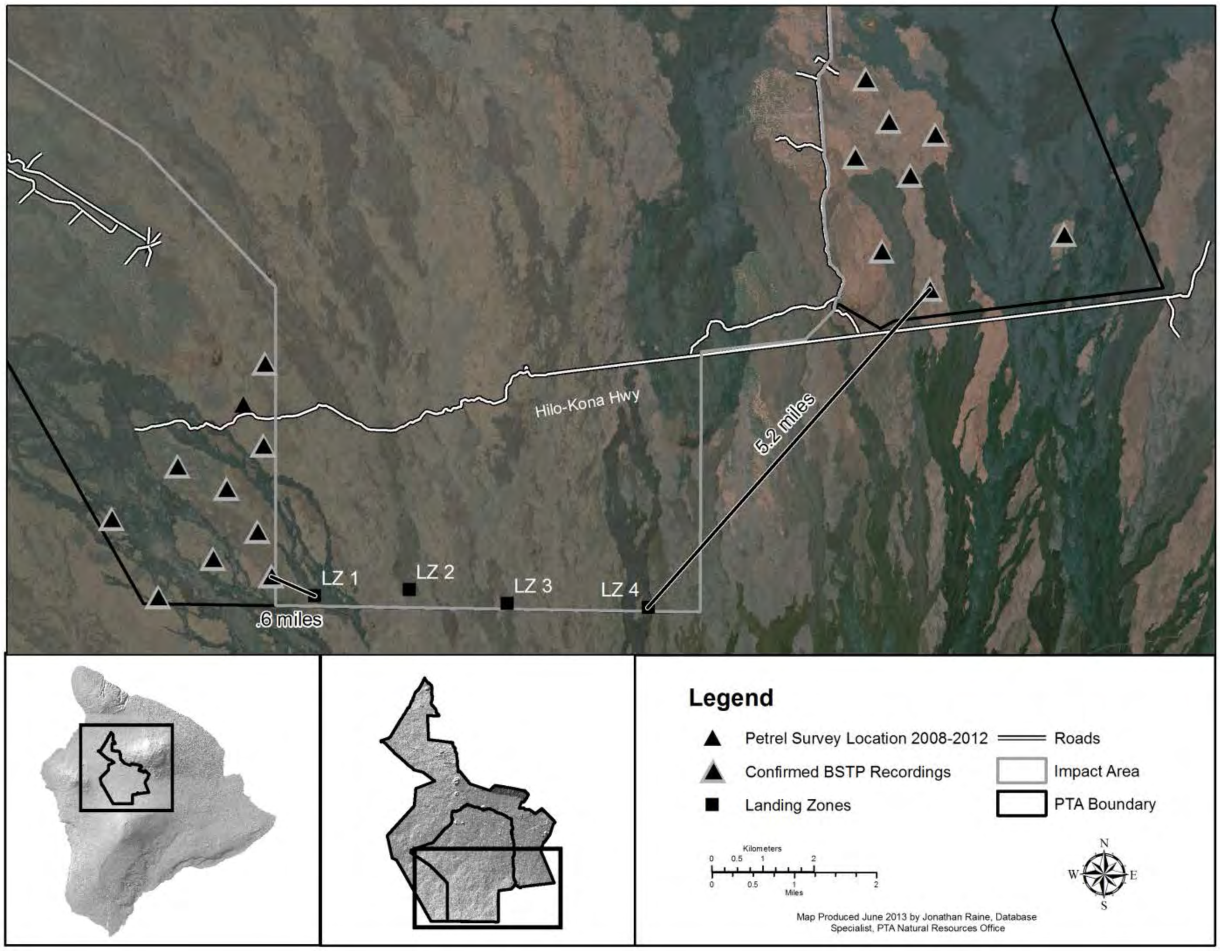

Figure 10. Band-Rumped Storm Petrel (BSTP) Survey Locations and Confirmed Recordings 2008-2012

Survey Methods

Surveys were conducted to determine Hawaiian Petrel and Band-Rumped Storm Petrel presence and habitat use in the general vicinity of the LZs. In colonies, petrels use openings in the lava as burrows to raise their young. Breeding pairs visit their burrows briefly in February to initiate breeding season. Pairs then depart the colonies to feed at sea, usually by March, and return to the colony in late April or early May to lay eggs. Both parents assist with incubating and rearing. Young petrels fledge from the colonies in October or November. Non-breeding petrels visit colonies from May to August. Non-breeding petrels call almost continuously within the colony during this period and are the portion of the population easiest to detect. It is assumed that healthy functional colonies will contain a non-breeding component. Surveys were therefore conducted between May and June when non-breeding petrels were expected to be present, if extant colonies were in the action area.

All classes of fixed wing and rotary wing aircraft from all services will potentially conduct aviation training at the PTA LZs. Similar to the avifauna surveys, the petrel survey area was based on a noise contour of 80 dB for the CH-53E Super Stallion and CH-47 Chinook, the 2 loudest aircraft proposed for training operations at the LZs. Although it is recognized that exceptions are possible among individual species, the 80 dB contour was selected as the reasonable noise level threshold of concern for disturbance of petrels (Peshut and Schnell 2011). The petrel survey area was extended from the perimeter of the LZs to account for potential noise effects from aircraft landing on the edge of the LZ footprints (i.e., worst-case scenario). See the avifauna section above for more details about noise impacts on birds as a result of military training.

To maximize the potential for detecting Hawaiian Petrels and Band-Rumped Storm Petrels, suitable habitat within the 80 dB noise contour at the LZs was surveyed using automated recording units (Figure 11). Three Song Meter II (SM) (Wildlife Acoustics, Inc., Concord, MA) units were deployed via helicopter and were set up with a recording radius of 1475 ft (450 m). The SM units were programmed to record all ambient sounds on 4 non-contiguous nights during an 8-night monitoring period from 1915 h to 2215 h, thereby incorporating the daily peak calling times for petrels (Simons and Hodges 1988). All SM units were deployed inside a protective wire cage and were suspended 1.6 ft (0.5 m) from the ground. Audio data was analyzed by comparing sound patterns recorded by SM units with known Hawaiian Petrel and Band-Rumped Storm Petrel call patterns. Each identifiable call, whether complete or a fragment, is considered a detection. Call activity cannot readily be equated to numbers of individuals. Additionally, when multiple calls are detected by the same recording unit over short periods of time and clearly show signal attenuation, petrels are assumed to be transiting the monitoring area.

Habitat along access trails was also surveyed for evidence of petrel use. Ocular surveys for suitable Hawaiian Petrel and Band-Rumped Storm Petrel habitat were coincidental with the biological surveys described above.

Results

In April 2013, ground surveys conducted by Lena Schnell, MSc (candidate), identified areas between LZ 2 and LZ 3 and between LZ 3 and LZ 4 with suitable openings for potential petrel nesting (Figure 11). However, no other evidence (e.g., guano, footprints, feathers, carcasses) indicated the openings were recently used by petrels for nesting. No petrel colonies were observed during surveys.

Figure 11. Pahoehoe Lava with Suitable Openings for Potential Petrel Nesting Burrows

Surveys to assess the presence and habitat use of petrels at the LZs and along the construction access route between LZ 2 and LZ4 were conducted from 28 May 2013 to 17 June 2013 using automated recording units. The survey team from within the PTA NRO consisted of Rogelio Doratt, MSc and Rachel Moseley, BSc. Three SM units were each deployed twice in the action area, for a total of 6 locations (Figure 12). The units were deployed near LZs 1, 2, and 3 (SM locations 1-3) for 8 nights, then were moved to new locations near LZs 3 and 4 for the same length of time (SM locations 4-6). Band-Rumped Storm Petrel calls were recorded at SM locations 1, 4, 5, and 6 over 4 different nights. Call detections were dispersed over the sample period with the earliest detection at 2103 h and the latest at 2304 h (Figure 13). However, activity is highly clustered and multiple calls are often recorded within short time intervals (e.g., 1 minute). Additionally, periods of inactivity intersperse call clusters and range from 10 to 60 minutes with 20 minutes between active periods. Overall, activity levels are relatively low in the area surrounding the LZs. Lastly, the short intervals and attenuated signal strength between the majority of calls suggest the birds were transiting the area.

No confirmed Hawaiian Petrel calls were recorded.

Additionally, surveys for nocturnal seabirds in the action area failed to detect Newell's Shearwater (*Puffinus newelli*), an MBTA protected species.

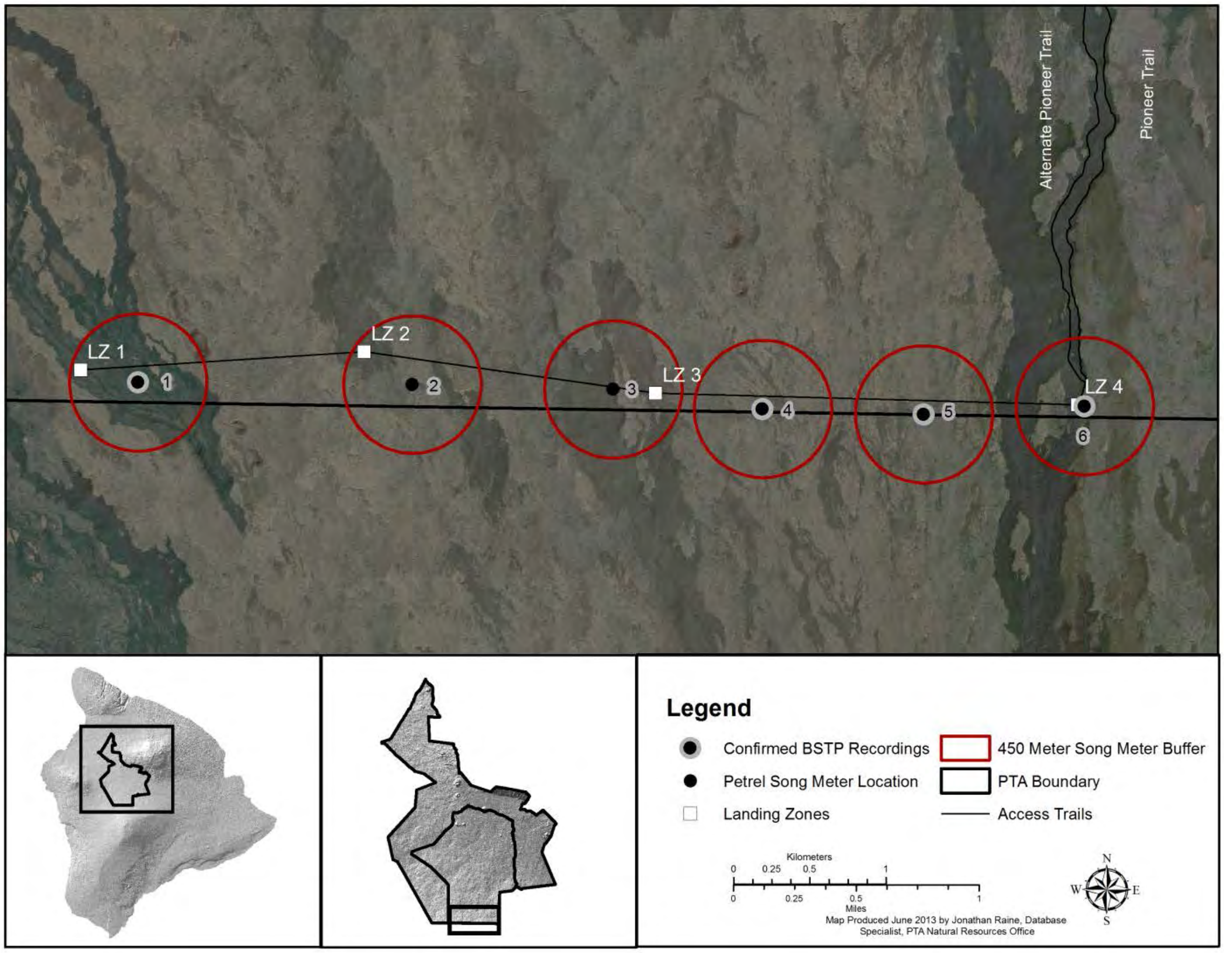

Figure 12. Petrel Survey Area and Confirmed Band-Rumped Storm Petrel (BSTP) Recordings in 2013

Discussion

Impacts to petrels could occur when the bulldozer transits potential nesting habitat within the construction access routes between LZs. Eggs, chicks, and/or adults could be injured or killed if occupied burrows collapse under the bulldozer. However, constructing the LZs and Pioneer Trail (or the alternate trail), is not considered to be of concern for Hawaiian Petrels and Band-Rumped Storm Petrels. Because the LZs are located on relatively young aa, grading and leveling will not impact potential nesting burrows of either petrel species. Although pahoehoe lava with suitable openings for nesting is present along the construction access routes between LZ 2 and LZ 3 and between LZ 3 and LZ 4, no Hawaiian Petrels were detected, indicating no colonial activity from these areas. Additionally, no visual evidence (i.e. guano, feathers, footprints) indicating recent use was discovered within the suitable openings. Therefore, we conclude the area is unoccupied by nesting Hawaiian Petrels and there will be no impacts from traversing the construction access route with a bulldozer.

Band-Rumped Storm Petrels were detected on 4 of 8 sampling nights and calls were recorded at monitor ing locations 1, 4, 5, and 6 (Figure 13). Calls were detected in suitable nesting habitat along the construction access route. Activity was highly clustered with calling activity lasting from 1 to 7 minutes. Call clusters were typically interspersed by periods of inactivity lasting from 10 to 60 minutes with an average of 20 minutes between active periods. The minimal duration of calls within a cluster and the relatively long inactive periods between call clusters suggests petrels sporadically occupy the area possibly while in transit. Overall call activity was relatively low indicating no colonial activity in these areas.

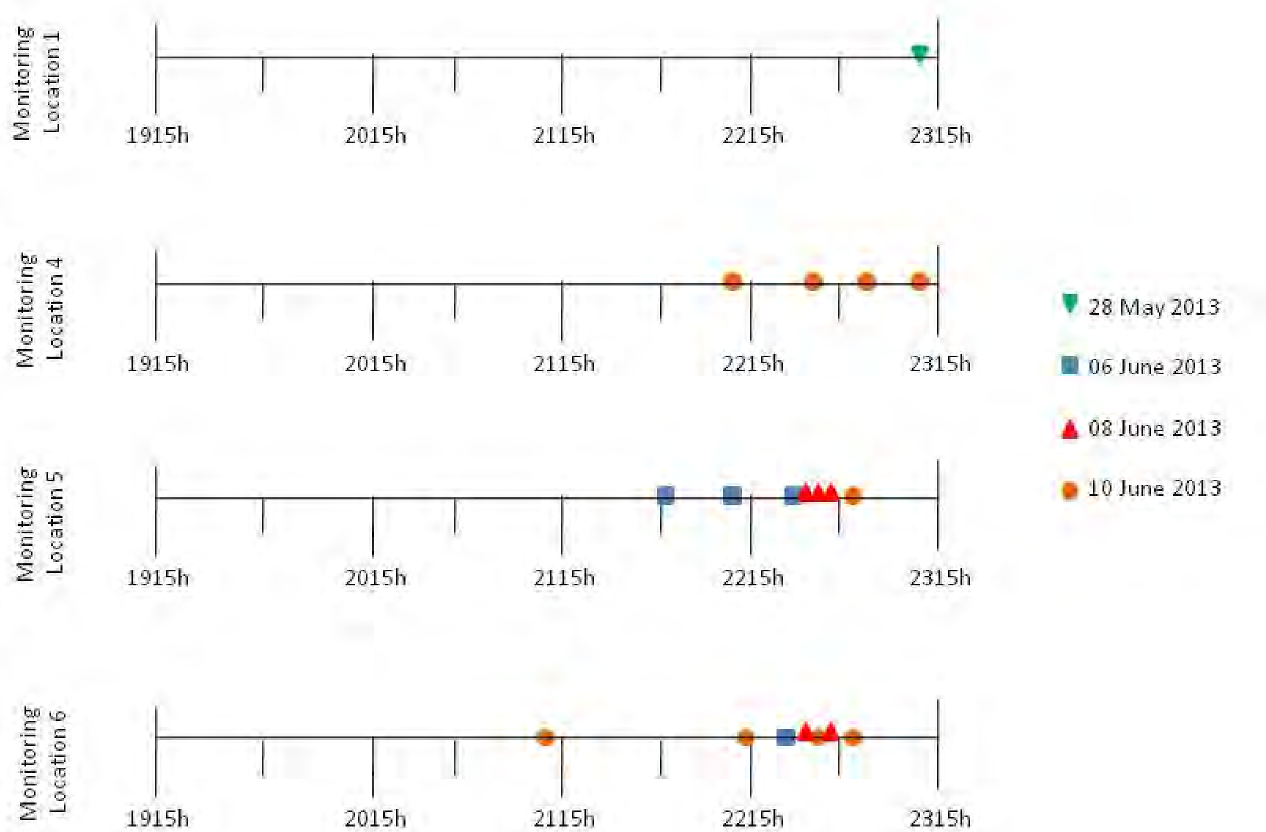

Figure 13. Band-Rumped Storm Petrel Recording Cluster Calling Activity (1 min) Timeline 1915 h to 2315 h

Although the recordings suggest petrels are moving through the area, Band-Rumped Storm Petrel nest site preferences and identifying characteristics are poorly understood on Hawaii Island. Survey techniques for identifying Hawaiian Petrel burrows may be insufficient to detect Band-Rumped Storm Petrel nesting activity (Swift and Burt-Towland 2009). Therefore, undetected Band-Rumped Storm Petrel burrows may be present along the construction access route. To avoid impacts from bulldozer operations to unidentified burrows within the construction access route, the NRO will mark suitable openings in the lava for avoidance.

As previously discussed, the 80 dB contour was selected as the reasonable noise level threshold of concern for disturbance of bird species for the purposes of these surveys, based on a review of the literature. Given the expected low density of petrels within the action area, noise ≥80 dB is not expected to affect an indeterminably small number of individuals.

In a radar survey of seabirds at PTA, Cooper et al. (1996) detected 5 seabirds (0.05 birds/hr), including 3 Hawaiian Petrels, on the eastern portion of the installation. This movement rate is 6-fold lower than the lowest seabird movement rate found in a similar study by Day et al. (2003) at coastal sites (0.3 birds/hr). Indeed, in 9 of the 14 sites sampled by Day et al. (2003), seabird movement rates were greater than 1.0 bird/hr, with a maximum rate of 25.8 birds/hr at Waipio Valley (northeast of PTA). Additionally, monitoring data from the action area detected Band-Rumped Storm Petrels transiting the area near the LZs. From these data, we conclude relatively few birds transit PTA. Therefore, very few petrels are likely to encounter noise at the proposed LZs.

Airstrikes as a result of training operations at the LZs are not considered to be of concern for the Hawaiian Petrel and the Band-Rumped Storm Petrel. Most training activities are scheduled for daylight hours when helicopters are visible as well as audible to petrels. Petrels that are transiting the saddle region are not expected to be in the vicinity of the LZs during daylight hours. Transiting petrels during nighttime exercises are expected to be minimal because petrel density in the flyway is expected to be low (Cooper et al. 1996). Band-Rumped Storm Petrels generally fly upslope within 33 ft (10 m) of the ground and Hawaiian Petrels also tend to fly close to the ground when at high elevations, especially within colonies (Swift and Burt-Toland 2009). As discussed in the avifauna section above, bird airstrikes are extremely rare for military aircraft overall, with only 2 airstrikes documented between 2001-2010 for all Army aircraft flights in the state of Hawaii (P. Mansoor, CW4, pers. comm., 2011). Moreover, helicopters are typically slow-moving at the elevations proposed for the LZs due to reduced aircraft performance (F. Tate, COL, pers. comm., 2011), which further reduces the likelihood of bird airstrikes.

Artificial light sources are known to be hazardous to fledging petrels because they disrupt navigation (Simons and Hodges 1988); however, artificial light sources will not be placed at the LZs, as this is not consistent with realistic combat conditions (F. Tate, COL, pers. comm., 2011). Therefore, no impacts to petrels from artificial light sources are expected.

The Hawaiian Petrel was not observed transiting the action area and no petrel colonies were observed during the survey period. Results are considered conclusive with respect to Hawaiian Petrel colonies, and support the proposition that petrel occurrence in the saddle region flyway is infrequent. The Band-Rumped Storm Petrel was recorded within the action area; however, call recording characteristics suggest the individuals were transiting the area. Because nesting site characteristics for Band-Rumped Storm Petrels are poorly understood and undetected burrows may be present in the construction access route, the NRO will mark suitable openings for avoidance by the bulldozer.

Aviation operations at the LZs are not likely to affect Newell's Shearwater. On Hawaii Island, shearwater colonies are limited to the Puna District (25 mi southeast of PTA), the Hamakua coast (25 mi northeast of PTA) and Waipio Valley (20 mi northwest of PTA). No shearwater colonies are known in the subalpine or alpine areas of Hawaii Island. Since Newell's Shearwater colonies are located near the coasts, inland flights through the saddle region are extremely unlikely during training operations at the LZs.

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Appendix B

Section 106 Consultation

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DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON
PŌHAKULOA
PO BOX 4607
HILO, HAWAII 96720-0607

REPLY TO
ATTENTION OF
Office of the Commander

NOV 2 6 2013

Mr. William Aila
State Historic Preservation Officer
State Historic Preservation Office
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

Dear Mr. Aila:

As Commander of the US Army Garrison, Pōhakuloa (USAG-Pōhakuloa), I am writing to amend consultation for the South Pōhakuloa Training Area (PTA) Landing Zones under Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations (36 CFR Part 800). The project is within the ahupua'a of Ka'ohe, district of Hāmākua, Hawai'i County, on the island of Hawai'i (TMK: (3) 4-4-016:001). Please see Enclosure 1 for a list of all consulting parties.

Consultation was initiated for this project in July 2013. It has subsequently been determined that additional area is required at Landing Zone 4, 50 meters on each side of the previously surveyed area for a total area of 200 by 200 meters at that one landing zone. PTA Cultural Resources staff returned to the project area to conduct archaeological survey of the additional area at LZ 4 (Enclosure 2). No archaeological sites were identified in the additional area around LZ 4.

In the event that iwi kūpuna or Native Hawaiian cultural deposits are encountered during the project, USAG-Pōhakuloa will implement our Inadvertent Discovery Plan (Enclosure 3).

I have determined that there will be no historic properties affected by this project. Pursuant to Section 106 of the National Historic Preservation Act of 1966 as amended and 36 CFR part 800.2(c), we are seeking your concurrence on the determinations made in this letter. Should you require additional information about this project, the point of contact is Dr. Julie M. E. Taomia, PTA Archeologist, at telephone number (808) 969-1966.

Sincerely,

Eric P. Shwedo
Lieutenant Colonel, US Army
Commanding

Enclosures

Mr. William Aila
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Aloha 'Aina Educational Center
P.O. Box 1523
Hilo, HI 96720

IMHW-PTA-PWE 08 October 2013

MEMORANDUM FOR THE RECORD

Subject: Archaeological Survey of the Southern Pōhakuloa Training Area (PTA) Landing Zone Extension of Landing Zone #04, PTA, Ka'ohe Ahupua'a, Hāmākua District, Hawai'i Island, [TMK (3) 4-4-016:001].

1. The U.S. Army Pacific has proposed the Southern PTA Landing Zone project at Pōhakuloa Training Area (PTA) in the Impact Area, Island of Hawai'i, Hawai'i (Figure 1). The purpose of the Southern PTA Landing Zone project is to enable fixed-rotor aircraft to conduct training in an austere environment. The project requires establishing four landing zones above 8,000 foot elevation. A trail, named Pioneer Trail, must be established for access to the landing zone areas for the construction equipment and for access by maintenance crews. An alternate trail was also proposed to allow for an option in the event that the topography of the Pioneer trail was too rough to traverse.

2. A survey was originally conducted of the project area in February and March 2013 (Yamauchi 2013). In the course of preparing an Environmental Assessment for the project it was determined that LZ #04 needed to be expanded from 100 meters by 100 meters to 200 meters by 200 meters (Figure 2). The additional 50 meters on each side had not been included in the previous survey. Therefore, PTA Cultural Resources staff returned to the project area to survey the additional area.

3. Elevation at LZ #04 is approximately 8,800 feet above sea level. The average annual rainfall within the PTA region ranges from 102 to 406 millimeters (4.0-16.0 inches) per year and the annual mean temperature is approximately 10-15.5°C (50 - 60 °F) (Hommon and Ahlo 1983: 10). LZ #04 is located at the interface of the Mauna Loa k4 *'a'ā* flow (200 -750 years before present [BP]) and the k2 *'a'ā* lava flow (1,500-3,000 BP). The expanded area covered by LZ #04 covers both lava flows. The project area is located on barren lava that is devoid of any significant vegetation (Shaw and Castillo 1997) (Figure 3).

4. On Thursday, September 26, 2013, Mr. Jeffrey Syrop (Cultural Resources Specialist) and Ms. Alysia Curdts (Cultural Resources Technician) met the Army pilot at Bradshaw Airfield who provided helicopter transport to the project area. Helicopter transport was implemented to expedite completion of the survey, facilitate access to the eastern-most landing zone and reduce the extreme physical demand on the survey team.

5. Transects spaced ten (10) meters apart were established to cover the expanded LZ #04 area. No archaeological sites were identified during the survey. Approximately three acres were surveyed.

Jeffrey Syrop
Cultural Resource Specialist

Alysia Curdts
Cultural Resources Technician
Environmental Office, PTA

Enclosure 2

References Cited:

Hommon, Robert J. and Hamilton M. Ahlo
1983 *A Research Design for Archaeological Studies at the Pōhakuloa Training Area, Island of Hawai'i.* Manuscript on file at the Historic Preservation Division, Department of Land and Natural Resources, State of Hawai'i, Honolulu.

Shaw, Robert B. and J. Michael Castillo
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Yamauchi, Jeffrey
2013 Memorandum for the Record: Archaeological Survey of Proposed Landing Zones, Pōhakuloa Training Area (PTA), Ka'ohe Ahupua'a, Hāmākua District, Hawai'i Island, [TMK (3) 4-4-016:001]. On file at Pōhakuloa Training Area Cultural Resources Office.

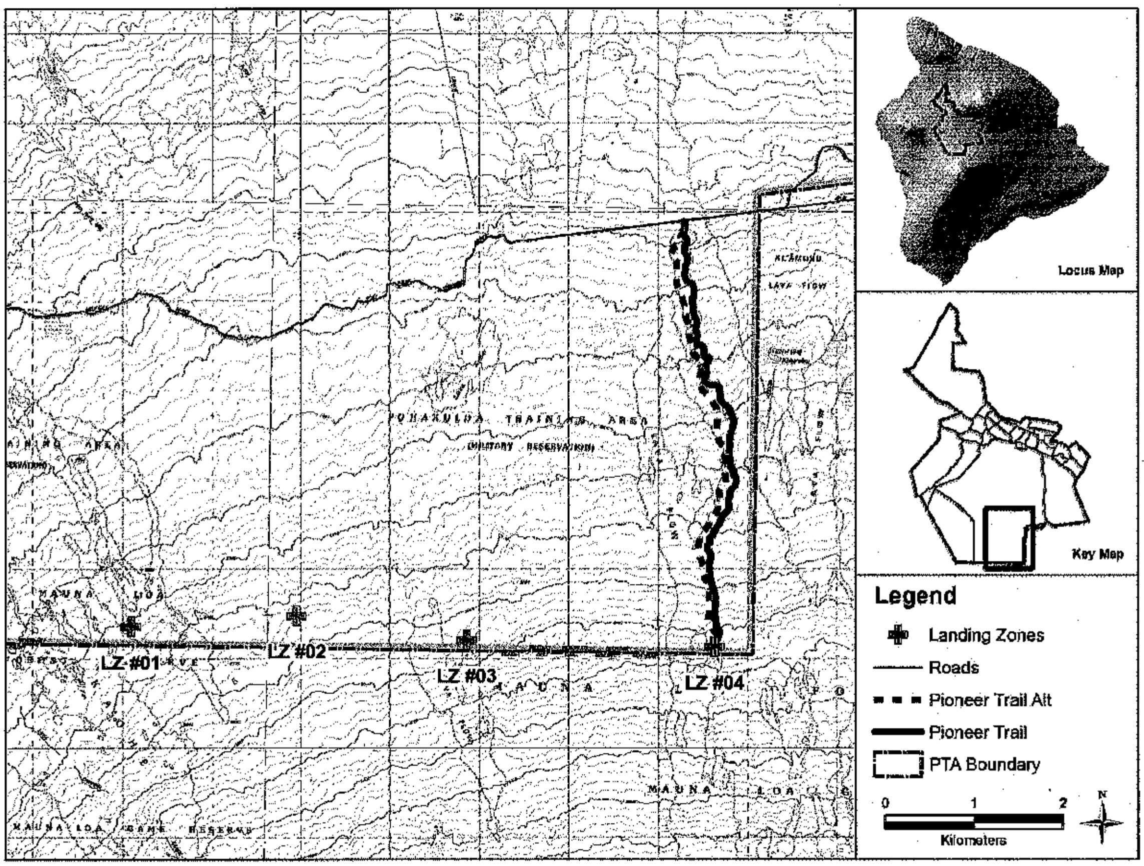

Figure 1. Overview of Southern PTA landing zones.

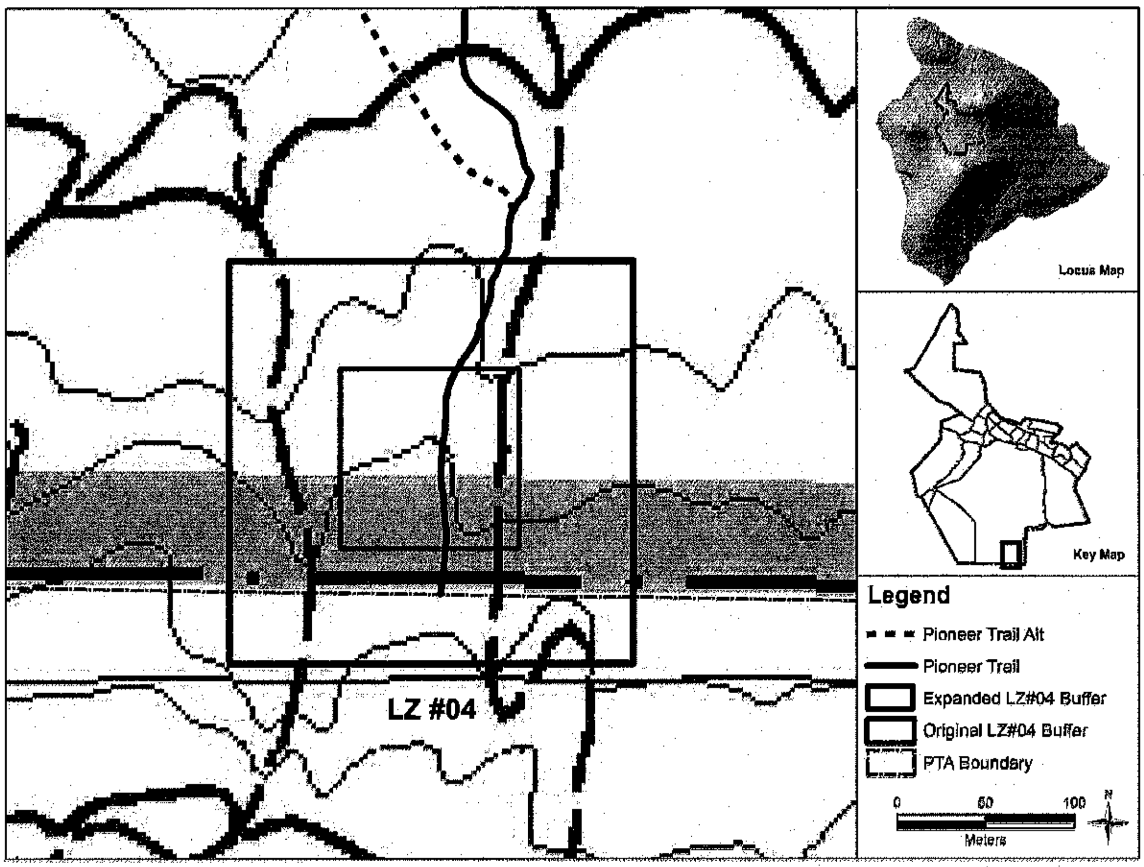

Figure 2. Southern PTA Landing Zone #4 extension area.

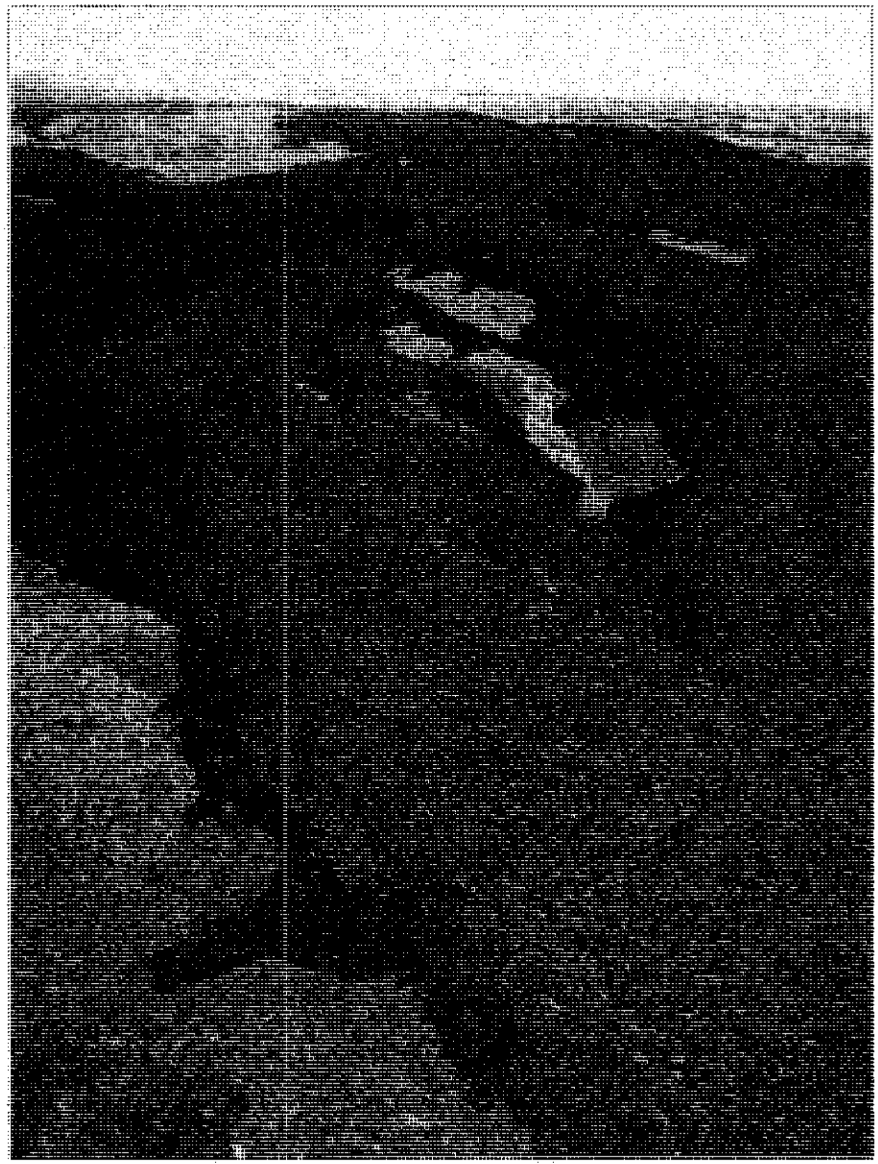

Figure 3. Aerial overview of Landing Zone #04 and Alternative Trail terrain – Northeast view.

INADVERTENT DISCOVERY PLAN FOLLOWING GUIDELINES ESTABLISHED IN NATIVE AMERICAN GRAVE PROTECTION AND REPATRIATION ACT

1. Any employee (or contractor in the employ) of the Garrison who knows or has reason to know that human remains or cultural items as defined under the Native American Grave Protection And Repatriation Act (NAGPRA) have been inadvertently discovered on land owned or controlled by the Garrison, shall provide immediate telephone notification of the discovery, with written back-up to the Garrison Commander and the Garrison Cultural Resources Manager.

2. The employee or contractor shall also immediately stop any activity in the area of the discovery and protect the human remains and cultural items unless prevented from doing for life/safety concerns.

3. Once contacted regarding an inadvertent discovery, the Garrison Cultural Resources Manager or their representative from the Cultural Resources staff will make an in-situ examination of the condition, antiquity and cultural affiliation of the human remains and cultural items based upon applicable professional standards to determine whether the remains and cultural items appear to be Native Hawaiian.

4. If the examination determines that the human remains or cultural items appear to be Native Hawaiian, the Garrison shall notify the State Historic Preservation Division, OHA, Hui Malama I Na Kupuna O Hawaii Nei and the appropriate Burial Council telephonically, via e-mail, or with written correspondence within 48 hours.

5. If, through consultation with the above parties, the Garrison Commander establishes the human remains and cultural items cannot be left in situ, their excavation and removal shall be undertaken by professional archaeologists employed by the Garrison within 15 working days from the initial contact between the Garrison and the Burial Council.

6. Prior to disposition of the human remains and cultural items, the Garrison shall publish a general notice of the proposed disposition in a newspaper of general circulation in the area in which the remains were recovered. The notice shall provide information as to the nature and cultural affiliation of the remains and cultural items and shall solicit further claims of ownership. The notice shall be published at least twice, at one-week intervals, and transfer shall not take place until 30 days after the second notice to allow for any additional claimants to come forward.

7. If re-internment is on land owned or controlled by the Garrison, the location of the re-internment shall only be reported to the claimant, the Garrison Commander, and the Cultural Resources Manager for the Garrison.

Enclosure 3

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON
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PO BOX 4607
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REPLY TO
ATTENTION OF

Office of the Commander

JUL 16 2013

Mr. William Aila
State Historic Preservation Officer
State Historic Preservation Office
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

Dear Mr. Aila:

As Commander of the US Army Garrison, Pōhakuloa (USAG-Pōhakuloa), I am writing to begin consultation under Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations (36 CFR Part 800) on a project proposed at the Pōhakuloa Training Area (PTA) within the ahupua'a of Ka'ohe, district of Hāmākua, Hawai'i County, on the island of Hawai'i (TMK: (3) 4-4-016:001). Please see Enclosure 1 for a list of all consulting parties.

I have determined that this project constitutes an undertaking. The purpose of this undertaking is to establish four landing zones at the southern end of PTA to provide more diverse training opportunities for helicopter pilots. The project will require leveling lava using a bulldozer. There are no trails to the landing zone locations; therefore the heavy equipment will create its own access trail. The proposed trail has been named Pioneer Trail, and begins at the Hilo-Kona Road. The trail will extend south along the eastern boundary of PTA to the southern boundary. From this location where the first landing zone will be located linking trails between the landing zones will also be pioneered to the west along the southern PTA boundary. The landing zones themselves will be 250 feet by 250 feet (76.2 by 76.2 meters) in area. A possible alternative trail was also identified approximately parallel to the Pioneer Trail to allow for an option in the event that the Pioneer Trail route is not passable by the bulldozer. The area of potential effects (APE) for the project was identified as 40 meters on either side of both proposed trail centerlines, and 176 by 176 meter areas at each of the landing zones for a total area of 344 acres (139 hectares) (Enclosure 2). The APE is located between 7,280 feet and 8,920 feet above sea level on lava flows dating from the historic period to 3000 B.P. A small area at the northern end of the trails is on older lava flows dating as much as 10,000 years old. Vegetation in the project area is sparse, and there is no soil development.

PTA Cultural Resources staff conducted an archaeological survey of the APE (Enclosure 3). None of the lava tubes encountered during the survey contained archaeological materials. Military communication lines were identified in the project area. Three possible archaeological sites were also identified. These included two pits in the k3 pāhoehoe lava (750-1500 BP) adjacent to the more recent k4 lava flow (200-750 BP), and one cairn on the k4 flow. The excavated pits do not show any evidence of impacts either on the rim of the pit or on the loose pieces of rock in and around the pits. The broken pāhoehoe is also not stacked. In recent research at PTA to clarify characteristics that are important to determine excavated pit sites eligible for the National Register, these characteristics have been identified as indicative of human activity (Robins & Liston 2013). The proximity of these pits to a more recent lava flow makes it likely that they are the result of gas explosions that occur when newer lava flows create gas that travels beneath older flows and often breaks the crust at weak spots or where pressure builds up to high enough levels. No artifacts were found at the pit sites, nor were any found at the cairn site. Therefore, I have determined that none of these sites are eligible for the National Register.

In the event that iwi kūpuna or Native Hawaiian cultural deposits are encountered during the project, USAG-Pōhakuloa will implement our Inadvertent Discovery Plan (Enclosure 4).

I have determined that there will be no historic properties affected by this project. Pursuant to Section 106 of the National Historic Preservation Act of 1966 as amended and 36 CFR part 800.2(c), we are seeking your concurrence on the determinations made in this letter. Should you require additional information about this project, the point of contact is Dr. Julie M. E. Taomia, PTA Archeologist, at telephone number (808) 969-1966.

Sincerely,

Eric P. Shwedo
Lieutenant Colonel, US Army
Commanding

Enclosures

Mr. William Aila
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State Historic Preservation Division
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Enclosure 1

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Superintendent
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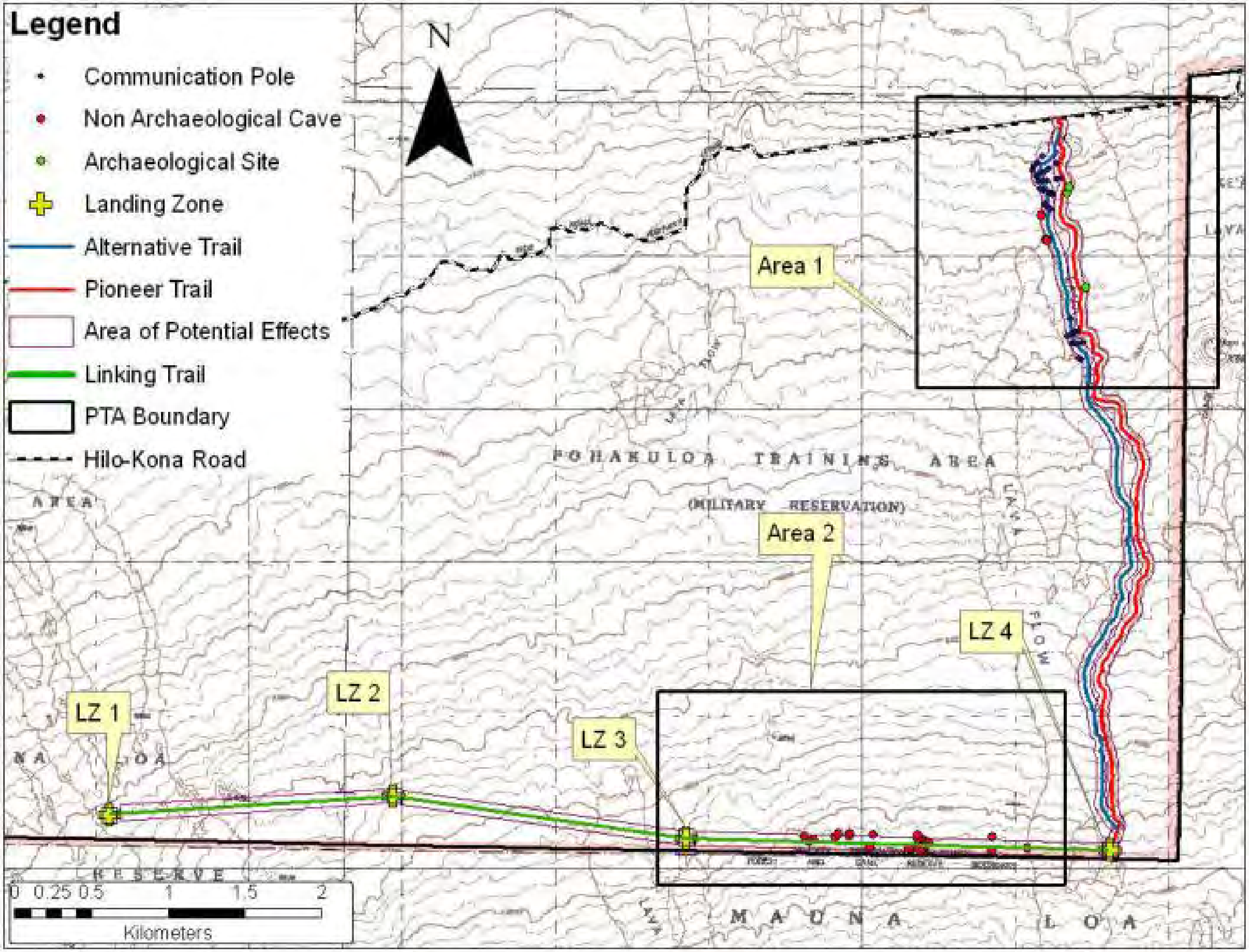

Area of Potential Effects

Enclosure 2

IMPC-HI-PWE 26 February 2013

MEMORANDUM FOR THE RECORD

Subject: Archaeological Survey of Proposed Landing Zones, Pōhakuloa Training Area (PTA), Ka‘ohe Ahupua‘a, Hāmākua District, Hawai‘i Island, [TMK (3) 4-4-016:001].

1. The U.S. Army Pacific has proposed the landing zone project at PTA in the Impact Area, Island of Hawai‘i, Hawai‘i. The purpose of new landing zones is to provide aviation units more diverse training opportunities at PTA. The project requires establishing four landing zones along the southern boundary of PTA. A trail, named Pioneer Trail, must be established for access to the landing zone areas for the construction equipment and for access by maintenance crews.

2. Located at the southern end of PTA in the Impact Area, the area of potential effects (APE) for the proposed project is approximately 344 acres. The APE includes the proposed Pioneer Trail to provide access to the landing zones from the Hilo-Kona Road, an Alternative Trail approximately parallel to the Pioneer Trail, four landing zones and linking trails between the landing zones. An 80 meter corridor was surveyed along each proposed trail segment. A 100 meter by 100 meter area was surveyed around each proposed landing zone location that will measure 328 feet by 328 feet (Figure 1).

3. Elevations for the APE are between 2,219 to 2,719 meters (7,280 to 8,920 feet). The average annual rainfall within the PTA region ranges from 102 to 406 millimeters (4.0-16.0 inches) per year and the annual mean temperature is approximately 10-15.5ºC (50 - 60 ºF) (Hommon and Ahlo 1983: 10).

   a. The lava flows in the project area trend from south/southeast to north/northeast, originating at the Mauna Loa caldera or vents of the volcano. The proposed Pioneer and Alternative Trails are located primarily on the Mauna Loa k4 *'a'ā* flow (200 -750 years before present [BP]) with the exception of a small area to the north which is on the Mauna Loa Klo *pāhoehoe* flow (5,000 – 10,000 years BP) and the k2 *'a'ā* flow (1,500 -3,000 years BP) (Figure 2). The k2 *'a'ā* flow also continues near the south/eastern portion of proposed Pioneer Trail. Proposed Landing Zone 1 is located on the Mauna Loa k5 *'a'ā* and *pāhoehoe* flow (0 – 200 years BP); Landing Zones 2 and 3 are located on the k3 *pāhoehoe* flow (750 – 1,500 BP); and Landing Zone 4 is located on the k2 *'a'ā* flow (1,500-3,000 BP). The proposed linking trail is located primarily on the k3 *pāhoehoe* flow with the eastern portion of the trail located on the k4 *'a'ā* flow and the western portion of the trail located on the k5 *'a'ā* and *pāhoehoe* flow. A small portion of the middle section of the linking trail is located on the k2 *'a'ā* flow.
   b. There are two types of plant communities in the project area: barren lava and *Styphelia-Dodonaea* shrub land (Shaw and Castillo 1997). The project area is located primarily on barren lava that is devoid of any significant vegetation. The

Enclosure 3

Styphelia-Dodonaea shrub land plant community consists of a sparse understory of *pūkiawe* (*Styphelia tameiameiae*), *ʻaʻaliʻi* (*Dodonaea viscose*), and *'ōhelo* (*Vaccinium reticulate*) and is associated with Landing Zones 2 and 3 as well as the linking trail that connects these two landing zones.

4. Mr. Jeffrey Syrop, Mr. Jeffrey Yamauchi, Mr. James Head (Cultural Resource Specialists), Ms. Alysia Curdts, Mr. Anthony Casiano, and Mr. Dietrix Duhaylonsod (Cultural Resource Technicians) commenced fieldwork on the proposed landing zone project during the period between February 26 to March 28, 2013. The archaeological survey required fifty-one (51) person days to complete. Mr. Casiano and Mr. Duhaylonsod joined PTA Cultural Resources staff from the USAG-HI Oahu Cultural Resources staff to assist with completion of the project. The archaeological survey crew was escorted by Delta Environmental Technical's unexploded ordinance (UXO) technicians because the APE is located in PTA's Impact Area.

5. The survey crew departed from the Cantonment between 0630 to 0700 hours and returned between 1530 to 1600 hours each day. The project area is located approximately 21.73 kilometers (13.5 miles) or one hour from the Cantonment.

    a. The survey area was typically accessed via the Hilo-Kona Road. However, as the survey progressed south, the project area was accessed via the Mauna Loa Observatory parking area, located at an elevation of approximately 3,353 meters (8, 989 feet). The PTA CR staff descended approximately five kilometers or 3 miles to the project area before commencing the survey. Ms. Ana Tejeda (Program Manager) and Mr. Yamauchi provided transport to the Mauna Loa Observatory parking area and then staged the project vehicle at a predetermined location on the Hilo-Kona Road. The round-trip driving distance from the Cantonment to the Mauna Loa Observatory parking area to the Hilo-Kona Road and back to the Cantonment is approximately 74 kilometers (46 miles). Transportation to the Mauna Loa Observatory parking area occurred on March 6, 8, 12, 13, 14, 15, and 21, 2013 and required a total of five (5) person days to complete.
    b. On March 27 and 28, 2013, Mr. David Okita of Volcano Helicopters provided helicopter transport to the project area. Helicopter transport was implemented to expedite completion of the survey, facilitate access to the western-most Landing Zones and reduce the extreme physical demand on the survey team. Typically, access to the linking trail and Landing Zones required a two hour hike; helicopter transportation reduced the access time to less than thirty minutes.

6. Transects spaced ten (10) meters apart were established and were oriented in a north/south direction for the Pioneer and Alternative Trails, and orientated in an east/west direction for the Landing Zones and associated linking trail. UTM coordinates were recorded for all sites using Trimble GPS GeoXH units with sub-meter accuracy using the North American Datum of 1983. All archaeological sites were recorded with field forms, photographed, measured, and, with the exception of excavated pits, mapped. The passageways of lava tube caves were explored up to thirty (30) meters from the entrance and assessed for the presence or absence of archaeological material.

7. Sites were assigned temporary site numbers followed the standard PTA Cultural Resources practice of T-MMDDYY-#, where the month (MM), day (DD) and year (YY) on which the site was first identified are followed by digits that start with 1 for each day, and increase with each new site (e.g. T-022613-01). Military sites were given a "MT" with the same number designation (e.g. MT-022613-01). Lava tube caves with no archaeological material were given a "C" designation, representing "cave" also with the same number designations (e.g. C-022613-01).

8. The archaeological sites identified include: two *pāhoehoe* excavated pits (T-022613-01 T-022613-02) and one cairn (T-022613-01). All of the archaeological sites are located in the northern portion of the Pioneer Trail. Nine (9) military sites represented by thirty-six (36) communication line poles are located in the northern portion of the Pioneer and Alternative Trails, and are considered military features. The remote location and elevation suggest military training occurred in the area rather than ranching or other civilian activities. There are no historic sites in the general vicinity to suggest multiple communication lines would have been utilized by ranching or civilian activities. The quick construction and relatively short distance indicates localized use which is more suggestive of military training than other activities. Twenty-five (25) non-archaeological lava tube caves were identified with the highest concentration along the linking trail between Landing Zones 3 and 4 (Figures 3 – 5).

9. **February 26, 2013:** The survey of the proposed Pioneer Trail was commenced by Mr. Head, Mr. Syrop, and Ms. Curdts who identified sites T-022613-01(excavated pit), T-022613-02 (excavated pit), T-022613-03 (cairn), and four (4) military communication pole alignments. The transects were primarily located on recent k4 *'a'ā* flow (200 -750 years BP) and approximately 30 acres was surveyed (Figure 6).

   a. Site T-022613-01 is an elongated shaped excavated pit, located at the base of the k4 *'a'ā* flow and at the edge of the Klo *pāhoehoe* flow (Figure 7). This site is located approximately 35 meters from the proposed Pioneer Trail. The excavated pit measures 3.7 meters long by 1.65 meters wide by 0.70 meter deep with 140˚/ 320˚ long axis. Ungulate scat and 0.50 caliber shells are present nearby, and no military impacts were observed. The floor of the excavated pit consists of sediment with *pāhoehoe* pebbles and cobbles. Excavated cobbles and boulders are discretely clustered around the southwest, north, and northeast edges of the feature while some cobbles are present in the interior of the feature (Figure 9). There is no evidence of bashing on the excavated material or on the lip of the excavated pit. However, the excavated and upturned material, measuring approximately one course high, is distributed in discrete areas around the outside of the excavated pit thereby suggesting that the pit may be anthropogenic in origin. Alternatively, the possibility exists that the excavated pit was formed naturally by a methane gas explosion that occasionally occurs with older lava flows that are near the edges of younger lava flows (personal communication from J. Taomia June 10, 2013).
   b. Site T-022613-02 is a circular shaped excavated pit, located at the base of the k4 *'a'ā* flow and at the edge of the Klo *pāhoehoe* flow (Figure 8). This site is located approximately 34 meters from the proposed Pioneer Trail. Excavated and cobbles

and boulders are distributed along the west, north, and northeast edges of the feature, and the pit floor consists of sediment with *pāhoehoe* pebbles and cobbles (Figure 9). The excavated material is one course high and there is no evidence of bashing on the excavated material or on the lip of the excavated pit. The excavated pit measures 1.2 meters long by 0.7 meter wide by 0.70 meter deep and with 130˚/ 310˚ long axis. Military debris includes 0.50 caliber shells located near the feature but no impacts were observed.

c. Site T-022613-03 is a circular shape cairn situated on top of a grayish colored *'a'ā* boulder and is located on the dark brown k4 *'a'ā* flow (Figure 10). This site is approximately 39 meters from the proposed pioneer trail. The feature is stacked three courses high with cobbles and boulders (Figure 11). The cairn measures 0.95 meter long by 0.90 meter wide by 0.46 meter high and with 70˚/ 250˚ long axis. The difference in color between the boulder and the surrounding *'a'ā* renders the cairn highly visible and may have functioned as a route marker.

d. MT-022613-01a – e consists of a series of five (5) upright military communication poles that are aligned in a 241º/ 61º orientation and are located approximately 30 meters apart with the exception of pole 01d and pole 01e which are located 70 meters apart. (Alphabetical designations for each pole commence with “a” on the western end and sequenced in an easterly direction). Located on the western edge of the k4 *'a'ā* flow, the total length of the five communication poles is approximately 160 meters. The top-notched milled wooden poles are approximately 1.5 meters high and 4.0 centimeters in diameter that are supported by cairns of *'a'ā* cobbles and boulders from the immediate area. A broken ceramic insulator is attached to the top of poles 01a, 01b, and 01e.

e.. MT-022613-02a – e is a series of five (5) upright military communication poles that are aligned in a 263 º/ 83 º orientation and are located approximately 30 meters apart with the exception of pole 02c and pole 02d which are located 57 meters apart. Located on the western edge of the k4 *'a'ā* flow, the total length of the five communication poles is approximately 147 meters. The top-notched milled wooden poles are approximately 1.5 meters high and 4.0 centimeters in diameter that are supported by cairns of *'a'ā* cobbles and boulders from the immediate area. A broken ceramic insulator is attached to the top of poles 02a and 02d.

f. MT-022613-03a – f consists of a series of five (5) upright and one broken military communication poles that are aligned in a 293 º/ 113º orientation until pole 03e turns five meters south to pole 03f. Distances between the poles vary from 13 to 35 meters. Located on the western edge of the k4 *'a'ā* flow, the total length of the six communication poles is about 92 meters. The top-notched milled wooden poles are approximately 1.5 meters high and 4.0 centimeters in diameter that are supported by cairns of *'a'ā* cobbles and boulders from the immediate area. Broken pole 03a, located on the k3 *pāhoehoe* flow, was inserted into a hole drilled into the bedrock. A broken ceramic insulator is attached to top of poles 03a and 03c, while a complete ceramic insulator is attached to pole 03f. The complete insulator measures approximately 8.0 centimeters in length by 6.0 centimeters in width by 8.0 centimeters in height (Figures 12 - 13).

g. MT-030113-04a – c is a series of three (3) upright military communication poles that are aligned in a 310 º/ 130 º orientation and are located approximately 25 meters apart. Located on the western edge of the k4 *'a'ā* flow, the total length of the three communication poles is approximately 50 meters. The top-notched milled wooden poles are approximately 1.5 meters high and 4.0 centimeters in diameter that are supported by cairns of *'a'ā* cobbles and boulders from the immediate area. A broken ceramic insulator is attached to top of poles 04a and 04b.

10. **February 27, 2013:** The Pioneer Trail survey included Mr. Syrop, Mr. Yamauchi, and Ms. Curdts. Transects for that day were on the k4 *'a'ā* flow (200 -750 years BP). No archaeological sites were found and approximately 29 acres was surveyed.

11. **February 28, 2013:** The Pioneer Trail survey included Mr. Syrop, Mr. Head, and Ms. Curdts. Transects for that day were on the k4 *'a'ā* flow (200 -750 years BP). No archaeological sites were found and approximately 33 acres was surveyed.

12. **March 1, 2013:** The Alternative Trail survey included Mr. Syrop, Mr. Yamauchi, and Ms. Curdts. The transects were primarily located on the k4 *'a'ā* flow (200 -750 years BP) and partially on the k3 *pāhoehoe* flow (750 – 1500 BP). Two (2) non-archaeological lava tubes and three (3) military communication pole alignments were recorded. Approximately 22 acres was surveyed.

a. C-030113-01 is a non-archaeological lava tube cave located in the k3 *pāhoehoe* flow next to the western edge of k4 *'a'ā* flow. A collapsed blister, measuring approximately 4 meters in diameter, exposes the lava tube passages. Located on the southeast edge of the blister, an exposed passage continues southeast for approximately 7 meters where it opens to Entrance B (1.5 meters wide by 0.5 meter high) in the *pāhoehoe*. An exposed passage on the northwest edge of Entrance A runs approximately 6 meters in length before narrowing and becoming impassable. Another exposed passage on the northeast edge of the Entrance A continues northeast for 4 meters before becoming too narrow to pass. The northeast passage connects with the southeast passage from an arm tube around the east inside edge of the collapsed blister. *Pūkiawe* (*Styphelia tameiameiae*) grows along the southeast side of the blister. Ungulate scat is present in all passages as well as bird feathers and droppings.

b. C-030113-02 is a non-archaeological lava tube cave located on a *pāhoehoe* flow next to the western edge of the k4 *'a'ā* flow. The cave is accessible from a sink measuring 12 meters in length by 8 meters in width with the entrance of the lava tube located on the north-northwest end of the collapsed opening. The entrance is approximately 8 meters wide and 4 meters high that drops about 7 meters into a large passage running north-northwest. At approximately 25 meters into the passage (25 meters wide and 4 meters high) it becomes narrow then increases in size and continues beyond 30 meters. There is another passage running southeast from the cave entrance that is blocked by breakdown. There is an abundance of ungulate scat located throughout the entire surveyed passage areas.

c. MT-030113-01a – e is a series of five (5) upright military communication poles that are aligned in a 217 º/ 37 º orientation and are located approximately between 27 to 30 meters apart. Located on the western edge of the k4 *'a'ā* flow, the total length of the communication poles is approximately 114 meters. The top-notched milled wooden poles are approximately 1.5 meters high and 4.0 centimeters in diameter that are supported by cairns constructed of *'a'ā* cobbles and boulders from the immediate area.

d. MT-030113-02 is an upright military communication pole, located on the western edge of the k4 *'a'ā* flow. The top-notched milled wooden pole is approximately 1.5 meters high and 4.0 centimeters in diameter that is supported by cairns of *'a'ā* cobbles and boulders from the immediate area. An insulated communication line approximately 1 centimeter in diameter is attached to the top of the pole and is strung out for approximately 20 meters in an easterly direction where it is tied off to an *'a'ā* boulder.

e. MT-030113-03a – e is a series of five (5) upright military communication poles that are aligned in a 252 º/ 72 º orientation and are located approximately 13 to 33 meters apart. Located on the western edge of the k4 *'a'ā* flow, the total length of the communication poles is about 86 meters. The top-notched milled wooden poles are approximately 1.5 meters high and 4.0 centimeters in diameter that are supported by cairns of *'a'ā* cobbles and boulders from the immediate area. A coil of insulated communication wire (1 centimeter in diameter) is attached to pole 3a.

13. **March 5, 2013:** The Alternative Trail survey included Mr. Syrop, Mr. Yamauchi, and Ms. Curdts. The transects were located on the k4 *'a'ā* flow (200 -750 years BP), and approximately 21 acres was surveyed. Two military communication pole alignments were recorded.

a. MT-030513-01a – d is a series of four (4) upright military communication poles that are aligned in a 270 º/ 90 º orientation and are located approximately 27 to 30 meters apart. Located on the western edge of the k4 *'a'ā* flow, the total length of the communication poles is about 72 meters. The top-notched milled wooden poles are approximately 1.5 meters high and 4.0 centimeters in diameter that are supported by cairns of *'a'ā* cobbles and boulders from the immediate area. A coil of insulated communication wire (1 centimeter in diameter) is attached to poles 1a, 1b, and 1d.

b. MT-030513-02a – b are two (2) broken military communication poles that are aligned in a 291 º/ 111 º orientation. Located on the western edge of the k4 *'a'ā* flow, the total length of the communication poles is about 19 meters. Remnant portions of the poles are still upright and are supported by cairns of *'a'ā* cobbles and boulders from the immediate area.

14. **March 6, 2013:** The Alternative Trail and Landing Zone 4 survey included Mr. Syrop, Mr. Head, and Ms. Curdts. The transects were located on the k4 *'a'ā* flow (200 -750 years BP) (Figure 14). No archaeological sites were found and approximately 25 acres was surveyed.

15. **March 7, 2013:** The Alternative Trail survey included Mr. Syrop, Mr. Yamauchi, and Ms. Curdts. The transects were located on the k4 *'a'ā* flow (200 -750 years BP). No archaeological sites were found and approximately 13 acres was surveyed.

16. **March 8, 2013:** The Alternative Trail survey included Mr. Syrop, Mr. Head, and Ms. Curdts. The transects were located on the k4 *'a'ā* flow (200 -750 years BP). No archaeological sites were found and approximately 13 acres was surveyed.

17. **March 12, 2013:** The survey of the linking trail between Landing Zone 3 and 4 included Mr. Syrop, Ms. Curdts, and Mr. Casiano. The transects were primarily located on the k3 *pāhoehoe* flow (750 – 1500 BP) and partially on the k4 *'a'ā* flow (200 -750 years BP). Six (6) non-archaeological lava tube caves were recorded (Figures 15 - 16) and approximately 15 acres was surveyed.

    a. C-031213-01 is a non-archaeological lava tube cave in the k3 *pāhoehoe* flow on the western edge of k4 *'a'ā* flow. The northeast entrance is approximately 2 meters long by 0.4 meter wide and drops steeply for about 4 meters. There is a desiccated goat at the entrance. The single passage is a narrow crawl space with a *pāhoehoe* floor that runs southwest for 3 meters before becoming impassable. The passage contains stalactites and stalagmites.
    b. C-031213-02 is a non-archaeological lava tube in the k3 *pāhoehoe* flow. The entrance measures approximately 5.5 meters in diameter with a 4 meter nearly vertical drop. The sides of the entrance are characterized as crumbly platy *pāhoehoe* that made it too dangerous to enter. The passage appears to run in a north direction. No archaeological material was observed from the surface.
    c. C-031213-03 is a non-archaeological lava tube cave in the k3 *pāhoehoe* flow. Oriented in a northeast/southwest direction, the lava tube has two entrances on both ends measuring approximately one meter in diameter. The passage is a narrow crawl space approximately 10 meters in length.
    d. C-031213-04 is a non-archaeological lava tube in the k3 *pāhoehoe* flow. The southern entrance is 1.5 meters in diameter with a passage running for approximately 20 meters then heading northwest beyond 30 meters. The large passage has a *pāhoehoe* floor.
    e. C-031213-05 is a non-archaeological lava tube in the k3 *pāhoehoe* flow. The entrance is 1 meter in diameter and drops nearly vertical for about 3.4 meters, making it too dangerous to enter. From the surface, the passage appears to run in a northeast/southwest direction and has a *pāhoehoe* floor.
    f. C-031213-06 is a non-archaeological lava tube in the k3 *pāhoehoe* flow. There are three passages that are exposed by a large collapsed blister. On the east edge of the blister, the first passage continues northeast for approximately 15 meters where light can be seen at a distance. On the north edge of the blister, the second passage extends 5 meters to the north and then opens into a room about 5 meters in diameter. On the southwest edge of the blister, the third passage continues southeast for approximately 15 meters before pinching off. The floors of all three passages are a mix of welded *'a'ā* and *pāhoehoe* that include rock breakdown from the walls and ceilings of the lava tube.

18. **March 13, 2013:** Survey of the proposed linking trail between Landing Zone 3 and 4 included Mr. Syrop, Ms. Curdts, and Mr. Casiano. The transects were primarily located on the k3 *pāhoehoe* flow (750 – 1500 BP) and partially on the k4 *'a'ā* flow (200 -750 years BP). Five (5) non-archaeological lava tube caves were recorded and approximately 15 acres was surveyed.

   a. C-031313-01 is a non-archaeological sink in a *pāhoehoe* flow. The sink is approximately 8 meters in diameter and five meters deep. The first passage, located on the southwest edge of the sink, is blocked by rock breakdown. A hole on the north edge of the sink drops down approximately 4 meters into a second passage that continues north. This passage continues for approximately 30 meters where it narrows and curves in a northwest direction. The third passage on the northeast side of the sink continues northeast for approximately 4 meters before it is blocked by rock breakdown. The floors of the lava tube cave are comprised of a mix of smooth *pāhoehoe* and rock breakdown.
   b. C-031313-02 is a non-archaeological cave with four distinct entrances in the k3 *pāhoehoe* flow. Entrance A is approximately 3 meters wide by 2 meters high that extends southeast into a narrow 3 meter long passage with a *pāhoehoe* floor that connects with Entrance B. Entrance B measure 4 meters wide and 2 meters high and extends west into a tight 4 meter long passage connecting with Entrance C. There is another side passage at Entrance B that extends southeast for ten meters and then pinches off. Entrance C measures about 2 meters in length by 1 meter in width. The passage connecting Entrances B and C branches from Entrance C and runs north for 5 meters before connecting to Entrance D, measuring 1.5 meters in diameter. From Entrance D the passage runs north for a meter where there is also a 0.5 meter in diameter opening that drops 5 meters into a small room with no ongoing passage.
   c. C-031313-03 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance is approximately 1 meter in diameter and drops 2 meters into a room about 3 meters in diameter. The floor of cave has a heavy concentration of rock breakdown.
   d. C-031313-04 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance measures 1 meter in width by 0.5 meter in height. The passage runs east for 10 meters before splitting into northeast and east passages which run beyond 20 meters. The floor is comprised of welded *'a'ā* and *pāhoehoe*.
   e. C-031313-05 is a non-archaeological cave in the k3 *pāhoehoe* flow. The sink measure 5 meters by 3 meters and drops down 8 meters. There is a passage on the north side of sink that is multilevel and runs northeast beyond 30 meters. There is passage on the south side of sink that runs east for 15 meters into a big room and continues northeast beyond 30 meters getting progressively narrower.

19. **March 14, 2013:** The survey of Landing Zone 2 (Figure 17) and the linking trail between Landing Zone 2 and 3 included Mr. Syrop, Ms. Curdts, and Mr. Casiano. The transects were located on the k3 *pāhoehoe* flow (750 – 1,500 BP). No archaeological sites were found and approximately 18 acres was surveyed.

20. **March 15, 2013:** The survey of the Pioneer Trail included Mr. Syrop, Ms. Curdts, and Mr. Casiano. The transects were located on the k4 *'a'ā* flow (200 -750 years BP). No archaeological sites were found and approximately 17 acres was surveyed.

21. **March 19, 2013:** The survey of the linking trail between Landing Zone 2 and 3 included Mr. Syrop, Ms. Curdts, and Mr. Duhaylonsod. The transects were located predominately on k3 *pāhoehoe* flow (750 – 1,500 BP) and partially on the k2 *'a'ā* flow (1,500 -3,000 years BP) (Figure 18). No archaeological sites were found and approximately 18 acres was surveyed.

22. **March 20, 2013:** The survey of Landing Zone 3 (Figure 19) and the linking trail between Landing Zone 3 and 4 included Mr. Syrop, Ms. Curdts, and Mr. Duhaylonsod. The transects were located on the k3 *pāhoehoe* flow (750 – 1,500 BP). Three (3) non-archaeological lava tube caves were recorded and approximately 16 acres was surveyed.

    a. C-032013-01 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance measures 1 meter wide by 0.5 meter high. The passage runs south for approximately five meters into a small room before continuing southeast for two meters where it then pinches off. The passage and associated room floor is comprised of *pāhoehoe*.
    b. C-032013-02 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance is approximately 0.5 meters in diameter on the edge of an *'a'ā* patch and in a narrow two meter section of *pāhoehoe*. The vertical entrance drops approximately 2.5 meters rendering it inaccessible. It appears to have a large passage running in a north and south direction, and the thin ceiling of the lava tube may present a construction hazard.
    c. C-032013-03 is a non-archaeological cave in the k3 *pāhoehoe* flow. The accessible steep entrance, measuring 0.5 meters in diameter, is on the north side of a sink that measures approximately 8 meters in length and 6 meters in width. Rock breakdown blocks most of the west side of the entrance. The passage runs in a north direction beyond thirty meters. The floor of the lava tube is comprised of both welded *'a'ā* and *pāhoehoe*.

23. **March 21, 2013:** The Alternative Trail survey included Mr. Syrop, Ms. Curdts, and Mr. Duhaylonsod. The transects were located on the k4 *'a'ā* flow (200 -750 years BP). No archaeological sites were found and approximately 14 acres was surveyed.

24. **March 27, 2013:** The survey of Landing Zone 1 and the linking trail between Landing Zones 1 and 2 (Figures 20 - 21) included Mr. Syrop, Mr. Yamauchi, and Ms. Curdts. The transects were located on the k3 *pāhoehoe* flow (750 – 1,500 BP) and the k5 *'a'ā* flow (0-200 years BP). No archaeological sites were located and approximately 31 acres was surveyed.

25. **March 28, 2013:** Survey of the linking trail between Landing Zone 3 and 4 included Mr. Syrop, Mr. Yamauchi, and Ms. Curdts. The transects were located on the k3 *pāhoehoe* flow (750 – 1,500 BP). Nine (9) non-archaeological lava tube caves were recorded and approximately 14 acres was surveyed.

a. C-032813-01 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance is approximately 2 meters wide by 1.5 meters high where a passage opens into an approximate three meter in diameter room. There is passage to the west of the room that runs in a northeast direction for approximately 10 meters before pinching off. The same passage extends southeast from the room for 15 meters before pinching off. The floor of the lava tube consists of both welded *'a'ā* and *pāhoehoe*. Ungulate scat is concentrated near the entrance of the cave.

b. C-032813-02 is a non-archaeological cave with two entrances in the k3 *pāhoehoe* flow. Entrance A is inaccessible and measures approximately 5 meters in length by 3 meters in width by 5 meters in depth. Entrance B measures 3 meters wide by 2 meters high where about a three meter wide passage leads southeast 5 meters to Entrance A. The floor of the cave is smooth *pāhoehoe*.

c. C-032813-03 is a non-archaeological cave with two entrances in the k3 *pāhoehoe* flow. Both entrances are approximately one meter in diameter and .5 meter apart and lead into the same passage that runs in a northeast to southwest orientation. The northeast portion of the passage is interspersed with five small skylights (less than 0.5 meter in diameter) for approximately 30 meters. The southwest portion of the passage forks west about two meters from the southwest entrance to an approximately five meter in diameter room. The passage from the room continues south for five meters before becoming too narrow to pass. The floor of the cave is both welded *'a'ā* and *pāhoehoe*.

d. C-032813-04 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance is approximately 3 meters wide by 1 meter high that immediately opens to an irregular shaped room measuring approximately 10 meters in diameter. The floor of the cave is both welded *'a'ā* and *pāhoehoe*.

e. C-032813-05 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance is a steep funnel shaped with smooth *pāhoehoe* that leads into a small opening approximately 0.5 meter in diameter. The passage runs in a northeast direction and measures approximately 10 meters in width and 3 meters in height and continues for approximately 15 meters before becoming too narrow to pass. Another passage runs west immediately from the entrance to a five meter in diameter room. The floor of the cave is breakdown of boulders and cobbles.

f. C-032813-06 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance measures 3.5 meters in width and 1.5 meters in height. Rock breakdown is strewn around the front of the entrance. A small passage runs southeast for approximately four meters before pinching off. The floor of the cave is both welded *'a'ā* and rock breakdown.

g. C-032813-07 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance is approximately 1 meter wide by 0.5 meter high and the passage opens into a room that is approximately 5 meters in length by 2 meters in width by one meter in height. The floor of the cave is both welded *'a'ā* and *pāhoehoe*.

h. C-032813-08 is a non-archaeological cave in the k3 *pāhoehoe* flow. The entrance measures 4 meters in length by 1.5 meters wide and steeply drops approximately three meters where the main passage runs north beyond 30 meters. The width of the main passage gradually narrows from 8 meters to 3 meters. There is a higher level passage about 8 meters into the main passage that runs northeast for approximately 15 meters.

i. C-032813-09 is a non-archaeological cave in the k3 *pāhoehoe* flow. There are two passages that originate from a sink that measures 8 meters in length by 5 meter in width. On the north side of the sink, a passage runs for approximately 15 meters in a northeast direction before becoming impassable due to rock breakdown. The floor of the passage consists of welded *'a'ā* with rock breakdown throughout. On the south side of the sink, the other passage continues for approximately 30 meters and is approximately 4 meters wide and between one to two meters high. The floor of the passage is a mix of welded *'a'ā* and *pāhoehoe* with scattering of rock breakdown.

26. In summary, the archaeological sites identified include: two (2) *pāhoehoe* excavated pits (T-022613-01 and T-022613-02) and one (1) cairn (T-022613-03) that are located on the northern portion of the Pioneer Trail. Nine (9) military sites represented by thirty-six (36) military communication line poles are located on the northern portion of the Pioneer and Alternative Trails. Twenty-five (25) non-archaeological lava tube caves were identified and are limited to the survey area between the linking trail and Landing Zones 3 and 4.

a. Sites T-022613-01 and T-022613-02 are consistent with pāhoehoe excavated pits that archaeologists have identified as associated with hunting Hawaiian Petrel (*Pterodroma sandwichensis*) in the Saddle Region. The excavated pits may have provided a habitat favorable to the Hawaiian Petrels that typically nest in burrows and/or crevices which are deep enough for them to retreat fully, support a nest, and have an opening that is sufficiently small to provide protection (Moniz-Nakumura, *et al.* 1998). The sediment in the interior of the excavated pits is a result of secondary deposition and no further information can be gleaned. Therefore, Sites T-022613-01 and T-022613-02 are not recommended as eligible for the National Register of Historic Places.

b. Site T-022613-03 has been fully recorded that included detailed site descriptions, scaled map, photograph, and UTM coordinates of the site using Trimble GPS GeoXH unit with sub-meter accuracy. The site consisted of a single cairn with no associated archaeological or historic artifacts and deposits thereby rendering its temporal designation as indeterminate. All pertinent information about the cairn has been document and numerous examples are present throughout PTA. Therefore, Site T-022613-03 is not recommended as eligible for the National Register of Historic Places.

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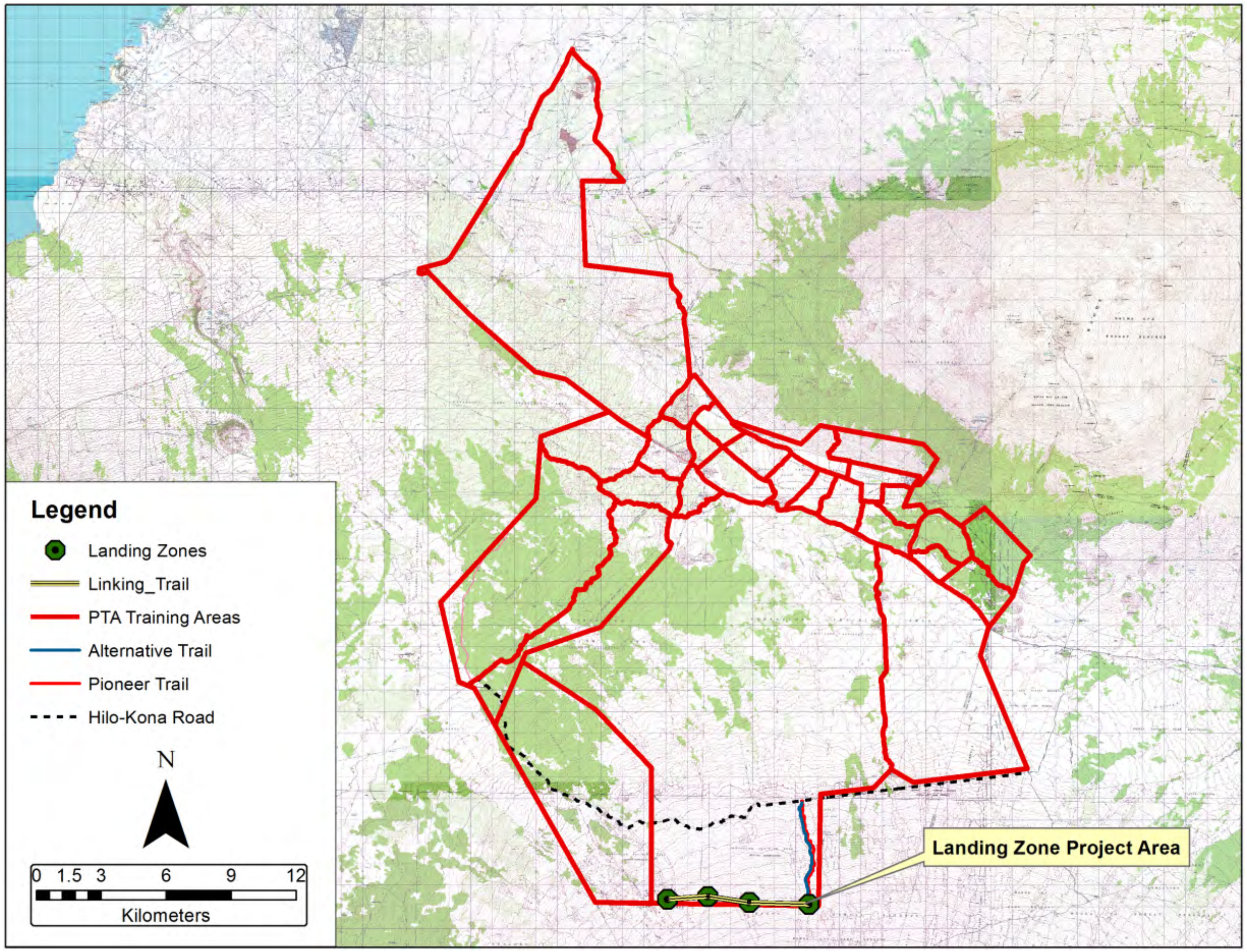

Figure 1. Location of the proposed Pioneer and Alternative Trails, linking trail and Landing Zones, Pōhakuloa Training Area.

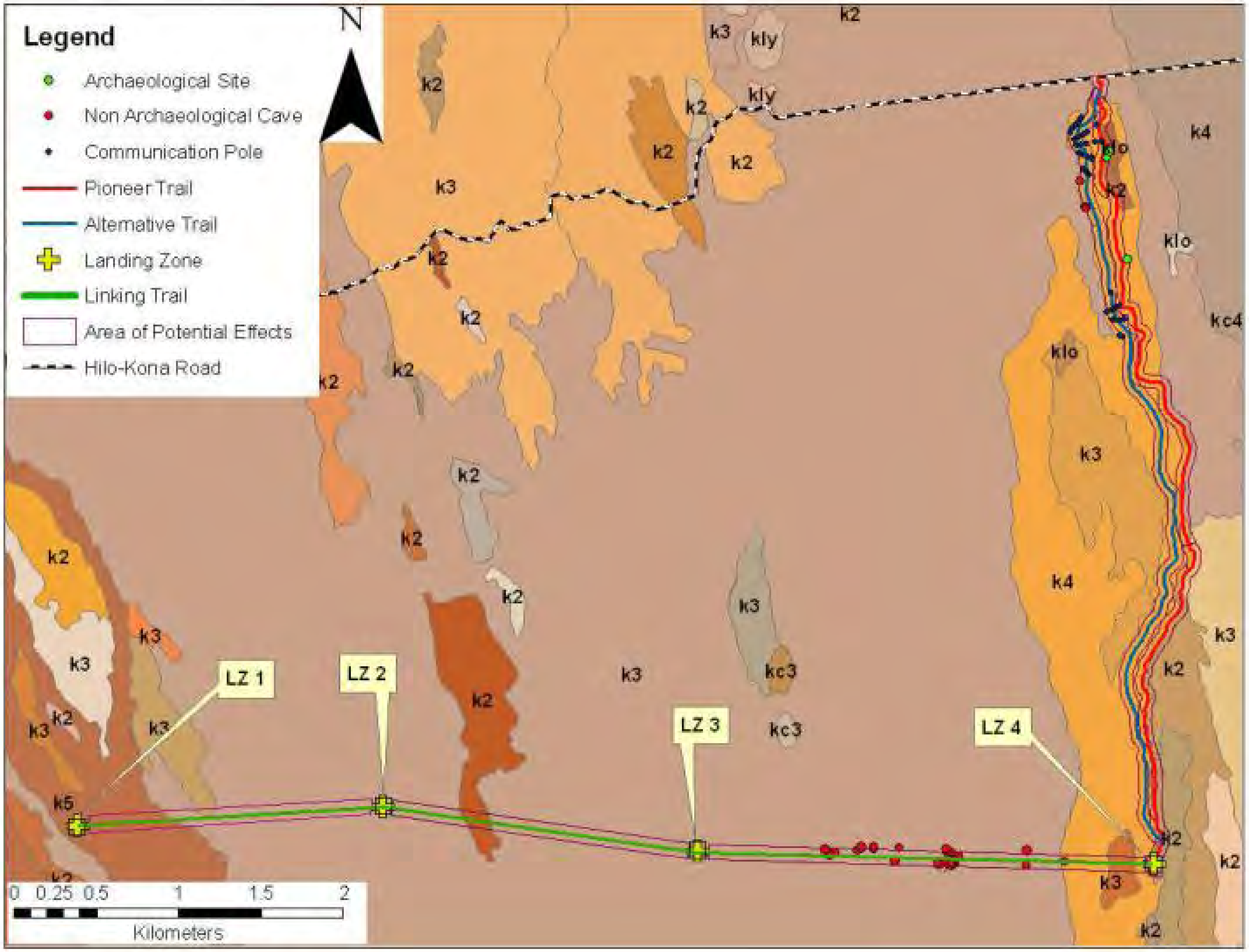

Figure 2. Lava flows found throughout the proposed Pioneer and Alternative Trails, Linking Trail and Landing Zones (LZ), Pōhakuloa Training Area.

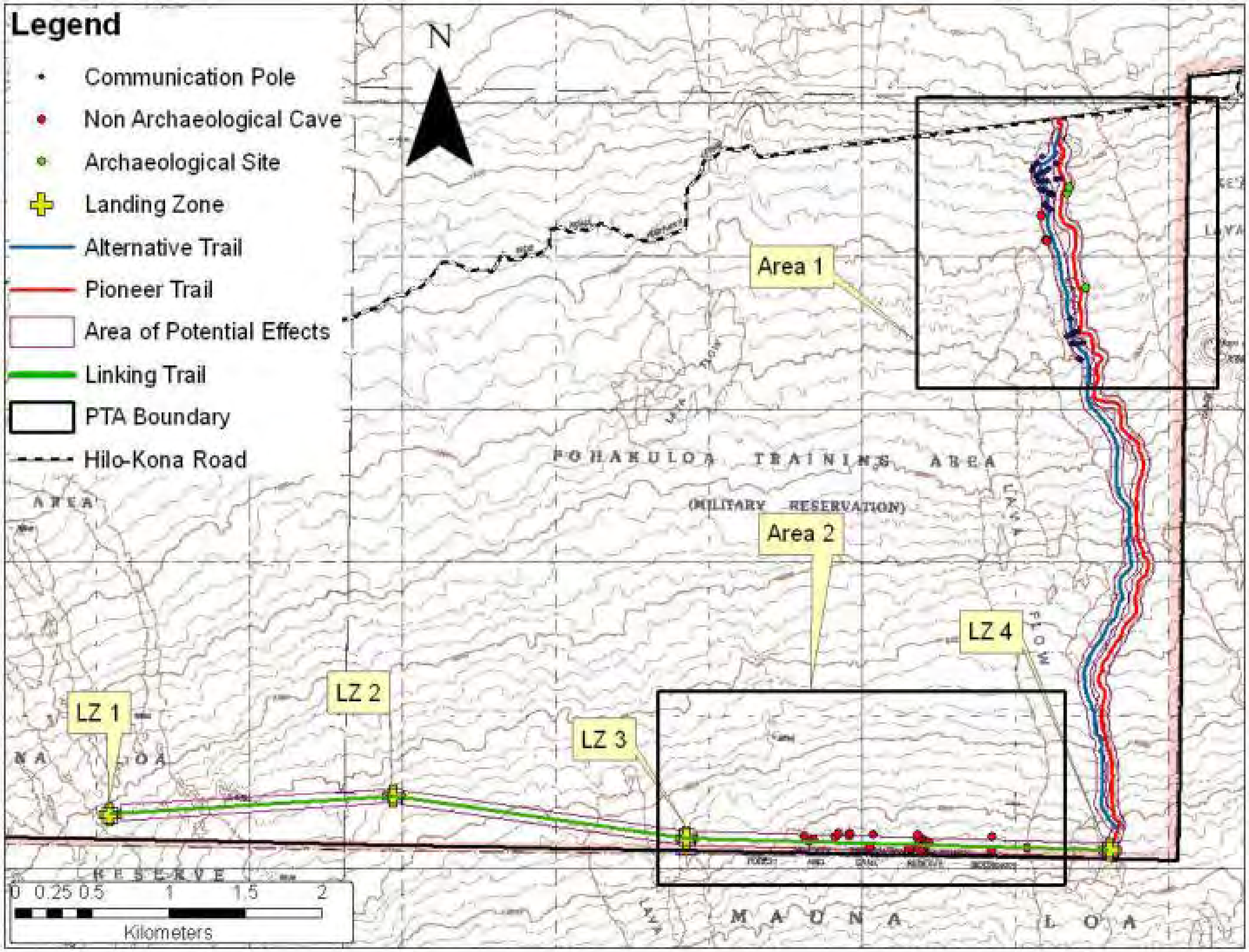

Figure 3. Overview of archaeological and non-archaeological sites located in the project area.

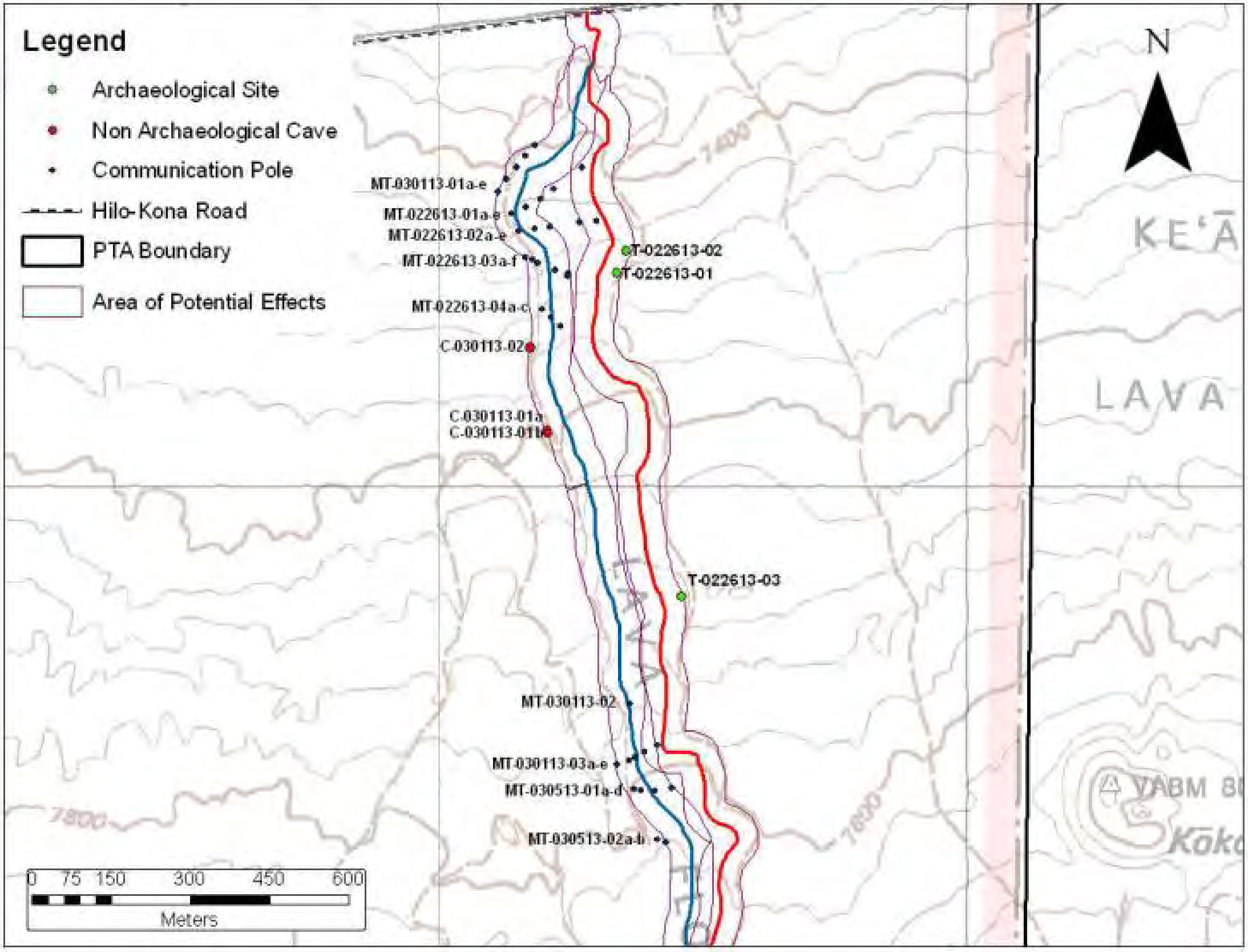

Figure 4. Archaeological, non-archaeological, and military sites in Area 1, Pōhakuloa Training Area.

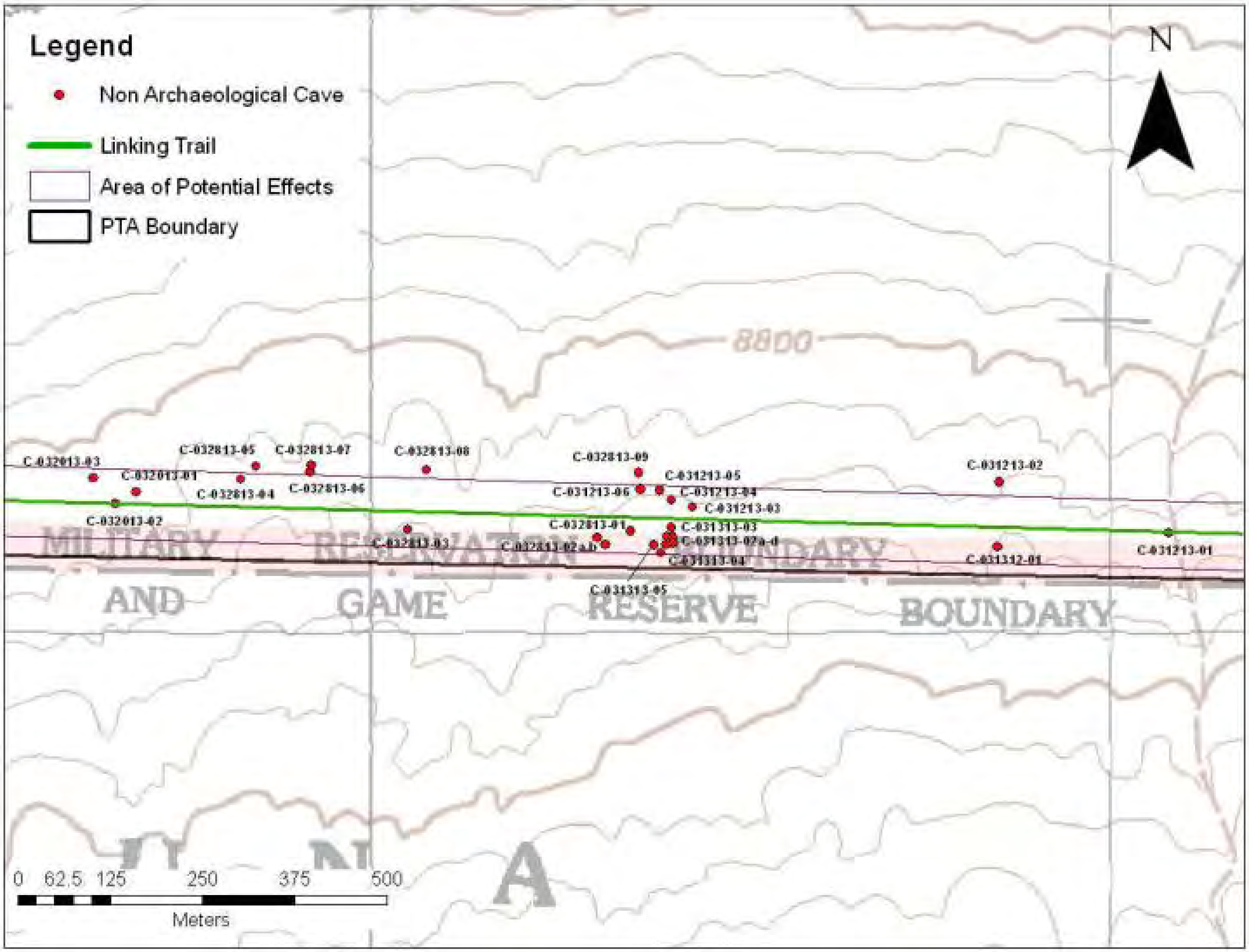

Figure 5. Non-archaeological caves in Area 2, Pōhakuloa Training Area.

Figure 6. Overview of Pioneer and Alternative Trails terrain – South view.

Figure 7. Site T-022613-01 (excavated pit) – Northeast view.

Figure 8. Site T-022613-02 (excavated pit) – Northeast view.

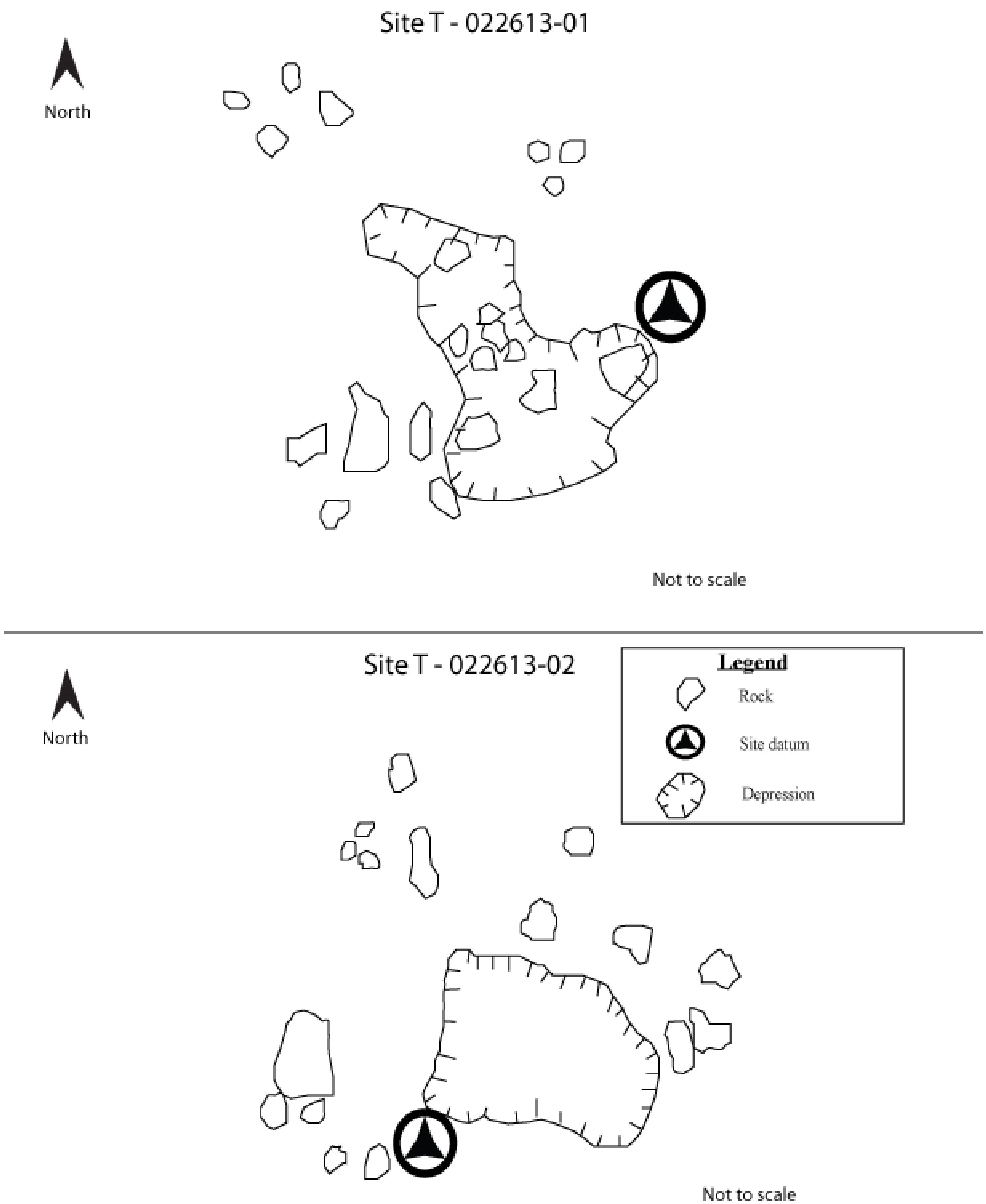

Figure 9. Sketch map of Sites T-022613-01 and T-022613-02.

Figure 10. Site T-022613-03 (cairn) – Northwest view.

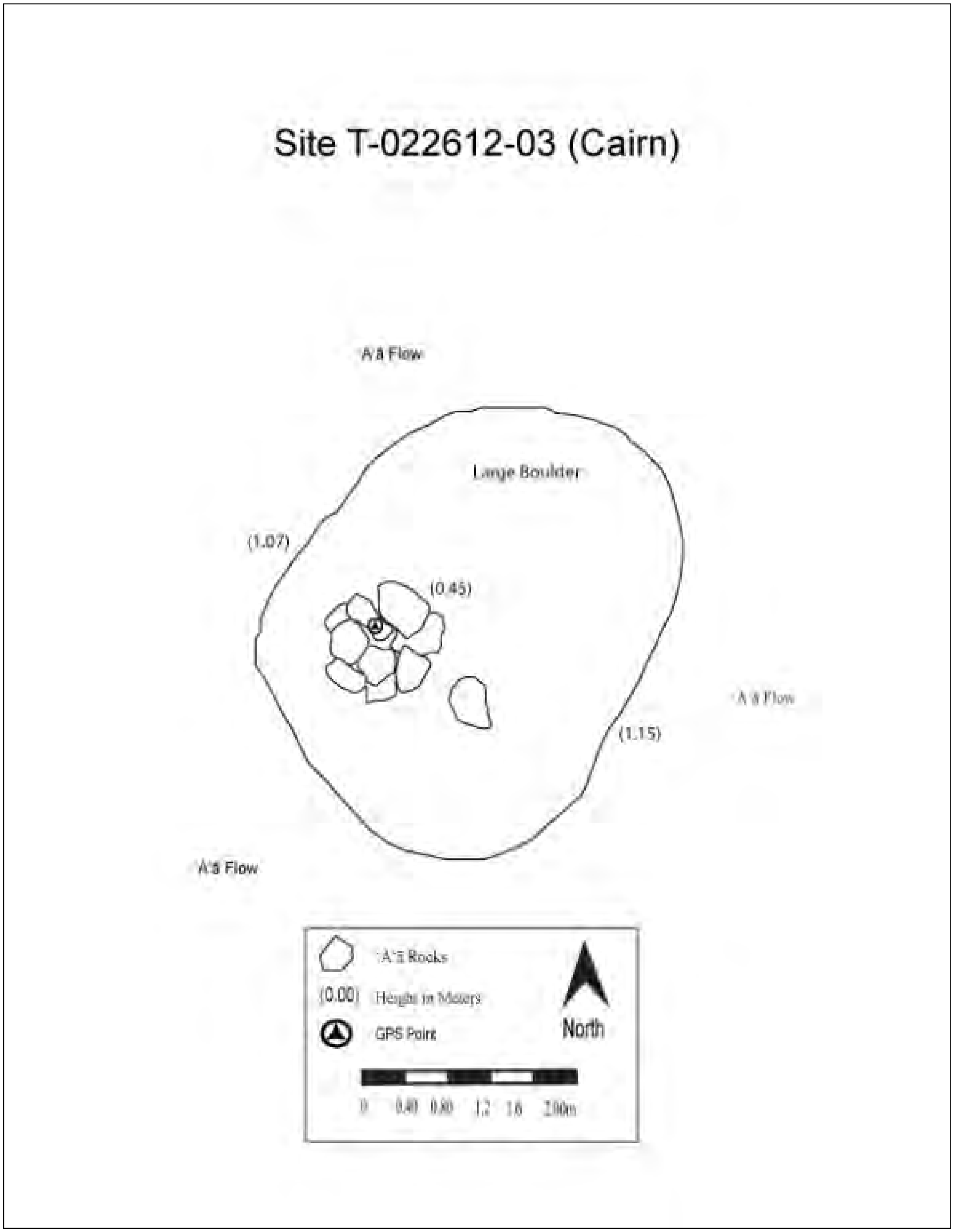

Figure 11. Plan view of T-022613-03 (cairn).

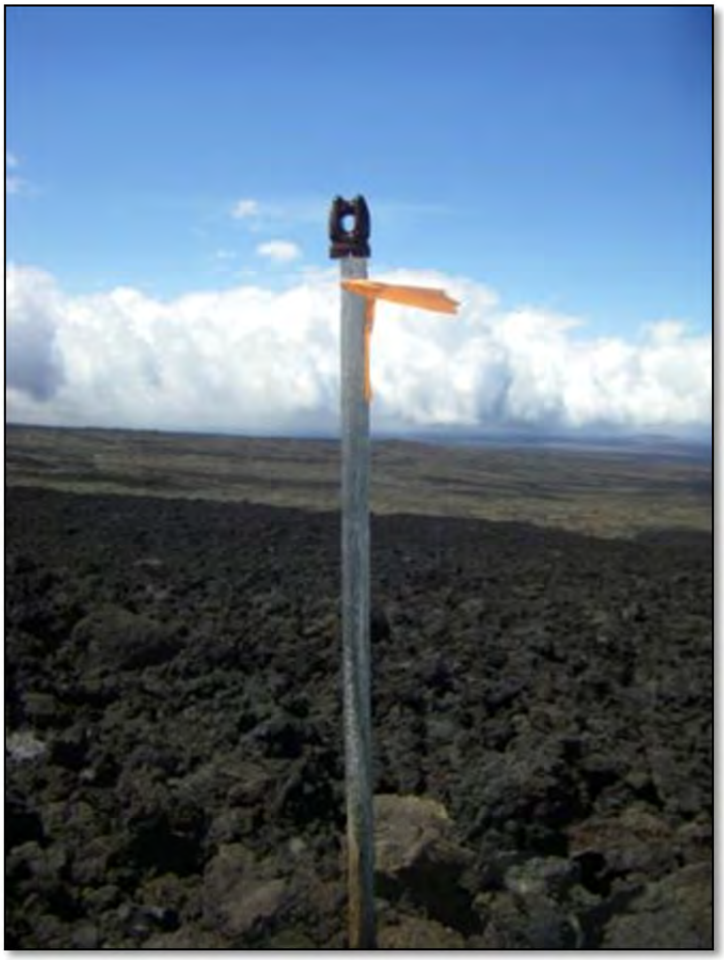

Figure 12. Example of a communication line pole with insulator – North view.

Figure 13. Example of ceramic insulator found on top of communication line poles – West view.

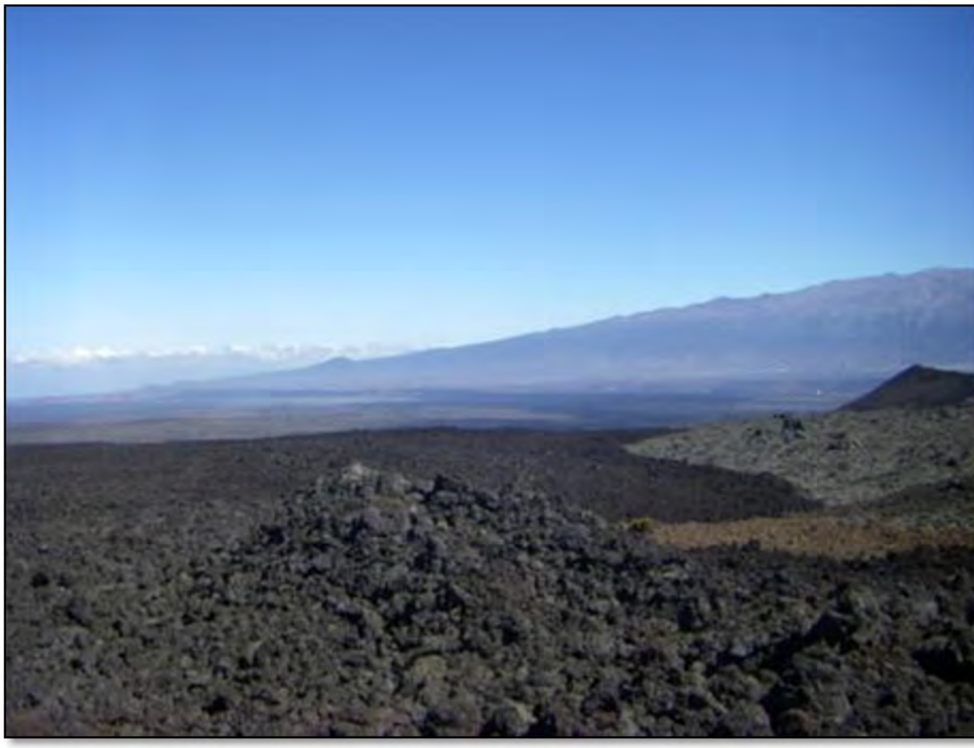

Figure 14. Overview of Landing Zone 4 and Alternative Trail terrain – Northeast view.

Figure 15. Overview of cave complex along linking trail between Landing Zones 3 and 4 – Northeast view

Figure 16. Overview of linking trail terrain between Landing Zones 3 and 4 – East view.

Figure 17. Overview of Landing Zone 2 terrain – West view.

Figure 18. Overview of linking trail between Landing Zones 2 and 3 in the k2 *'a'ā* flow – West View.

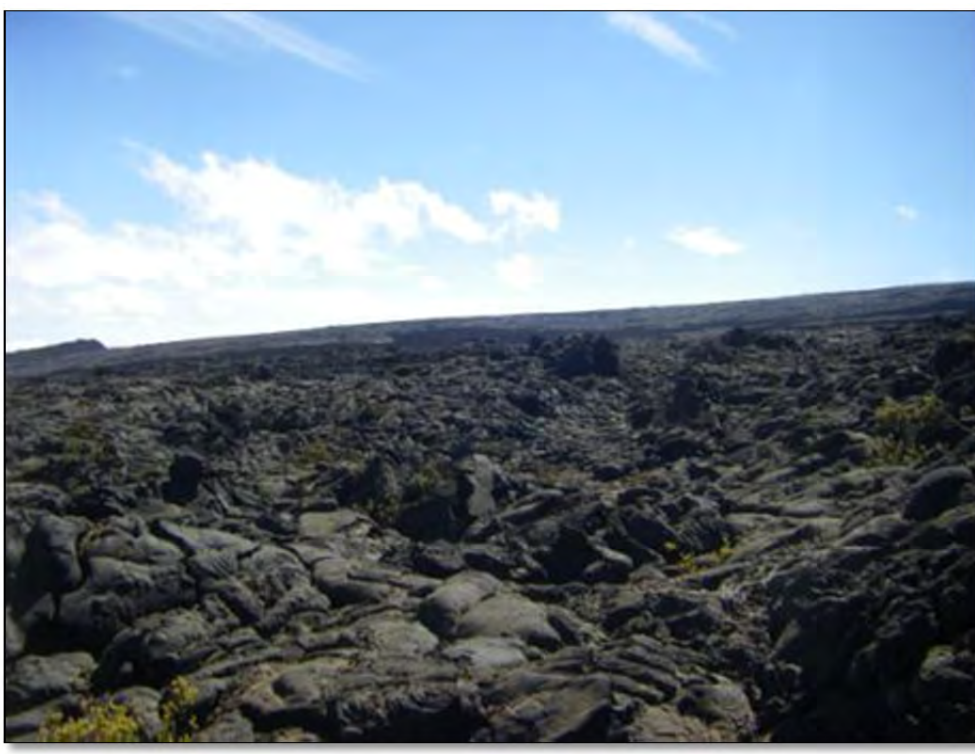

Figure 19. Overview of Landing Zone 3 terrain – East view.

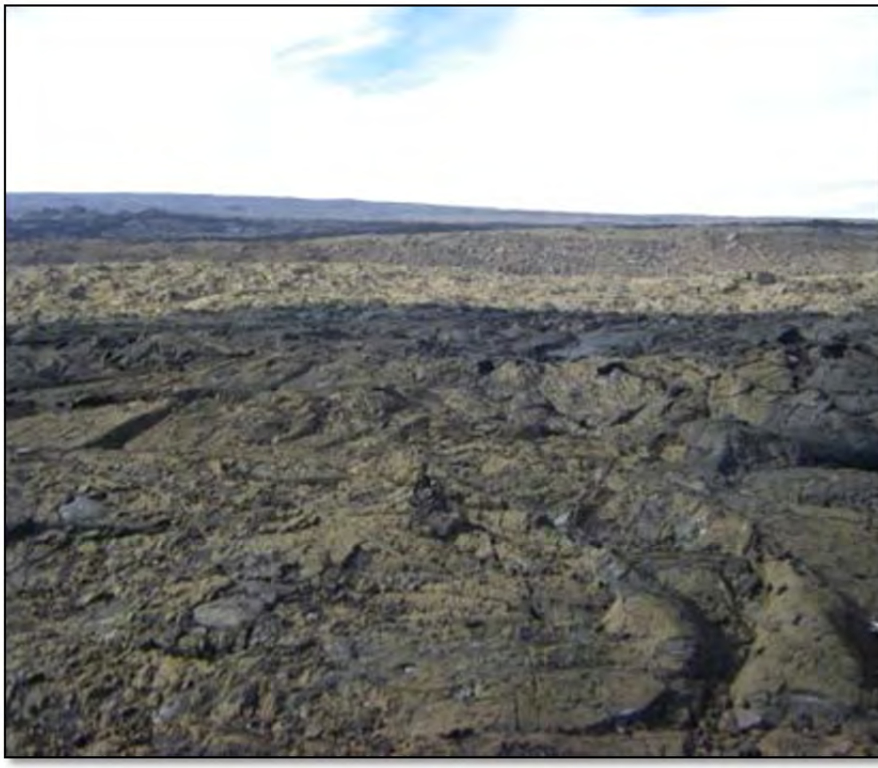

Figure 20. Overview of Landing Zone 1 terrain –West view.

Figure 21. Overview of linking trail terrain between Landing Zones 1 and 2 – East view.

INADVERTENT DISCOVERY PLAN
FOLLOWING GUIDELINES ESTABLISHED IN
NATIVE AMERICAN GRAVE PROTECTION AND REPATRIATION ACT

1**.** Any employee (or contractor in the employ) of the Garrison who knows or has reason to know that human remains or cultural items as defined under the Native American Grave Protection And Repatriation Act (NAGPRA) have been inadvertently discovered on land owned or controlled by the Garrison, shall provide immediate telephone notification of the discovery, with written back-up to the Garrison Commander and the Garrison Cultural Resources Manager.

2. The employee or contractor shall also immediately stop any activity in the area of the discovery and protect the human remains and cultural items unless prevented from doing for life/safety concerns.

3. Once contacted regarding an inadvertent discovery, the Garrison Cultural Resources Manager or their representative from the Cultural Resources staff will make an in-situ examination of the condition, antiquity and cultural affiliation of the human remains and cultural items based upon applicable professional standards to determine whether the remains and cultural items appear to be Native Hawaiian.

4. If the examination determines that the human remains or cultural items appear to be Native Hawaiian, the Garrison shall notify the State Historic Preservation Division, OHA, Hui Malama I Na Kupuna O Hawaii Nei and the appropriate Burial Council telephonically, via e-mail, or with written correspondence within 48 hours.

5. If, through consultation with the above parties, the Garrison Commander establishes the human remains and cultural items cannot be left in situ, their excavation and removal shall be undertaken by professional archaeologists employed by the Garrison within 15 working days from the initial contact between the Garrison and the Burial Council.

6. Prior to disposition of the human remains and cultural items, the Garrison shall publish a general notice of the proposed disposition in a newspaper of general circulation in the area in which the remains were recovered. The notice shall provide information as to the nature and cultural affiliation of the remains and cultural items and shall solicit further claims of ownership. The notice shall be published at least twice, at one-week intervals, and transfer shall not take place until 30 days after the second notice to allow for any additional claimants to come forward.

7. If re-internment is on land owned or controlled by the Garrison, the location of the re-internment shall only be reported to the claimant, the Garrison Commander, and the Cultural Resources Manager for the Garrison.

Enclosure 4