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DRAFT

ENVIRONMENTAL ASSESSMENT

Issuance of an Incidental Take License and Proposed Conservation Measures Associated with the Advanced Technology Solar Telescope, Haleakalā, Maui, Hawai‘i

August 2010

EXECUTIVE SUMMARY

PROPOSING AGENCY: National Science Foundation (NSF)

LOCATION OF PROPOSED ACTION: Haleakalā, County of Maui, Hawai‘i; TMK (2) 2-2 07:005, 008, 009, 012, 013, 014, 016, and 017

LANDOWNER: State of Hawai‘i; National Park Service

PROJECT SUMMARY: Draft Environmental Assessment for Issuance of an Incidental Take License and Implementation of Proposed Conservation Measures Associated with the Advanced Technology Solar Telescope, Haleakalā, Maui, Hawai‘i

LEGAL AUTHORITY: The National Environmental Policy Act, 40 CFR 1500-1508, and Chapter 343, Hawai'i Revised Statutes (H.R.S.)

APLICABLE ENVIRONMENTAL ASSESSMENT REVIEW "TRIGGER":

Use of State Lands

Use of Conservation District Lands

TYPE OF DOCUMENT: Draft Environmental Assessment for Issuance of an Incidental Take License and Implementation of Conservation Measures

ANTICIPATED DETERMINATION: Based on the information contained in this Draft Environmental Assessment (EA), NSF has determined that the Proposed Action will not have a significant impact on the environment. Accordingly, NSF anticipates issuing a Finding of No Significant Impact (FONSI).

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ES.1 Introduction

The National Science Foundation proposes to implement a series of conservation measures to avoid, minimize, and mitigate potential impacts of the Advanced Technology Solar Telescope (ATST) project to federally- or State of Hawai‘i-listed species. The ATST Environmental Impact Statement (EIS) and accompanying Record of Decision were completed for the ATST in 2009. The EIS evaluated the proposed development of the ATST project within the 18.166-acre (ac) (7.352-hectare [ha]) Haleakalā High Altitude Observatory (HO) site at the summit of Haleakalā, Maui, Hawai‘i. The ATST project area includes four species that are listed as either endangered or threatened: ‘ahinahina (Haleakalā silversword, *Argyroxipbium sandwicense*), the ‘ua‘u (Hawaiian petrel, *Pterodoma phaeopygia sandwichnesis*), the nēnē (Hawaiian goose, *Branta sandvicensis*); and the ‘ope‘ape‘a (Hawaiian hoary bat, *Lasiurus cinereus semotus*).

Although consultations with the U.S. Fish and Wildlife Service (USFWS) during the EIS planning process resulted in an Informal Consultation opinion that the ATST project is not likely to adversely affect any endangered species, and subsequent consultation with the USFWS confirmed that finding, NSF subsequently reinitiated consultations with the USFWS, the Hawai‘i State Division of Forestry and

Wildlife (DOFAW), the NPS, and the University of Hawai‘i Institute for Astronomy (IfA) to reexamine concerns raised by the State during the EIS process. The result was NSF’s decision to adopt a more conservative position with respect to protection of endangered species during construction of the ATST. Specifically, post-EIS consultation efforts led to the development of a draft Habitat Conservation Plan (HCP) (NSF, 2010) and will result in publication of a Biological Opinion, currently in preparation. These documents identify conservation measures developed to avoid or minimize impacts from the ATST project. Some of these measures were evaluated in the ATST EIS, while others were developed since that environmental review was completed.

This Environmental Assessment is tiered to the ATST EIS, focusing on those measures that have been developed or changed since completion of that document. The EA is prepared pursuant to the National Environmental Policy Act (NEPA; Chapter 40 Code of Federal Regulations [CFR] Parts 1500-1508) and H.R.S. Chapter 343, Environmental Impact Statement Law. In accordance with 36 CFR 800.3(b), the Section 106 NHPA consultation process will be combined with the NEPA process for these proposed conservation measures.

ES.1.1 Agencies Proposing Conservation Measures and Issuance of an Incidental Take License

NSF is the lead federal agency for the ATST project and associated studies, including this environmental review. Because NSF would fund the proposed conservation measures as part of the ATST project, this analysis must comply with NEPA (40 CFR 1500-1508) and NSF’s NEPA-implementing regulations (45 CFR Part 640).

Because the state is considering issuing an Incidental Take License (ITL) under H.R.S. 195D and because the proposed conservation measures would be located on State lands within the State Conservation District, an environmental review by the State of Hawai‘i pursuant to H.R.S. Chapter 343 is required. The Department of Land and Natural Resources (DLNR) is the State accepting authority, with implementation and review completed through DOFAW.

ES.1.2 Purpose and Need

Two federally-listed species, the Hawaiian petrel and the Hawaiian goose, are known to occur in the project study area. Survival of these species is threatened by feral ungulates degrading their habitats, predators, and other human activities such as traffic. Conservation measures currently used by Haleakalā National Park (the Park) have proven successful in excluding feral ungulates, and controlling predators (primarily dogs, rats, cats, and mongoose). The purpose of this EA is to evaluate the environmental impacts associated with the issuance of an Incidental Take License authorizing the implementation of a series of conservation measures developed in coordination with USFWS, the NPS, the State, and NSF.

ES.1.3 Project Location

The approved ATST project will be located within the 18.166-ac (7.352-ha) HO site at the summit of Haleakalā, County of Maui, Hawai‘i. Proposed conservation measures associated with the ATST project, evaluated in this EA, would occur along the 10.6-mile (mi) (17.0-kilometer [km]) Park Road accessing HO; within a 10-ac (4-ha) area located near the entrance of the Park that is to be used for construction of a nēnē holding pen; within the HO property where the ATST facilities are to be constructed; and elsewhere within the proposed ATST conservation area located on unencumbered State Conservation District lands surrounding the HO property near the summit.

ES.2 Proposed Action

Pursuant to Chapter 195D, Hawai‘i Revised Statutes, the DLNR proposes to issue to the NSF an Incidental Take License for potential take of the endangered Hawaiian petrel resulting from construction of the ATST facilities. Issuance of the ITL is subject to compliance with all sections of H.R.S. 195D, including an approved HCP and approval by a two-thirds vote of the Board of Land and Natural

Resources (BLNR). The HCP development and approval process provides for a thorough review and assessment of the levels of endangered species take, incorporates appropriate minimization and avoidance measures and an assessment of the cumulative impacts on species and habitats, and requires that any permitted incidental take be fully mitigated to provide a net benefit to the affected species. An HCP and Incidental Take License will not be issued unless the HCP and proposed take meet the issuance criteria in H.R.S. 195D-4 and 195D-21.

Issuance of the proposed ITL is common to the Proposed Action, Alternative 1, and Alternative 2, as defined below.

In addition to the issuance of the ITL, the Proposed Action evaluated in this EA consists of implementation of the following nine measures:

- **Measure 1: Conservation Fencing.** (Installation of hog wire conservation fencing connecting with existing Park boundary fence to exclude ungulates; under the Proposed Action the fence would include no polytape, while under Alternatives 1 and 2 white or black polytape, respectively, would be added to the fence)
- **Measure 2: Visibility Painting and Polytaping of Structures and Equipment**. (Makes structures/equipment more visible to minimize flight hazards to Hawaiian petrels)
- **Measure 3: Long-term Predator Control**. (Includes trapping and removal of known predators such as cats and mongoose and baiting of rats)
- **Measure 4: Hawaiian Petrel Monitoring and Reporting**. (Assesses the effectiveness of conservation measures on the productivity of the Hawaiian petrel)
- **Measure 5: Traffic Calming Devices**. (Installation of temporary devices such as speed humps to minimize vehicle collisions with Hawaiian geese)
- **Measure 6: Hawaiian Goose Monitoring and Reporting**. (Includes informal identification of Hawaiian geese struck by vehicles along the Park Road)
- **Measure 7: Construction of Hawaiian Goose (Nēnē) Holding Pen**. (For the purpose of propagating the species and rehabilitating injured geese)
- **Measure 8: Haleakalā Silversword Propagation and Planting**. (Includes planting of silverswords on State property)
- **Measure 9: Year-round Construction**. (Eliminates most construction restrictions originally imposed during Hawaiian petrel incubation season [April-July] in order to shorten the ATST construction period by as much as one year, yielding net recovery benefits to petrels)

ES.2.1 Project Alternatives

Issuance of An Incidental Take License and Implementation of Proposed Conservation Measures with White Fence Polytape (Alternative 1)

Alternative 1 would be identical to the Proposed Action except for the addition of white polytape to the hog wire fence described in Measure 1 above. In this first alternative, three strands of twisted white polytape would be woven into the proposed conservation fencing to increase visibility and minimize the potential for birdstrike.

Issuance of An Incidental Take License and Implementation of Proposed Conservation Measures with Black Fence Polytape (Alternative 2)

Under Alternative 2, the only difference from Alternative 1 would be that the polytape used on the conservation fencing would be black in color. The color variation offers potentially less reflectivity while still allowing for a more solid appearance to the fence, and thus would be intended to reduce the potential impact on visual resources and visitor use, since one or the other color may be more or less visible or apparent to adjacent land users.

No-Action Alternative

Under the No-Action Alternative, the ATST observatory would be constructed and mitigation and conservation measures as identified in the EIS would be implemented as appropriate to minimize, avoid, or offset impacts. The nēnē holding pen, however, would not be constructed and the Incidental Take License implementing the conservation measures described in this EA would not be issued. The construction schedule would include previously imposed restrictions during egg incubation and nesting periods, which would result in a longer construction period. There would be an increased risk of take of the Hawaiian petrel and Hawaiian goose. Monitoring would occur, as outlined in the EIS.

ES.3 Summary of Impacts

A summary the potential environmental impacts of the Proposed Action, project alternatives, and the No-Action Alternative are provided on **Table ES-1**. Relevant mitigation measures and subsequent impact determinations are also provided. Impacts are categorized under one of four levels of significance: negligible, minor, moderate, or major. For the purpose of this analysis, no impact and negligible impact are synonymous. Cumulative impacts are summarized following the table.

ES.3.1 Cumulative Impacts

Major cumulative impacts associated with past, present, and reasonably foreseeable future actions in the project area, including the ATST project, relate to cultural, historic and archeological resources; biological resources; visual resources and view planes; and visitor use and experience. While the Proposed Action could contribute to cumulative impacts to some resources, overall, the conservation measures are expected to result in negligible to moderate cumulative impacts. Furthermore, certain measures would result in long-term beneficial impacts or would further reduce adverse impacts resulting from cumulative activities, specifically the ATST project. In either case, the cumulative impact of the ATST project would be reduced by implementing the conservation measures described in this EA.

ES.4 Other Required Analyses

NEPA requires additional evaluation of the project's impacts with regard to the relationship between local short-term uses of the environment and long-term productivity, irreversible or irretrievable commitment of resources, and unavoidable adverse impacts.

Relationship Between Local Short-Term Uses of the Environment and Long-Term Productivity

The impacts associated with the proposed conservation measures would be largely short-term and are intended to provide a long-term benefit, or productivity, to the environment, and primarily to the Hawaiian petrel. Short-term impacts would occur associated with helicopter noise and fence installation during the construction of the conservation fencing (Measure 1). Similarly, noise associated with the installation of traffic-calming devices (Measure 5) would occur for only a few days. Longer-lasting short-term impacts would occur as most construction activities associated with building the ATST facility would continue year-round (Measure 9) instead of being restricted during the petrel incubation period. Measure 9 will reduce the overall construction period to 6-7 years (one year less than that analyzed in the ATST EIS), which is expected to benefit the petrels in the long run even though impacts to the

Table ES-1. Summary Of Impacts And Mitigations.

Resource Area	Alternative	Impact	Mitigation	Impact after Mitigation
Land Use and Existing Activities	Proposed Action	Minor, adverse, long-term impact on level of use of the land and current land use designation	Limit human access and staging to Resource Subzone of the Conservation District	Minor, adverse, and long-term
	Alternative 1	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	Alternative 2	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	No-Action Alternative	Negligible, long-term	None	Negligible, long-term
Cultural, Historic, and Archeological Resources	Proposed Action	Minor and major, adverse, short- and long term impacts to archeological and historic resources	Cultural monitor on-site during staging and construction Adjust fenceline to avoid archeological resources	Negligible and minor, adverse, short- and long-term Section 106: *No Effect*
	Alternative 1	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	Alternative 2	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	No-Action Alternative	Negligible, long-term	None	Negligible, long-term Section 106: *No Effect*
Biological Resources	Proposed Action	Minor and moderate, beneficial, short- and long-term impacts to species and habitat	Monitoring to avoid petrel burrows Implementation of HO Long Range Development Plan best management practice (BMP) measures	Negligible to moderate, beneficial and adverse, short-and long term
	Alternative 1	Same as for Proposed Action, with reduction of potential for petrel to collide with fencing	Same as for Proposed Action	Same as for Proposed Action
	Alternative 2	Same as for Proposed Action, with reduction of potential for petrel to collide with fencing	Same as for Proposed Action	Same as for Proposed Action
	No-Action Alternative	Moderate, adverse, long-term	None	Moderate, adverse, long-term
Visual Resources and View Plane	Proposed Action	Negligible and moderate, adverse, short-and long-term impacts to views	None	Negligible and moderate, adverse, short- and long-term
	Alternative 1	Same as for Proposed Action	None	Same as for Proposed Action
	Alternative 2	Same as for Proposed Action	None	Same as for Proposed Action
	No-Action Alternative	Minor and moderate, adverse, short- and long-term	None	Same as for Proposed Action

Table ES-1. Summary Of Impacts And Mitigations.

Resource Area	Alternative	Impact	Mitigation	Impact after Mitigation
Visitor Use and Experience	Proposed Action	Negligible to moderate, adverse, short- and long-term impacts to visitor use and experience	None	Negligible to moderate, adverse, short- and long-term
	Alternative 1	Same as for Proposed Action	None	Same as for Proposed Action
	Alternative 2	Same as for Proposed Action	None	Same as for Proposed Action
	No-Action Alternative	Negligible to moderate, adverse, short- and long-term	None	Same as for Proposed Action
Noise	Proposed Action	Negligible and minor, adverse, short-term impacts from construction activities and traffic	Phasing helicopter activities when the Hawaiian petrel is not present Coordinate flight plans with Park rangers and State personnel	Negligible and minor, adverse, short-term
	Alternative 1	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	Alternative 2	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	No-Action Alternative	Negligible, adverse, long-term	None	Negligible, adverse, long-term
Transportation and Traffic	Proposed Action	Minor, adverse, short- and long-term impacts due to increases in traffic levels, increases in vehicle round trips, and traffic delays	None	Minor, adverse, short- and long-term
	Alternative 1	Same as for Proposed Action	None	Same as for Proposed Action
	Alternative 2	Same as for Proposed Action	None	Same as for Proposed Action
	No-Action Alternative	Minor, adverse, short- and long-term impact from ATST construction	None	Minor, adverse, short- and long-term impact from ATST construction
Air Quality	Proposed Action	Negligible to minor, adverse, short- and long-term.	Implementation of HO Long Range Development Plan BMPs	Negligible to minor, adverse, short- and long-term
	Alternative 1	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	Alternative 2	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	No-Action Alternative	Negligible, adverse, and long-term	None	Negligible, adverse, and long-term
Topography, Geology and Soils	Proposed Action	Minor, adverse, short-term.	None	Negligible, adverse, short-term
	Alternative 1	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	Alternative 2	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
	No-Action Alternative	Negligible, long-term	None	Negligible, long-term

soundscape, viewshed, cultural practices, biological resources, and traffic on Haleakalā would occur throughout the year.

The analyses performed for this Environmental Assessment indicate that all of these measures will enhance the productivity of the Hawaiian petrel and Hawaiian goose over the long term—e.g., by protecting the petrel nests from ungulates and predators (Measure 1), reducing nēnē mortality along the Park Road (Measure 5), and supporting the construction of a holding pen to be used for the propagation and protection of the nēnē (Measure 7). The actual effectiveness of these measures in enhancing productivity of these resources will be monitored over the course of ATST construction.

Irreversible and Irretrievable Commitments of Resources

There is a NEPA requirement for analysis of the extent to which the proposed project's impacts would commit non-renewable resources to uses that would be irreversible or irretrievable to future generations. Fuel would be used by the delivery helicopter and construction vehicles and by staff vehicles during fence construction and maintenance and petrel monitoring. Implementation of the proposed conservation measures would otherwise neither irreversibly nor irretrievably commit such resources.

Unavoidable Adverse Impacts

There are no major adverse impacts associated with the proposed conservation measures that could not be mitigated to a reduced level.

Agency Consultation and Public Involvement

Consultation activities and public input gathered during the ATST project were considered in the development of the Proposed Action and alternatives and during this EA planning process. Since the final EIS was completed, however, continued consultation efforts with the USFWS, NPS, the State (DLNR), and IfA resulted in the development of a draft HCP pursuant to H.R.S. 195D, which as of this writing is out for a 60-day public comment period. A Biological Opinion from USFWS is also being prepared pursuant to the federal Endangered Species Act Section 7. The conservation measures analyzed in this EA were developed during preparation of the draft Biological Opinion and draft HCP as a response to offset potential impacts to the Hawaiian petrel and Hawaiian goose.

Pursuant to NEPA and Section 106 of the National Historic Preservation Act (NHPA), NSF has initiated consultation with the State Historic Preservation Office regarding the proposed measures and to solicit feedback on potential impacts. In addition, NSF has raised the Proposed Action through informal meetings with members of the public and also with the ATST Native Hawaiian Working Group.

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APPENDIX

A Arthropod Habitat Reconnaissance and Assessment at a Proposed Conservation Area on Haleakalā, Maui, Hawai`i

ACRONYMS AND ABBREVIATIONS

ac	acre
AFRL	U.S. Air Force Research Laboratory
AQI	Air Quality Index
ATST	Advanced Technology Solar Telescope
AURA	Association of Universities for Research in Astronomy
BLNR	Board of Land and Natural Resources
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
dB	decibels
dBA	A-weighted decibels
DLNR	State of Hawai‘i Department of Land and Natural Resources
DOFAW	State of Hawai‘i Division of Forestry & Wildlife
DOH	State of Hawai‘i Department of Health
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
ESRC	State of Hawai‘i Endangered Species Recovery Committee
FAA	Federal Aviation Administration
ft	foot/feet
ha	hectare
HAR	Hawai‘i Administrative Rules
HCP	Habitat Conservation Plan
HO	Haleakalā High Altitude Observatory
H.R.S.	Hawai‘i Revised Statute
IfA	University of Hawai‘i Institute for Astronomy
ISA	isolated artifact
ITL	Incidental Take License

km	kilometer
LRDP	Long Range Development Plan
m	meter
mi	mile
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NSF	National Science Foundation
NSO	National Solar Observatory
Park	Haleakalā National Park
SEEF	searcher efficiency
SIHP	Hawai‘i State Inventory of Historic Places
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

The National Science Foundation (NSF), through its awardee, the Association of Universities for Research in Astronomy (AURA)/National Solar Observatory (NSO), proposes to implement a series of conservation measures to avoid, minimize, and mitigate potential impacts of the Advanced Technology Solar Telescope (ATST) project to federally- or State of Hawai‘i-listed species. The ATST project is an international venture led by NSO, which is operated by AURA under a cooperative agreement with NSF. Although informal consultations with the U.S. Fish and Wildlife Service (USFWS) resulted in an Informal Consultation opinion that the ATST project is not likely to adversely affect any endangered species (USFWS, 2007), and follow-up consultation with the USFWS confirmed that finding (USFWS, 2009), NSF subsequently reinitiated consultations with the USFWS, the Hawai‘i State Division of Forestry and Wildlife (DOFAW), the National Park Service (NPS), and the University of Hawai‘i Institute for Astronomy (IfA) to take another look at concerns raised by the State during the Environmental Impact Statement (EIS) process. The result of those subsequent consultations was NSF’s decision to adopt a more conservative position with respect to protection of endangered species during construction of the ATST. Specifically, after the ATST EIS was completed in 2009 (NSF, 2009), NSF entered into additional consultation efforts with the USFWS, the NPS, the State, and the IfA, which led to the development of a draft Habitat Conservation Plan (HCP; NSF, 2010b) and will result in publication of a Biological Opinion, currently in preparation. The HCP was prepared pursuant to Hawai‘i Revised Statute (H.R.S.) 195D, and the Biological Opinion is being prepared pursuant to the federal Endangered Species Act of 1973 (ESA) Section 7. These documents identify conservation measures developed to avoid, minimize, and/or mitigate impacts from the ATST project. Some of these measures were evaluated in the ATST EIS while others were developed since that environmental review was completed.

This Environmental Assessment (EA) is tiered to the ATST EIS, focusing on those measures that have been developed or changed since completion of that document. The EA is prepared pursuant to the National Environmental Policy Act (NEPA; Chapter 40 Code of Federal Regulations [CFR] Parts 1500-1508; and Chapter 45 CFR Part 640) and H.R.S. Chapter 343, Environmental Impact Statement Law. In accordance with 36 CFR 800.3(b), the Section 106 National Historic Preservation Act (NHPA) consultation process will be combined with the NEPA process for these proposed conservation measures.

1.1 Background

An EIS and accompanying Record of Decision were completed for the ATST in 2009. The EIS evaluated the proposed development of the ATST project within the 18.166-acre (ac) Haleakalā High Altitude Observatory (HO) site at the summit of Haleakalā, Maui, Hawai‘i.

The EIS evaluated potential impacts resulting from the construction, operation, and maintenance of the ATST facility. Construction activities will include use of the Haleakalā National Park (the Park) roadway (Highway 378, or the Park Road) to access the summit of Haleakalā; demolition of the existing driveway, parking area, and other items at the construction site; grading, leveling, excavation, caisson drilling, and ATST facility construction; and temporary road widening and subsequent vegetation restoration at the Park entrance station to accommodate wide loads. The analysis considered that construction would occur year-round; however, restrictions were incorporated to limit noise and vibration-generating activities during part of the nesting period during which incubation occurs for the ‘ua‘u (Hawaiian petrel, *Pterodoma phaeopygia sandwichnesis*) (April through July). The entire construction period was estimated to last 7 to 8 years.

The ATST project area includes four species that are listed as either endangered or threatened: the Hawaiian petrel, ‘ahinahina (Haleakalā silversword, *Argyroxipbium sandwicense*), the nēnē (Hawaiian goose, *Branta sandvicensis*); and the ‘ope‘ape‘a (Hawaiian hoary bat, *Lasiurus cinereus semotus*). During the EIS planning process, NSF completed informal consultation with the USFWS. The Informal Consultation document (USFWS, 2007) stated that impacts to listed species were found to not adversely

affect species, or in the case of the Hawaiian petrel, to be mitigable, thereby avoiding "incidental take" of these species.

Subsequent to the EIS process, NSF, as discussed above, engaged in additional consultations with USFWS, the State, the NPS, and IfA triggered by concerns raised by the State during the EIS process. As a result of those consultations, NSF decided to adopt a very conservative position with respect to addressing potential take of endangered species during construction of the ATST. To provide additional analysis of the potential for take, NSF engaged a biologist familiar with breeding and habitat conservation of Hawaiian petrels to conduct further analyses on the potential for adverse effects on endangered species. These analyses, e.g., noise and vibration focusing on the Hawaiian petrel (Holmes, 2009) found that impacts realized during the pre-egg-laying/prospecting period could be substantial enough such that "take" would occur, as defined by ESA Section 7 and H.R.S. 195D. A series of twenty-four meetings between NSF, USFWS, DOFAW, and the NPS from September 2009 to January 2010 to assess these and additional findings resulted in the development of a draft HCP that includes conservation measures to reduce or avoid take of the Hawaiian petrel (NSF, 2010a; 2010b), and a draft Biological Opinion, which is currently in preparation by USFWS. Several of these measures were not evaluated in the original EIS, and, therefore, this environmental review evaluates those specific measures.

1.2 Agencies Proposing the Conservation Measures and Issuance of the Incidental Take License

NSF is the lead federal agency for the ATST project and associated studies, including this environmental review. Because NSF would fund the proposed conservation measures as part of the ATST project, this analysis must comply with NEPA (40 CFR 1500-1508) and NSF's NEPA-implementing regulations (45 CFR Part 640).

Because the State is considering issuing an Incidental Take License (ITL) under H.R.S. 195D and because the proposed conservation measures would be located on State lands within the State Conservation District, an environmental review by the State of Hawai‘i pursuant to H.R.S. Chapter 343 is required. The Department of Land and Natural Resources (DLNR) is the State accepting authority, with implementation and review completed through DOFAW.

1.3 Purpose and Need

The endangered Hawaiian petrel is a medium-sized seabird in the family Procellariidae (shearwaters, petrels, and fulmars). The Hawaiian petrel was listed as endangered on March 11, 1967 (32 FR 4001). The Hawaiian petrel nests in high-elevation burrows located beneath rock outcrops, along talus slopes or along edges of lava flows where there is suitable soil underlying rock substrate for excavation of tunnels. Burrows are excavated to a depth of three to six feet, but sometimes reach a length of 15 feet or more. Most of the nests on Haleakalā are in rock crevices in sparsely vegetated, xeric habitat (Simons and Hodges, 1998).

Hawaiian petrels were abundant and widely distributed in prehistory. Human hunting, predation by introduced mammals such as rats (*Rattus rattus*), dogs (*Canis familiaris*), and pigs (*Sus scrofa*), and habitat alteration, however, caused decline of the Hawaiian petrel population and probably its extirpation from O‘ahu (Olson and James, 1982).

The primary reason for the relatively large numbers of petrels and their successful breeding around Haleakalā summit today is the fencing and intensive predator control maintained by the Park since about 1982. Elsewhere on Maui and in Hawai‘i the Hawaiian petrel faces severe threats from non-native predators including rats, cats *(Felis cattus)*, mongoose (*Herpestes auropunctatus*), and introduced barn owls (*Tyto alba*). The petrel's habitat is destroyed or severely compromised by feral ungulates (hooved animals) such as goats (*Capra* sp.), and by pigs in wetter and more vegetated environments than Haleakalā's summit.

As such, propagation of the Hawaiian petrel around Haleakalā summit depends to some extent on the exclusion of feral ungulates; the control of rats, cats, and mongoose; and the minimization of new construction and related activities that would disturb the petrels and their habitat. The purpose of this EA is to evaluate the environmental impacts associated with the issuance of an Incidental Take License authorizing the implementation of a series of conservation measures developed in coordination with USFWS, the NPS, the State, and NSF.

Likewise, the Hawaiian goose is a federally and State of Hawai'i endangered bird species known to occur along the Park Road corridor as well as other areas of Maui, Hawai'i, and Kaua'i. Once abundant, the nēnē population has declined. Current threats to the nēnē population include predation, nutritional deficiency due to habitat degradation, lack of lowland habitat, human-caused disturbance, road-kills, behavioral problems, and inbreeding depression.

The Park has actively worked to protect and care for the nēnē. One such effort includes a small, 5-ft by 10-ft pen constructed on Park property near their greenhouse. This structure was meant to be temporary and has since been used numerous times to hold nēnē for various reasons. The need for this type of care, and the goal of supporting propagation of nēnē, has overwhelmed the capacity of the temporary pen. As such, the Park proposes to construct, with ATST funds, a larger, permanent holding pen on their property in the former horse pasture in the Park Operations area near the Park entrance station (see Measure 7 in Section 1.5 below). Because federal monies would be used to fund the construction of the proposed nēnē holding pen, this EA also addresses the environmental impacts associated with this measure.

1.4 Project Location

The ATST project, evaluated in a previous EIS (NSF, 2009), will be located on State of Hawai'i lands designated for General Conservation within the State Conservation District on Pu'u (hill) Kolekole, near the summit of Haleakalā. The ATST project will be located within the 18.166-ac (7.352-hectare [ha]) HO site at the summit of Haleakalā, County of Maui, Hawai'i. This land is owned in fee by the University of Hawai'i under Executive Order 1987, and is administered by IfA.

Proposed conservation measures associated with the ATST project, evaluated in this EA, would occur along the 10.6-mile (mi) (17.0-kilometer [km]) Park Road accessing HO; in a horse pasture within the 10-acre Park Operations area located near the Park entrance station; within the HO property where the ATST facilities are to be constructed; and elsewhere within the proposed ATST conservation area (the conservation area) located on unencumbered State Conservation District lands surrounding the HO property near the summit (see **Figure 1-1**).

The conservation area is the area proposed in this analysis to be enclosed within a conservation fence during construction of the ATST project[1], and within which most of the proposed conservation measures will be implemented. The conservation area is located within the State Conservation District Limited Subzone, Resource Subzone, and General Subzone and consists of approximately 328 ac (133 ha) of unencumbered lands surrounding the 18.1-acre HO complex (**Figure 1-1**). This area is located immediately west of Haleakalā National Park (**Figure 1-2**). The boundary of the conservation area is entirely on State land and all parcels within the conservation area are owned by the State or the federal government. The conservation area will encompass all observatories, broadcast facilities, communication towers, and other structures collectively known as "Science City,"[2] plus the portion of Skyline Trail

[1] Although the intention is for the fence line to follow the proposed conservation area boundary to the extent possible, the fence line will be rerouted inside the conservation area boundary as needed to avoid sensitive resources (e.g., petrel burrows, archeological sites) identified during pre-construction surveys and/or encountered in the field. Therefore, most but not all of the 328-ac conservation area will ultimately be enclosed within the conservation fence.

[2] The observatory facilities located at the summit of Haleakalā are sometimes locally referred to as "Science City" because of the numerous scientific research facilities present at the summit; however, the correct name is the Haleakalā High Altitude Observatory (HO).

dissecting the site from the northeast to southwest. Cultural and historic resources exist in the region and have been extensively analyzed by NSF for HO, as reflected in the ATST EIS (NSF, 2009). The Kula Forest Reserve and the Kahikinui Forest Reserve are adjacent properties on the northeast and southeast sides of the conservation area, respectively. There would be no change in land ownership or land use associated with this action.

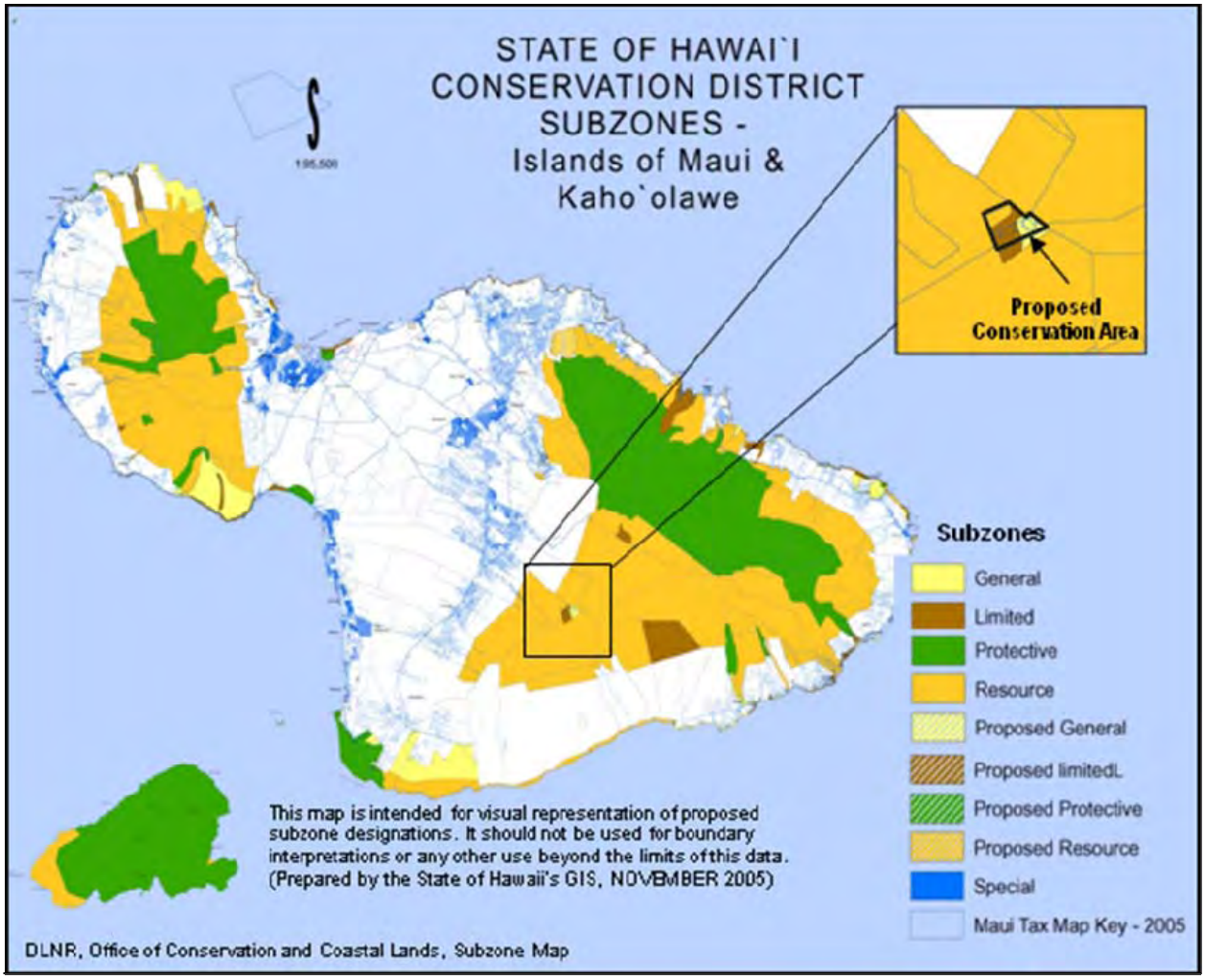


Figure 1-1. Proposed ATST Conservation Area and Associated State of Hawai‘i Conservation District Subzones.

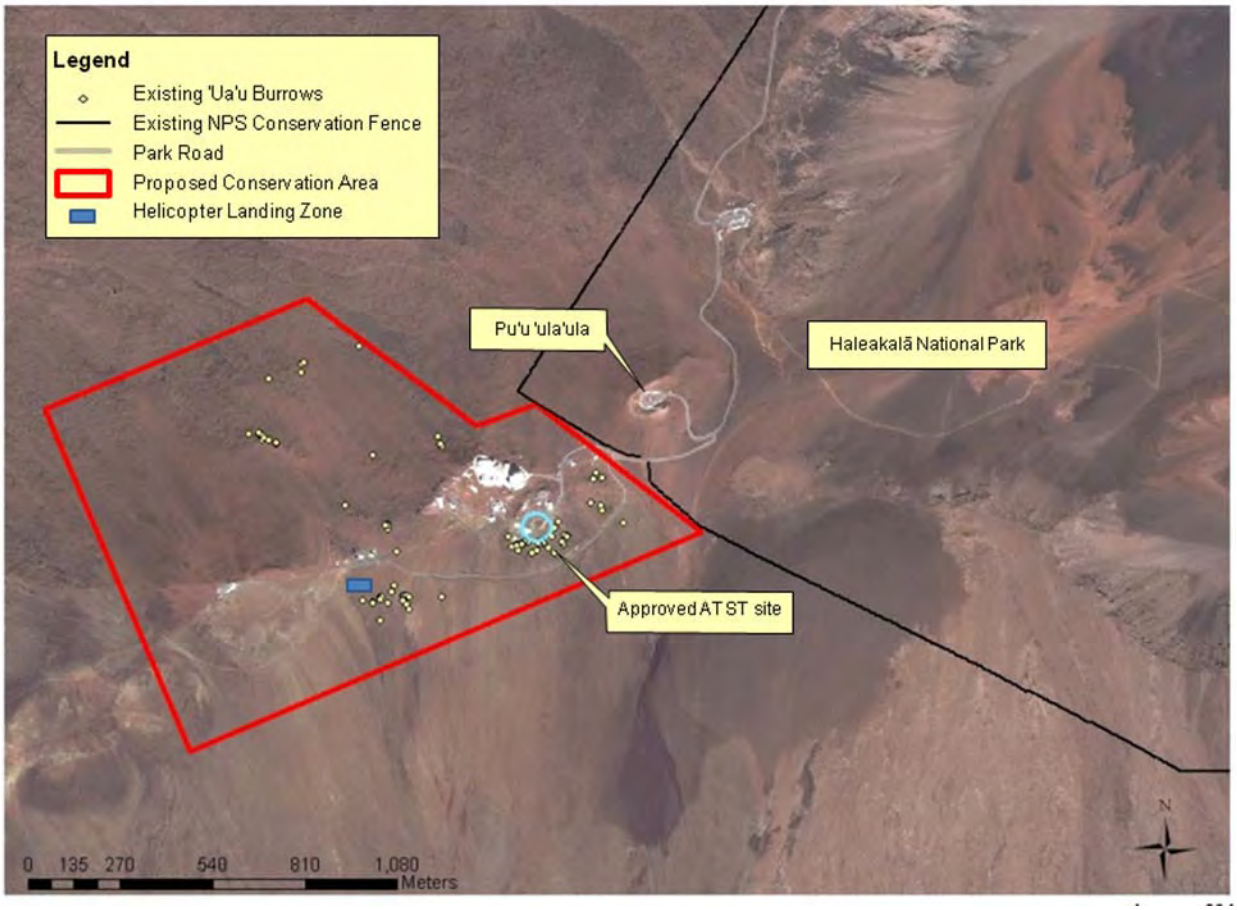


Figure 1-2. Proposed ATST Conservation Area Showing Identified Hawaiian Petrel Burrows.

The Park Road corridor is a 10.6-mi (17.0-km) stretch of road that begins at the entrance to Haleakalā National Park and ends at the summit of Haleakalā. The nēnē is known to frequently occur along the Park Road corridor building nests along the side of the roadway between November and March (see **Figure 1-3**).

The proposed nēnē holding pen (Measure 7, discussed below) would occur in an area currently used as a horse pasture by the Park Operations area near the Park entrance station (**see Figure 1-3**). This site is currently used by the Park Maintenance and Resource Management Divisions.

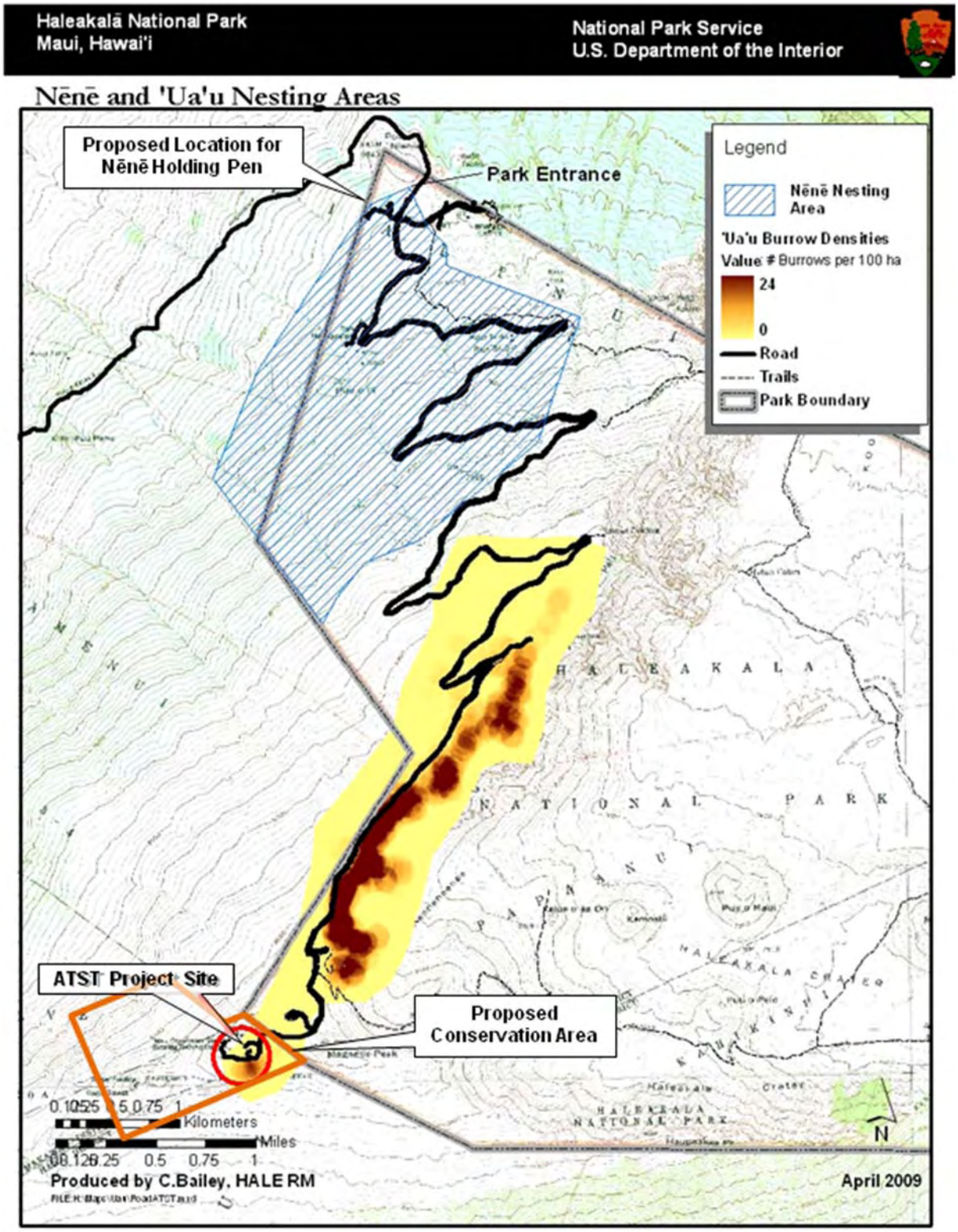


Figure 1-3. Petrel Burrows and Nēnē Habitat In Proximity to the Proposed Conservation Measures.

1.5 Description of the Proposed Action and Alternatives

1.5.1 Issuance of an Incidental Take License

Pursuant to Chapter 195D, Hawai‘i Revised Statutes, the DLNR proposes to issue to the NSF an Incidental Take License for potential take of the endangered Hawaiian petrel resulting from construction of the ATST facilities. Issuance of the ITL is subject to compliance with all sections of H.R.S. 195D, including an approved HCP and approval by a two-thirds vote of the Board of Land and Natural Resources (BLNR). The HCP development and approval process provides for a thorough review and assessment of the levels of endangered species take, incorporates appropriate minimization and avoidance measures and an assessment of the cumulative impacts on species and habitats, and requires that any permitted incidental take be fully mitigated to provide a net benefit to the affected species. An HCP and ITL will not be issued unless the HCP and proposed take meet the issuance criteria in H.R.S. 195D-4 and 195D-21.

Issuance of the proposed ITL is common to the Proposed Action, Alternative 1, and Alternative 2, as defined below.

1.5.2 Proposed Action - Issuance of an Incidental Take License and Implementation of Proposed Conservation Measures Without Fence Polytape

Under the Proposed Action the nēnē holding pen would be constructed and the State would issue an ITL that would authorize certain conservation measures, as discussed in Section 1.5.1 above. The conservation measures would be the same as those that were developed during consultation proceedings associated with ESA Section 7 and H.R.S. 195D processes. Some of these measures were not established during the EIS planning process or differ from those evaluated in the EIS, and consequently require further environmental review.

These conservation measures focus on the removal of predators and habitat protection during the course of the ATST project. As such, implementation of these measures is contingent on the ATST project moving forward. The Proposed Action evaluated in this EA consists of implementation of the following nine measures:

- **Measure 1: Conservation Fencing.** (Installation of conservation fencing connecting with existing Park boundary fence to exclude ungulates; under the Proposed Action the fence would include no polytape, while under Alternatives 1 and 2 white or black polytape, respectively, would be added to the fence)
- **Measure 2: Visibility Painting and Polytaping of Structures and Equipment**. (Makes structures/equipment more visible to minimize flight hazards to Hawaiian petrels)
- **Measure 3: Long-term Predator Control**. (Includes trapping and removal of known predators such as cats, and mongoose and baiting of rats)
- **Measure 4: Hawaiian Petrel Monitoring and Reporting**. (Assesses the effectiveness of conservation measures on the productivity of the Hawaiian petrel)
- **Measure 5: Traffic-Calming Devices**. (Installation of temporary devices such as speed humps to minimize vehicle collisions with Hawaiian geese)
- **Measure 6: Hawaiian Goose Monitoring and Reporting**. (Includes informal identification of Hawaiian geese struck by vehicles along the Park Road)

- **Measure 7: Construction of Hawaiian Goose (Nēnē) Holding Pen**. (Includes breeding of nēnē in pens for the purpose of propagating the species and rehabilitating injured geese)
- **Measure 8: Haleakalā Silversword Propagation and Planting**. (Includes planting of silverswords on State property)
- **Measure 9: Year-round Construction**. (Eliminates most construction restrictions originally imposed during Hawaiian petrel incubation season [April-July] in order to shorten the ATST construction period by as much as one year, yielding net recovery benefits to petrels)

These nine conservation measures are evaluated in this EA and described in detail below.

Measure 1: Conservation Fencing

The State owns the Conservation District lands surrounding the ATST construction site and, with its NSF partner, proposes to erect a conservation fence designed to exclude ungulates (feral goats). Specifically, up to 14,107.6 feet (ft) (4,300 meters [m]) of fence would be installed along or within the 328-ac (133-ha) conservation area boundary, connecting to the existing 2,296.6 ft (700 m) of fence at the western edge of Haleakalā National Park. The area would be surveyed for sensitive resources including petrel burrows and archeological sites prior to staging of materials, and qualified monitors (archeologist/cultural monitor and avian biologist) will be on-site during fence installation. Although the intention is for the fence line to follow the conservation area boundary to the extent possible, the fence line will be rerouted inside the conservation area boundary wherever necessary to avoid these resources.

The proposed fencing will have the same general appearance, and will be installed in generally the same manner as the conservation fencing currently surrounding the Park property (see **Figure 1-4**). Specifically, the proposed conservation fence would be 5 ft (1.5 m) in height, consist of hog wire with no barbed wire strands, and would include a cattle grid across the Skyline Trail at the western end of the site. As noted above, this measure has two alternatives aside from the Proposed Action; under the Proposed Action, no polytape would be interwoven into the fence, while under Alternatives 1 and 2, white and black polytape, respectively, would be added to the hog wire.

Figure 1-4. Representative Photograph of Existing State Conservation Fence with Polytape Surrounding Haleakalā National Park.

(Photograph by Jay Penniman, DOFAW, 2006.)

Fence Installation Process

Fencing materials would be delivered by flatbed truck to a designated helicopter landing zone located on State property west of HO, close to the gated portion of Skyline Drive (see **Figure 1-2**). Up to two truckloads would be necessary. A helicopter would then transport the materials to the fence installation site and deposit them in staging areas spaced in 300-ft (91-m) intervals along the fence line. Although the flights between staging areas would be short (roundtrips will all be less than 2.2 miles [3.6 km]), up to 100 round-trip flights between the Skyline Drive and fence line staging areas may be necessary to deliver all the materials to the site. Helicopter deliveries are only anticipated to occur over a total of one or two days. Helicopters would fly between 30 feet and 100 feet above ground level and would remain above State lands.

An initial archeological survey has been completed (see Section 2.2 and Section 3.2) and a survey of petrel burrows within the conservation area and along the proposed fence line will be completed prior to fence construction. The fence line would follow the 328-ac conservation area boundary to the extent possible; however, the actual alignment may be adjusted based on these surveys to avoid archeological sites, petrel burrows, or other sensitive resources. Additionally, as noted above, a qualified archeologist/cultural monitor and a qualified avian biologist would be onsite during staging and fence construction to (a) identify appropriate staging locations, and (b) confirm that the fence line avoids sensitive sites.

Surveys would be completed prior to fence construction. Helicopter delivery of fencing materials along the proposed fence line would occur between November and February to avoid petrel nesting season. During this period petrels are not present on the mountain and noise from the helicopter would not affect the birds. If active burrows are identified in close proximity to the proposed fence line either by surveys completed prior to fence construction activities or by the biological monitor present during construction, the posts for the fence line in these areas would be driven when the petrels are not present. Other post driving and fence installation activities that are not anticipated to be a nuisance or hazard to the petrels may be performed at any time of the year without restriction. All fence work will occur only during daylight hours.

Construction of the fence is anticipated to be completed in three months with a daily crew of up to eight people. In teams of two, posts will be driven every ten feet and hog wire fencing will be attached to the posts and linked to the existing Park fence line to the east of the conservation area.

Although the State would ultimately own and maintain the proposed conservation fence, NSF, through the ATST award, would fund the construction and maintenance of the fence, ensure that the conservation area is kept free of ungulates and that predator control measures are implemented, and monitor the productivity of the petrel population as detailed below under Measure 4, for a period of no less than six years following completion of the fence and removal of all ungulates, or for the duration of the ATST construction activities, whichever is longer.

Measure 2: Visibility Painting and Polytaping of Structures and Equipment

Exposed materials and equipment present during the construction phase of the ATST pose potential strike risks to the Hawaiian petrel. Ornithological radar and visual data collected during 2004 and 2005 (Cooper and Day, 2004; and Day et al., 2005) indicate that the ATST construction site is located within the flight paths used by Hawaiian petrels. The Hawaiian petrel flight paths pass through areas including the Haleakalā cliff sides and through the HO site. Furthermore, it is anticipated that the petrels' use of the airspace in the immediate vicinity of their burrows on the HO site will increase in the long term as the Hawaiian petrel population increases as a result of conservation activities (e.g., conservation fencing and landscape-scale predator control measures).

To increase visibility of project-related materials and equipment for the Hawaiian petrel and minimize flight hazards, the ATST structural framework, scaffolding, exposed structures, and construction equipment would be pre-painted white prior to mobilization to the project site. Pre-painting denotes that painting would occur off-site. Maintenance painting, as addressed in the ATST EIS (NSF, 2009), would still occur at the project site.

Furthermore, to ensure that the crane used during construction of the ATST facility does not crush any Hawaiian petrel burrows when it moves away from the existing road, the project site manager will confirm that crane access and staging plans do not conflict with petrel burrow surveys completed to date in the area and will install temporary marking to delineate the maximum extent of the crane‘s operation before it leaves the roadway to move into position. Furthermore, a biological monitor will be on-site during construction. To minimize and avoid the collision risk to birds between February and November, the cranes' lattice structures will be lowered along the paved roadway each night, to rest no higher than 14 ft (4.3 m) from the ground, and the booms will be painted white or marked at night with white fence polytape.

White, non-reflective fencing polytape will be secured to all sides of the entire boom portion of the crane each night. The polytape strips would form a grid, with vertical and horizontal strips of polytape running a minimum of every 12 in (30.5 cm). The specific method of attachment would be finalized after consultation with the crane contractor. The polytape grid might be sewn to a canvas fabric to be thrown over the crane boom at night, a sewn matrix of tape might be pulled over the boom, or another method may be employed to secure the grid of polytape to the crane.

Measure 3: Long-term Predator Control

Predator control for cats, mongoose, and rats within the conservation area was addressed in the ATST EIS (NSF, 2009); however, this proposed measure would extend that control beyond the HO site and down the mountain to the proposed conservation fencing. Consistent with the methodology described in the EIS, predator control would be implemented prior to and throughout the Hawaiian petrel breeding season, beginning when the birds return to Haleakalā in February and ending when they leave the mountain for the winter months in November (based on existing protocols used by the Park). Traps would be checked every second day on foot and animal disposal would be consistent with ethics protocols required by the State. The placement of traps and bait stations would be determined based on topography and outcomes of burrow surveys. Rodenticide bait stations would be sited and maintained pursuant to 24c State Conservation Label to minimize potential for the project to affect rodent resistance to active ingredients in the bait. No vehicles would be driven off-road.

Measure 4: Hawaiian Petrel Monitoring and Reporting

The conservation measures proposed to protect the Hawaiian petrel were developed based on past studies and monitoring, which resulted in successful propagation and protection techniques. These measures are meant to be a dynamic approach which would require monitoring, interpretation, and adaptation of the program, when necessary.

Hawaiian Petrel Monitoring

Monitoring is an important tool in an adaptive management approach (defined below in the Hawaiian Petrel Adaptive Management Program subsection) and should be designed in a way that ensures that data would be properly collected, analyzed, and used to adjust management strategies, as appropriate. As a commitment from the ATST EIS (NSF, 2009), monitoring is required at the ATST construction site. The measure is extended in this analysis to the proposed conservation fence line to ensure that the authorized levels of take are not exceeded, and that the effects of take are minimized and mitigated to the extent possible.

There are several potential mortality mechanisms for Hawaiian petrels that are of concern during ATST construction and operations, including birdstrike, vibration, noise, and general stress from other factors related to construction activities. There is also a risk of take for breeding birds not initiating, or abandoning, breeding attempts during the breeding season because of construction activity (noise, vibration, etc.) and general proximity to ATST construction, as well as a reduction in fledgling survival rates. Wildlife responses to human activity are known to vary based on a variety of factors including previous exposure to human activity (Keller, 1989; Dunlop, 1996), species (Rodgers & Smith, 1997; Fernández-Juricic et al., 2002; Blumstein et al., 2003) and stimulus type (Burger, 1986; Lord et al., 2001). These suggest that Hawaiian petrel responses to noise, vibration, and general proximity to the ATST construction site are likely to be species- and situation-specific. As such, the following methodology to monitoring was developed in coordination with the USFWS, the NPS, and the State to best capture the realistic success of conservation management.

The Hawaiian petrel monitoring plan would include the following approach:

1) Use of ATST technical staff and/or third-party contractors who have been trained by the responsible ATST biologist to conduct observatory/bird interaction studies. As part of the conservation activities for ATST, the qualified biologist would function as lead researcher, with two additional trained biological technicians, conducting transects and other monitoring to ensure that valid field data are collected in a timely manner.

2) Early in the ATST planning process motion-triggered digital infrared and visible spectrum cameras were mounted at the entrances to the burrows in the HO site colony, adjacent to the ATST construction site. Most of the burrow cameras are mounted outside burrow entrances so that the bird is visible only when it is at the entrance. Several of the cameras are mounted in the burrows, so that the nesting activity of the birds can be monitored. Pre-construction data was gathered beginning in 2006 and during each successive year. Video surveillance would continue at designated burrows to foster assessment of changes in Hawaiian petrel behavior resulting from noise incurred during ATST construction.

2) Carcass removal (i.e., scavenging) and searcher efficiency (SEEF) trials would be conducted each nesting season (February to November) with sufficient replication to produce scientifically reliable results.

3) Systematic searches under the direction of a qualified biologist would be conducted at least twice per week during the intensive (petrel nesting months) monitoring period.

4) The frequency of searches would be based on conditions such as days after moonless, cloudy, or stormy nights when the observatory, surrounding infrastructure, and fencing would be least visible and the risk of collision would presumably be greater, especially during peak fledgling periods.

5) Intensive searches would be conducted for the first two years, after which it is expected that the approach would be reduced to a sampling method based on the results obtained up to that point.

Comparison of the treatment data (ATST burrow productivity) to suitable control data is critical to a successful monitoring program. These control data should include:

1) Previously collected fledgling success data from the ATST site. Approximately 8 years of data exist for this site (C. Bailey, pers. comm., 2009). Because these data would primarily come from the same individuals that would be impacted by the ATST process, they reduce any error associated with individual-to-individual variation and increase a likelihood of detecting a difference due to the ATST construction.

2) Breeding productivity from control sites within the same years of ATST construction. Breeding success is inherently variable from year to year due to food availability (Warham, 1990). Same-year control data reduces the year-to-year variation and increases the likelihood of detecting a difference due to ATST construction.

Hawaiian Petrel Reporting

NSF would meet with the State on a semi-annual basis, at a minimum, to evaluate the efficiency of monitoring methods, compare the results of monitoring to the estimated take, evaluate the success of mitigation, and develop recommendations for future monitoring and mitigation. If necessary, take limits would be reviewed and changed circumstances or adaptive management measures would be discussed with the USFWS and the State as needed. In addition, an incident report would be filed within five business days of any documented take (i.e., injury or fatality) of covered species.

In addition to semi-annual meetings, NSF would coordinate monthly with the State, the USFWS, and the NPS during the first two years of construction or two full petrel nesting cycles regarding the status of mitigation activities, in order to measure the effectiveness of the proposed conservation fencing (Measure 1, above).

NSF would also meet annually with the State's Endangered Species Recovery Committee (ESRC) to provide updates to monitoring, mitigation, and adaptive management, and to solicit input and recommendations for future efforts.

Finally, NSF would provide annual reports to the State, the NPS, the USFWS, and ESRC that summarize the results of the construction mortality monitoring and any take that has occurred. Adaptive management practices and performance and success would also be included, when applicable.

Based on the findings of the monitoring activities and reviews with the State, the USFWS, the NPS, and ESRC, if changes to the implemented conservation measures are found to be warranted (whether in terms of degree/duration of the proposed measures, or more substantive changes to the measures), a new environmental review would, if appropriate, be initiated.

Conservation and Monitoring Timeline

These ATST project conservation measures are proposed for the duration of ATST construction. The EIS considered a construction phase of an estimated 7 to 8 years. The conservation measures included in Measure 9 below would shorten the construction period by an estimated one year. As such, for this analysis **Table 1-1** summarizes the various proposed conservation activities for the initial six years of construction and the corresponding year(s) during which they would be performed. Based on the results of the conservation efforts employed during the construction phase of the project, an additional 4 years of conservation and monitoring could be applied should monitoring demonstrate that the first six years did not meet conservation goals.

Hawaiian Petrel Adaptive Management Program

According to USFWS policy (65 Federal Register 35242, June 1, 2000), adaptive management is defined as a formal, structured approach to dealing with uncertainty in natural resources management, using the experience of management and the results of research as an ongoing feedback loop for continuous improvement. Adaptive approaches to management recognize that the answers to all management questions are not known and that the information necessary to formulate answers is often unavailable. Adaptive management also includes, by definition, a commitment to change management practices when determined appropriate.

Table 1-1. Timeline for Proposed Hawaiian Petrel Conservation and Landscape-Scale Mitigation Activity.

Objective	Activity	Year					
		1	2	3	4	5	6
Determine breeding numbers in conservation area	Burrow searches	X					
Protect habitat	Construct conservation fence	X					
	Remove ungulates	X					
	Fence inspection and maintenance	X	X	X	X	X	X
Predator control	Place cat / mongoose traps	X					
	Cat /mongoose trapping	X	X	X	X	X	X
	Rat bait station placement	X					
	Rat baiting	X	X	X	X	X	X
Hawaiian petrel monitoring and reporting	Monitor the area within the conservation fence line for Hawaiian petrel mortality	X	X	X	X	X	X

Because actual rates of take may not match those projected through modeling, efforts would increase though adaptive management measures if monitoring demonstrates that incidental take is occurring above baseline levels. Conservation efforts would also be allowed to decrease if rates or take are found to be occurring below baseline levels. Any changes in the conservation effort would be made only with the concurrence of the USFWS and the State. Regardless of recorded take levels, avoidance and minimization measures would be employed for the duration of the ATST project.

Measure 5: Traffic-Calming Devices

Concerns about take of the Hawaiian goose (nēnē) along the Park roadway were raised during consultations. To minimize the traffic-related take of the nēnē, the following traffic-calming measures would be employed:

1) Existing portable "Nēnē Crossing" signs currently in use at the Park would be augmented;

2) Two temporary speed humps, each spanning half the roadway to slow alternate directions, in up to three locations (six total humps) would be installed with appropriate marking and signage; and

3) Two temporary speed-measuring signs that would display motorists' current speed would be installed and maintained to operate 90 percent of the time.

The speed humps and speed-measuring signs would be temporary in that each would be installed when nēnē are identified in the area and removed or relocated when they are no longer present. In other words, the locations of the speed humps and signs could change and may only be present in any location for a short period.

NSF will contribute funds to NPS to implement this measure.

Measure 6: Hawaiian Goose Monitoring and Reporting

NSF and Park staff would be trained and directed to identify and report to the USFWS any Hawaiian geese found struck along the Park Road. Although the roadway is not used solely for HO operations or

construction, Hawaiian goose fatalities which through adequate evidence can be attributed directly to HO traffic would be reported to the USFWS.

Measure 7: Construction of Hawaiian Goose (Nēnē) Holding Pen

NSF, through the ATST award, would contribute funding to a new nēnē holding pen on Park land to be used for the propagation and protection of the Hawaiian goose. NPS would construct a 20-ft by 40-ft closed-top holding pen structure to temporarily hold and care for nēnē for periods ranging from several hours to two months at a time. Two 20-ft by 20-ft pens would be contained within this structure. The structure would consist of fenceposts and predator-proof metal fencing material, such as chicken wire, approximately 6 ft high. A nēnē shelter would be installed within each pen, such as a plywood and rebar-reinforced A-frame structure. Deer netting would be placed over the top of the entire pen structure. Each pen would include a water source and feeding station. The water source would be a single 50-gallon aboveground water tank which would be housed within one of the pens and under a corrugated, non-toxic roofing. The tank would feed into shallow water bowls into each of the two pens.

This pen would be located on an approximately 10-acre area on Park property near the Park entrance station (see **Figure 1-3**). The site is an already developed property in the front-country horse pasture along the Park boundary fence adjacent to the Haleakalā National Park Maintenance and Resource Management Divisions maintenance yard.

NPS would build and operate the holding pen with the goal of rejuvenating the Hawaiian goose population on Haleakalā.

Measure 8: Haleakalā Silversword Propagation and Planting

NSF, as a goodwill gesture, would plant a total of 300 Haleakalā silversword seedlings on Haleakalā on State lands. Plants would be grown in the Park greenhouse and nursery facilities for approximately 12 months from seed collected from adult plants growing in the immediate vicinity of the planting site. In consultation with the Park regarding planting methods and identification of suitable planting locations, it has been determined that plants in 4-inch (10-centimeter) pots would be out-planted within a suitable area on Haleakalā outside of the Park.

Measure 9: Year-round Construction

The ATST EIS (NSF, 2009) evaluated year-round construction with certain restrictions for activities generating noise and vibration between April and July, the petrel egg-incubation period. Specifically:

- Limit on-site ATST-related construction activities to the time-frame of 30 minutes after sunrise to 30 minutes prior to sunset,
- Limit when wide load vehicles could traverse the Park Road to between the time-frame of 30 minutes after sunrise to 30 minutes prior to sunset, and
- Wide or heavy loads could not traverse the Park Road at night between April 20th through July 15th (Hawaiian petrel incubation period).

These restrictions were developed based on early informal consultation with the USFWS. Continued consultation and studies, however, found that without incubation-period (April 20th-July 15th) construction blackout, total construction time could be shortened by as much as one year. Revised calculations based on this additional information indicated working through the incubation period would actually be more beneficial to the Hawaiian petrel and result in less overall reduction in breeding success (Holmes, 2010). Based on this information, NSF modified the project schedule so that construction, with the exception of caisson (underground concrete columns to support the ATST structure) drilling, would occur year-round. Installation of the caissons would still be curtailed during the Hawaiian petrel incubation period.

Moreover, under the revised schedule, no nighttime (from 30 minutes prior to sunset to 30 minutes after sunrise) driving will occur. The total construction duration, omitting the abovementioned restrictions, is expected to last for 6-7 years (about one year less than stated in the EIS).

1.5.3 Alternative 1 - Issuance of An Incidental Take License and Implementation of Proposed Conservation Measures with White Fence Polytape

Alternative 1 would be identical to the Proposed Action except for the addition of white polytape to the hog wire fence described in Measure 1 above. In this first alternative, three strands of twisted white polytape would be woven into the proposed conservation fencing to increase visibility and minimize the potential for birdstrike.

Studies completed on similar conservation fencing located on Lanaʻi found that the incorporation of strips of white, non-reflective electric fence polytape or similar material into fences reduced the risk of Hawaiian petrel collision (Swift, 2004; Penniman and Duvall, 2006). Before the installation of white visibility tape on the Lanaʻi fencing, birds collided with a new ungulate exclusion fence in the vicinity of a Hawaiian petrel colony on two occasions. Since the white electric fence polytape was installed, no bird collisions with the fence have been reported (Penniman pers. comm.). Swift (2004) noted that birds appear to exhibit late avoidance behaviors when approaching marked fences, which they did not display when approaching unmarked fences, indicating that the apparent 100 percent successful collision avoidance marked fences is due to the birds' visual detection of the white tape. Ultimately, solid objects present the least strike risk (i.e., completed buildings).

Furthermore, as discussed above under Measure 2, exposed materials and equipment used during the construction phase of the ATST project also presents a potential strike risk to Hawaiian petrel. Ornithological radar and visual data collected during 2004 and 2005 (Cooper and Day, 2004; and Day et al., 2005) indicate that the ATST construction site is located within the flight path used by Hawaiian petrels. To minimize the likelihood that construction equipment and materials may cause a flight hazard to Hawaiian petrels, in addition to pre-painting building frame materials, the lattice structure, and construction cranes, equipment and materials may also be marked with white polytape under this alternative.

1.5.4 Alternative 2 - Issuance of An Incidental Take License and Implementation of Proposed Conservation Measures with Black Fence Polytape

Under Alternative 2, the only difference from Alternative 1 would be that the polytape used on the conservation fencing and exposed construction materials and equipment would be black in color. The color variation offers potentially less reflectivity while still allowing for a more solid appearance to the fence, and thus would be intended to reduce the potential impact on visual resources and visitor use, since one or the other color may be more or less visible or apparent to adjacent land users.

1.5.5 No-Action Alternative

Under the No-Action Alternative, the ATST observatory would be constructed and mitigation and conservation measures as identified in the EIS would be implemented as appropriate to minimize, avoid, or offset impacts. The nēnē holding pen, however, would not be constructed and the Incidental Take License implementing the conservation measures described in this EA would not be issued. The baseline for which the No-Action Alternative analysis is based considers conditions today, prior to ATST construction. The construction schedule would include previously imposed restrictions during egg incubation and nesting periods, which would result in a longer construction period. There would be an increased risk of take of the Hawaiian petrel and Hawaiian goose. Monitoring would occur, as outlined in the EIS.

The No-Action Alternative is included in the alternatives evaluation to provide the baseline for evaluating potential environmental impacts of the Proposed Action. While the No-Action Alternative does not meet

the purpose and need of the Proposed Action described in this EA, it does provide a basis for comparing and contrasting the potential impacts of the proposed conservation measures.

1.5.6 Alternatives Eliminated from Further Consideration

The proposed conservation measures were developed in consultation with biologists from the USFWS, the NPS, and the State. These measures were identified as the most appropriate approach to protecting the Hawaiian petrel. Potential modifications to these measures would be discussed in monitoring and reporting discussions with the USFWS and NPS based on the results of early implementation. Alternative locations were considered for some conservation measures, including a research area on the Big Island, which was not yet funded, and other lands with mixed ownership adjacent to Haleakalā National Park on Maui. Because of the incomplete funding and mixed ownership, conservation planning on these lands was found to not be possible in light of the ATST project planning schedule requirements.

Other than the Proposed Action and the two alternatives described above, the only other alternative that was considered for this EA is the No-Action Alternative; no other alternatives were considered or eliminated from further consideration.

1.6 Resources Eliminated from Further Consideration

This EA evaluates the Implementation of Proposed conservation measures. The goal of these measures is to protect the Hawaiian petrel and Hawaiian goose from predators and minimize the disturbance to these species and their habitat from ATST construction and activities. Resource analyses will focus on those resources that may potentially have an adverse or beneficial impact on the natural and physical environment. Resources that would not have the potential to be significantly affected, directly or indirectly, by the implementation of proposed conservation measures are not considered further in this EA, including water resources; solid waste; infrastructure and utilities; socioeconomics and environmental justice; public services and facilities; and natural hazards.

1.7 Supplemental Environmental Studies

To substantiate the environmental analysis of the issuance of the Incidental Take License, the draft HCP and studies conducted in support thereof were prepared. To support the environmental analysis of the proposed conservation measures, two studies have been completed:

1. *Archaeological Survey for the Predator Control Fence Proposed as a Mitigation Measure for the Advanced Technology Solar Telescope (ATST) Project, Haleakalā High Altitude Observatory Site* (IARII, 2010).

2. *Arthropod Habitat Reconnaissance and Assessment at a Proposed Conservation Area on Haleakalā, Maui, Hawai`i* (Pacific Analytics, LLC, 2010; included as Appendix A).

2.0 AFFECTED ENVIRONMENT

This chapter provides an overview of the baseline physical, biological, cultural, and social conditions that occur within the study area, as defined in Section 1.5, Project Location. Only those environmental conditions relevant to the proposed project are presented; these are discussed in the following subsections:

2.1 Land Use and Existing Activities

2.2 Cultural, Historic, and Archeological Resources

2.3 Biological Resources

2.4 Visual Resources and View Plane

2.5 Visitor Use and Experience

2.6 Noise

2.7 Transportation and Traffic

2.8 Air Quality

2.9 Topography, Geology, and Soils

Each subsection gives an overview of the general conditions of the resource within the study area.

2.1 Land Use and Existing Activities

The land use study area for this analysis is defined as the land potentially affected by the proposed ATST project conservation measures and includes the 328 acres (ac) (133 hectares [ha]) of proposed conservation area consisting of unencumbered State Conservation Lands; an approximately 10-acre area located on Park property near the entrance of the Park entrance station; and the 10.6-mile-long Park Road (Highway 378) corridor (see **Figures 1-2 and 1-3**).

The 328-ac conservation area is located within a Conservation District under the jurisdiction of the DLNR, Office of Conservation and Coastal Lands. Approximately 14 percent of the land is developed, which includes developed, open space, developed low intensity, and developed medium intensity. The remainder is mostly barren with a small percentage consisting of Hawai‘i montane-subalpine dry shrubland and Hawai‘i alpine dwarf shrubland (NSF, 2010).

A horse pasture within an approximately 10-acre Park Operations area near the Park entrance station is also part of the study area. This site would accommodate Measure 7, the proposed nēnē holding pen. The site was first used by the U.S. Army as a base camp for personnel constructing, operating and maintaining a national defense project at the summit of Haleakalā (Balachowski et al., 2001), and was occupied by the U.S. Army until 1946. Between 1947 and 1961, the area was used by a concessionaire to operate the Haleakalā Mountain Lodge (later renamed the Silversword Inn). Since 1961, the site has functioned as an administrative area for the Park and is currently occupied by the Maintenance and Resource Management Divisions.

The purpose of the Conservation District is to conserve, protect, and preserve the important natural resources of the State through appropriate management and use in order to promote their long-term sustainability and the public health, safety, and welfare. The Conservation District has five subzones: Special, Protective, Limited, Resource, and General. The Special Subzone is to provide for sustainable use of areas possessing unique developmental qualities that complement the natural resources of the area. The remaining subzones are arranged in the order of environmental sensitivity, with the most environmentally sensitive being the Protective Subzone and the least sensitive being the

General Subzone (NSF, 2009). These subzones are in close proximity at the summit area, and as shown on **Figure 1-1**, the proposed conservation area is within the Limited Subzone, Resource Subzone, and General Subzone. Hawai‘i Administrative Rules (HAR) Title 13, Chapter 5 describes the purpose of these subzones and the conservation district:

- The objective of the Limited Subzone is to limit uses where natural conditions may preclude human activities due to lands being susceptible to floods and soil erosion or where the protection of the land is necessary to provide health, safety, and welfare of the public due to the possibility of inundation by tsunami, flooding, volcanic activity, or landslides, or which have a slope of forty percent or more (DLNR, 2009).

- The objective of the Resource Subzone is to sustain the use of natural resources through proper management. These lands may include potential future parklands, current parklands, lands suitable for commercial timber, and lands suitable for outdoor recreational activities. Most of the study area is within the Resource Subzone.

- The objective of the General Subzone is to designate open space where specific conservation uses may not be defined, but where urban use would be premature (DLNR, 2009). The Haleakalā Observatories and the proposed ATST facility are located within the General Subzone.

Each subzone has a set of identified land uses which may be allowed by discretionary permit. Most identified land uses require a discretionary permit or approval from the DLNR. In the case of the Conservation District, a Conservation District Use Permit is typically required before the area can be developed.

The portion of the study area within the Conservation District is primarily unencumbered and undeveloped. This area also includes a parcel given by the State in fee to the University of Hawai‘i under Executive Order 1987 and two small adjacent properties. The two small adjacent properties host facilities of the U.S. Department of Energy, U.S. Coast Guard, the Federal Aviation Administration, the Maui Police Department, the Federal Bureau of Investigation, and other agencies. Land adjacent to the proposed conservation area includes Haleakalā National Park immediately to the east, Kula Forest Reserve to the north and west, and the Kahikinui Forest Reserve to the west (**Figure 2.1-1**).

The 18.166 acres of land within the conservation area given to the University of Hawai’i is the site of HO and is considered one of the prime sites in the world for astronomical and space surveillance activities (NSF, 2010). Currently HO contains seven existing observatories, including astronomical facilities and the Air Force Maui Space Surveillance Complex. Within Park lands, the Park Road is primarily utilized by visitors to the Park. Hosmer Grove, Park Headquarters Visitor Center, Halemau’u Trailhead, Leleiwi Overlook, Kalahaku Overlook, Haleakalā Visitor Center (or Pa Ka’oao Observation Station), and Pu‘u ‘Ula‘ula Overlook are spots along the Park Road frequented by visitors to the Park. Visitor traffic also includes a large number of buses. Traffic is described in further detail in Section 2.7. The Park Road also provides the only access to HO lands. The summit area is sacred to Native Hawaiians and is used for traditional cultural practices. The HO property, while restricted from general public access, is not restricted to Native Hawaiians entering for the purpose of engaging in traditional and cultural practices. Native Hawaiians are welcome to enter HO at any time, as reflected by a sign, in Hawaiian, at the entrance to HO.

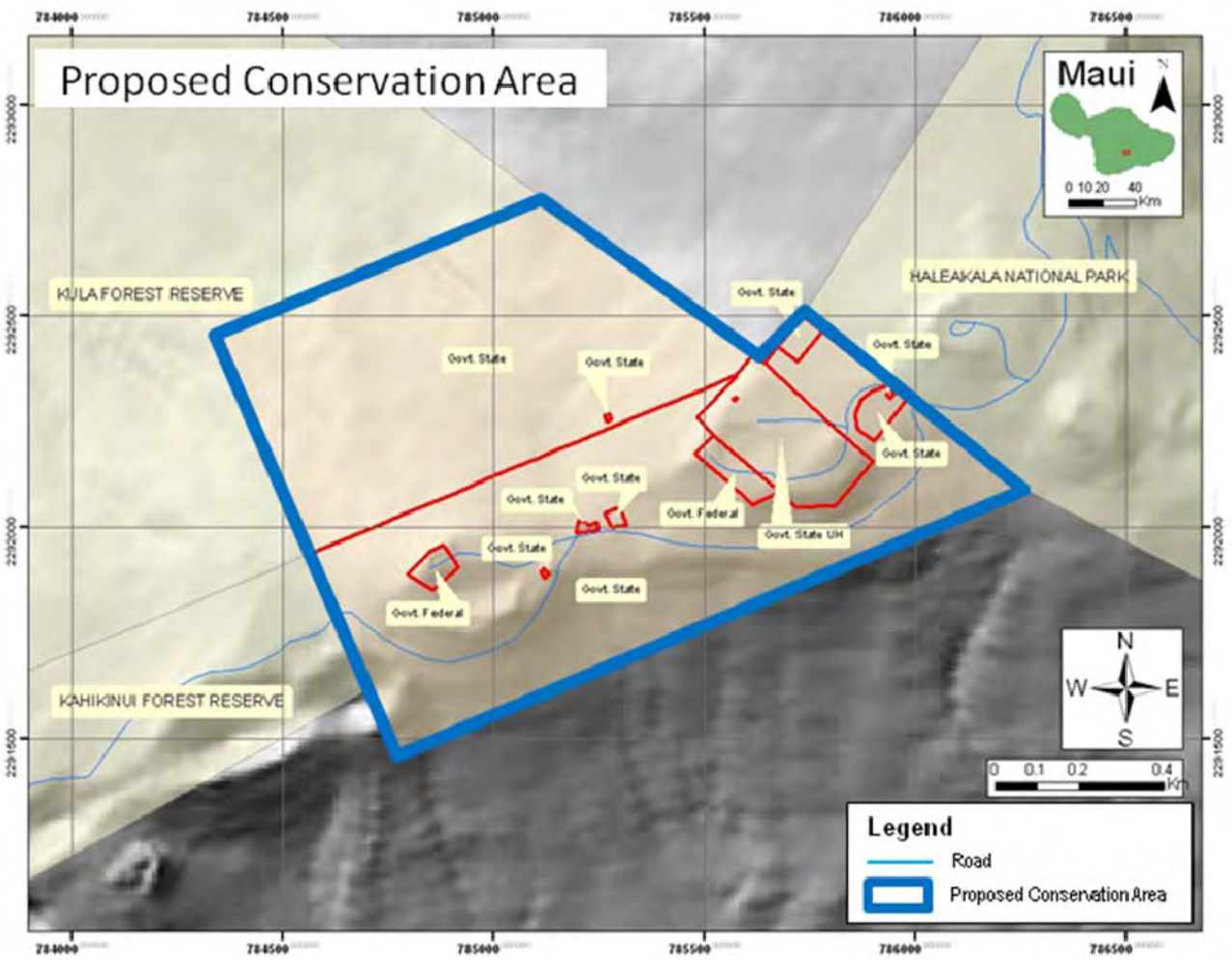


Figure 2.1-1. Proposed Conservation Area and Adjacent Land Uses.

Haleakalā National Park lies to the east of the proposed conservation area. This national park is managed by the National Park Service and includes over 33,230 ac (NPS, 2010a). Visitors come to the Park to enjoy volcanic landscapes, sub-tropical rain forests, and backcountry hiking. Visitor experience is discussed further in Section 2.5.

The adjacent Kula and Kahikinui Forest Reserves were created as a public-private partnership to protect and enhance forested mauka lands, which are also known as upland forests, for the wide variety of public benefits and values they provide. This land is managed by DOFAW. The public is generally welcome within the reserves. Through directives and guidance of H.R.S., Chapter 183 and associated Hawai‘i Administrative Rules (HAR; Chapter 104), DOFAW uses its resources to protect, manage, restore, and monitor the natural resources. As part of the original intention of the forest reserve system, DOFAW also provides recreational and hunting opportunities; aesthetic benefits; watershed restoration; native, threatened, and endangered species habitat protection and management; cultural resources; and fire protection, among many others (DLNR, 2010).

2.2 Cultural, Historic, and Archeological Resources

As part of an environmental assessment and documentation supporting the Section 106 compliance process, potential impacts to cultural, historic, and archeological resources are evaluated. Cultural resources are defined as "districts, sites, buildings, structures, and objects for the National Register of Historic Places and [are categorized] as archeological resources, cultural landscapes, structures, museum objects, and ethnographic resources," and "contain significant information about a culture and are tangible entities or cultural practices" (NPS, 1998). The term historic resources includes districts, sites, structures, or landscapes that are significant in American history, architecture, engineering, archeology or culture (NPS, 1998). Archeological resources are defined as "any material remains or physical evidence of past human life or activities which are of archeological interest, including the record of the effects of human activities on the environment" (NPS, 1998).

The region of influence and area of potential effect for cultural, historic and archeological resources includes the area within the 328-acre conservation area and directly along the Park Road, as well as the 10-acre Park Operations area near the Park entrance station. Resources in the project area include cultural and archeological resources within the summit area of Haleakalā. There have been numerous studies which have documented and determined the historic significance of the cultural, historic and archeological resources on Haleakalā. Haleakalā means "house [used by] the sun" and has been associated with the demigod Māui's snaring the sun to slow its transit across the sky and lengthen the day (Pukui and Elbert, 1986; Tomonari-Tuggle and Tuggle, 2006:37-38).

A number of traditional cultural practices are also conducted within the study area. These practices require silence and solitude and may also require uninterrupted view place and sacred space. The sign at the entrance to HO states that Native Hawaiians are welcome to enter to conduct their traditional cultural practices within HO. The NPS also supports the perpetuation of traditional cultural practices within areas of Haleakalā National Park, as appropriate under NPS policy.

Historically significant archeological resources found during past studies on Haleakalā include sites traditionally used by adze-making specialists, by *kāhuna* for religious ceremonies, and by commoners in association with burials and disposal of the *piko* of newborn infants. The natural resources of Haleakalā were also utilized by Native Hawaiians. Rock was quarried along the west rim of Haleakalā crater and the slopes below the summit were used by Native Hawaiians for the collection of wood, bird feathers, and other forest products (Allen, 2010). Resources associated with these types of activities that have been found on Haleakalā include enclosures, caves, cairns, platforms, and a limited number of adze production workshop sites (Carson and Mintmier, 2007). Most of the sites found on the summit would have been used to provide shelter from the area's winds and cold.

The Haleakalā National Park roadway has been determined eligible for listing in the National Register of Historic Places (NRHP**)** as a historic cultural landscape with contributing historic features (**Table 2.2-1**). In addition, the Park road corridor is within the boundaries of the Crater Historic District, which is listed on both the State Inventory of Historic Places (SIHP 50-50-11-12-1739) and on the NRHP. All eligible cultural, historic, and archeological resources within the Crater Historic District, even if not formally listed, are protected and preserved as though they were formally listed on the NRHP.

The period of historical significance for the Park road corridor extends from 1933, when development began to provide access to additional views of the Haleakalā Crater in addition to those provided by White Hill, to 1966, when the improvements and expansions of development modes (such as Pu'u 'Ula'ula) along the road designed to enhance the visitor's access to the Haleakalā Crater were built (NSF, 2009). The 10.6-mile portion of the highway within the Park boundaries was designed by the Bureau of Public Roads between 1925 and 1933 with input from the Hawai'i National Park superintendent and NPS landscape architects. Road construction on this segment of the road began in

1933 and was completed in 1935 with improvements made at Pa Kaʻoao (White Hill) and the Kalahaku Overlook. (NSF, 2009).

Table 2.2-1. Historic Structures within the Proposed 10-acre Nēnē Holding Pen Site.

LCS ID #	Historic Structure Name	Current Structure Name and Number
58292	Explosives Storage	P-14
58433	Garage	Garage and Storage, HQ-21
58638	Radio Building	Laboratory and Offices, HQ-16
58657	Powerhouse	Paint Storage, HQ-20
92670	Barracks	Resource Management Offices, HQ-17
92671	Barracks	Maintenance Offices and Shop, HQ-18
759229	Haleakalā Park Road	

Notes:
LCS = List of Classified Structures.
P-14, HQ-16, 17, 18, 20 and 21 are eligible for listing in the NRHP under Criterion A.
Park Road is eligible for listing under NRHP under Criteria A and C.

The 10-acre Park Operations area wherein the proposed nēnē pen would be installed also is located within the Crater Historic District. Based on past archeological surveys (Carson and Mintmier, 2006; Dye and Rosendahl, 1977; Komori and Oshima, 1977; Rosendahl, 1975a, 1975b; and Soehren, 1963) of front country areas in the Summit District of the Park, there is one archeological site located in or near the proposed nēnē pen site: SIHP Site #50-50-11-3650. This site is comprised of two features, an enclosure and a long wall, probably related to cattle ranching in the historic era (i.e., late 1880s). This site is eligible for listing in the National Register of Historic Places under criterion D as described in 36 CFR Part 60.4, which applies to properties that have yielded, or may be likely to yield, information important in prehistory or history. Site #50-50-11-3650 is located more than 200 feet (60 meters) from the proposed location of the 10-acre Park Operations area where the proposed nēnē pen would be located.

Six historic structures are located within the 10-acre Park Operations area that have been determined eligible for listing in the National Register of Historic Places through consultation with the Hawaiʻi State Historic Preservation Officer (**Table 2.2-1**). These structures are listed in the National Park Service List of Classified Structures. The closest historic structure to the to the proposed nēnē pen area is HQ-21, which is more than 100 feet (30 meters) from the horse pasture where the pen would be located.

A new cultural, historic and archeological resources study was completed in May 2010 to provide supplemental information specific to the location of the proposed conservation fence (i.e., the boundary of the conservation area). The survey area was a corridor 46 ft wide and approximately 2.7 miles long, following the proposed fence corridor, encompassing 328 acres around the HO site

(Allen, 2010). Survey findings include 5 isolated artifacts (ISA), 22 new features, and 6 previously identified features.

The six previously identified features are part of Site 50-50-11-5438, a likely short-term habitation site comprising a rock-walled enclosure, terraces, and a rock mound. Rock piles and one *ahu* (cairn) were also recorded. These features suggest traditional Hawaiian activities including hunting and religious practices occurred within the project area (Allen, 2010). This site is eligible for nomination to the National Register of Historic Places under significance criterion D (36 CFR Part 63) as it may yield information important in prehistory and history and retains sufficient integrity to convey its significance. Based on the May 2010 study, the six isolated artifacts and 22 features are not eligible for nomination to the National Register of Historic Places. Moreover, none of these resources are listed on the State Inventory of Historic Properties.

The isolated artifacts include basalt fragments and sling stones. The basalt fragments may be the result of tool production, curation of tool raw material, or building material. These were identified as artifacts by material type, a dark gray fine-grained basalt not naturally present in the vesicular basalt outcrops available locally.

Table 2.2-2 lists the isolated artifact finds located within or near the proposed exclusion fence corridor that were documented as part of the May 2010 study.

Table 2.2-2. Isolated Artifact Finds.

Site/Feature Designation	Artifact Number	Artifact Type	General Description	Distance to Fence (in meters)
Site 5438	ISA 1	Sling stone	Oval shaped, 5.5 x 4.5 cm, of heavy grey basalt	15.0 m
Site 5438	ISA 2	Basalt fragment	Dark grey, fine grained slab, 25 x 15 x 2 cm	4.6 m
Site 5438	ISA 3	Sling stone	Grey, heavy basalt, 3.6 cm diameter sphere	13.2 m
Feature 13	ISA 4	Basalt fragment	Rectangular, dark grey, fine-grained basalt, 5.2 x 2.5 x 1cm	7.7 m
Feature 13	ISA 5	Basalt fragment	Rectangular, dark grey, fine-grained basalt, 6.2 x 4.6 x 1cm	7.7 m

Note:
Site 5438 is a previously identified site consisting of a rock-walled enclosure, 4 terraces, and a rock mound.
Source: Cochrane, 2010

As previously stated, 22 newly identified features were recorded during the survey and six previously identified features within the 14-m-wide corridor were also located. **Table 2.2-3** provides a summary of the features documented as part of the May 2010 study, including those both newly discovered and those previously documented. All but six of these 33 identified features are within the conservation area; the others are located in close proximity to the boundary of the State lands.

1

Table 2.2-3. Newly Discovered and Previously Documented Archeological Features.

Site Designation	Feature Number	Feature Type	Dimensions (L x W x H in meters)	General Description	Possible Function	Distance to Fence (in meters)
Site 5438	A	Rock enclosure	2.8 x 1.8 x 1.2	Two, 3-6 course, rock wall sections of angular to sub-angular vesicular basalt cobbles & boulders partially enclosing approx. 4 m^2 & abutting raised bedrock outcrop; fence line passes through Feature A	Wind-break/ short-term habitation	0.0
Site 5438	B	Terrace	2.2 x 1.6x 1.2	Approx. 3.25 m^2 level surface retained by up to 7 course rock wall of angular to sub-angular vesicular basalt cobbles & boulders & abutting raised bedrock outcrop	Wind-break/ short-term habitation	0.0
Site 5438	C	Terrace	2.6 x 1.2 x 0.4	2-3 course retaining wall of angular to sub-angular vesicular basalt cobbles & boulders abutting raised bedrock outcrop	Wind-break/ short-term habitation	3.25
Site 5438	D	Terrace	2.1 x 1.0 x 0.4	1-2 course retaining wall of angular to sub-angular vesicular basalt cobbles & boulders	Short-term habitation	1.9
Site 5438	E	Terrace	1.6 x 1.2 x 0.25	Alignment of angular to sub-angular vesicular basalt cobbles & boulders retains level area abutting raised bedrock outcrop	Wind-break/ short-term habitation	5.0
Site 5438	F	Rock wall	2.2 x 1.0 x 0.8	"C" shaped, 2-4 courses angular to sub-angular basalt cobbles & boulders	Wind-break/ *'Ua'u* trap	11.0
Site 5438	1	Survey marker	0.06 x 0.06 x 0.17	Pipe set in concrete block	Survey marker	9.1
--	2	Rock pile	0.5 x 0.5 x 0.47	Angular to sub-angular vesicular basalt cobbles & boulders	Boundary marker	18.2
--	3	Rock pile	0.6 x 0.5 x 0.7	Angular to sub-angular vesicular basalt cobbles & boulders placed on sub-angular vesicular basalt boulder	Boundary marker	5.5
--	4	Rock enclosure	1.8 x 2.2 x 1.02	Two, 4-10 course, rock wall sections of angular to sub-angular vesicular basalt cobbles & boulders partially enclosing approx. 2.3 m^2, with large, approx 1.5 m long, boulders as third wall	Wind-break/ short-term habitation	20.9
--	5	Rock wall	1 x 0.4 x 0.7	Up to 7 course wall of angular to sub-angular vesicular basalt cobbles & boulders anchored to large, approx 0.9 m boulder	Wind-break	23.3
--	6	Rock wall	1.7 x 0.3 x 0.5	Up to 3 course wall of angular to sub-angular vesicular basalt cobbles & boulders	Wind-break	28.0
--	7	Rock wall up to 4 course	0.9 x 0.2 x 0.5	Wall of angular to sub-angular vesicular basalt cobbles & boulders	Wind-break	32.0
--	8	Rock enclosure	1.9 x 1.7 x 1	Up to 4 course wall of angular to sub-angular vesicular basalt cobbles & boulders partially enclosing an approx. 2 m^2 circular area with down-slope perimeter of bedrock and boulders	Wind-break/ short-term habitation	27.1

Table 2.2-3. Newly Discovered and Previously Documented Archeological Features.

Site Designation	Feature Number	Feature Type	Dimensions (L x W x H in meters)	General Description	Possible Function	Distance to Fence (in meters)
--	9	Enclosure	3.5 x 1.7 x 0.8	"M" shaped enclosure, 2-7 course rock walls of angular to sub-angular vesicular basalt cobbles & boulders utilizing bedrock in construction; two enclosed areas are approx. 1.5 m^2 and 1.75 m^2	Wind-break/ short-term habitation	32.6
--	10	Rock pile	0.8 x 0.8 x 0.6	Angular to sub-rounded vesicular basalt cobbles & boulders stacked in pile	Boundary marker	11.1
--	11	Rock wall	1.3 x 0.3 x 0.9	Angular to sub-rounded vesicular basalt cobbles & boulders, up to 5 course, staked on bedrock boulders	Wind-break/ *'Ua'u* trap	17.0
--	12	Rock wall	0.6 x 0.25 x 0. 35	Angular vesicular basalt cobbles & boulders	Wind-break	11.2
--	13	Rock wall	1.6 x 0.4 x 0.8	Up to 3 courses of angular to sub-rounded vesicular boulders stacked on boulder bedrock	Wind-break	7.7
--	14	Rock wall	2.7 x 0.6 x 1.3	Up to 5 courses of angular to sub-rounded vesicular boulders	Wind-break	11.9
--	15	Rock wall	1.9 x 0.4 x 0.6	Slightly "C" shaped wall of angular to sub-rounded vesicular cobbles and boulders place on bedrock	Wind-break	1.7
--	16	Rock wall	1.9 x 0.4 x 0.7	Up to 7 courses of angular to sub-rounded vesicular cobbles and boulders placed on boulder bedrock	Wind-break	6.7
--	17	Rock pile	1.0 x 1.0 x 0.5	Angular to sub-rounded vesicular cobbles and boulders placed in pile	Boundary marker	11.2
--	18	Upright stone/ahu	2.0 x 1.0 x 1.0	55 cm tall vesicular basalt upright atop pile of angular to sub-rounded vesicular cobbles and boulders	Religious performance site/ boundary marker	1.7
--	19	Rock wall	1.0 x 0.3 x 0.4	Up to 5 courses of angular to sub-rounded vesicular basalt wedged between boulder bedrock	Wind-break/ *'Ua'u* trap	13.3
--	20	Retaining wall	1.25 x 0.3 x 0.4	Up to 5 courses of angular to sub- angular vesicular basalt cobbles and boulders retaining sediment forming level area upslope, to south and in lee of large bedrock outcrop	Short-term habitation	30.4
--	21	Rock pile	0.8 x 0.7 x 0.8	Single sub-angular vesicular boulder placed atop very large boulder	Boundary marker	4.8
--	22	Rock pile	0.3 x 0.15 x 0.2	Single angular vesicular boulder placed atop bedrock	Boundary marker	8.3

Note:
Site 5438 is a previously identified site consisting of a rock-walled enclosure, 4 terraces, and a rock mound.
Source: Cochrane, 2010

1

2.3 Biological Resources

Biological resources consist of vegetation and wildlife, and their habitats. Threatened and endangered species, and the habitats upon which they depend, are protected under the Endangered Species Act. The ESA requires federal agencies to demonstrate that any action they authorize, fund, or carry out will not adversely impact a threatened or endangered species, or destroy or adversely modify any critical habitat for that species. Threatened and endangered species are further protected under Hawai‘i state law (H.R.S. §195D-4), as administered by the State of Hawai‘i Department of Land and Natural Resources, Division of Forestry and Wildlife. H.R.S. 195D-4 states that any endangered or threatened species of fish or wildlife recognized by the ESA shall also be so deemed under H.R.S. 195D.

The study area for biological resources is defined as the land potentially affected by the proposed ATST project conservation measures and includes the 328-ac conservation area, the Park Road corridor, and the 10-acre Park Operations area near the entrance station wherein the proposed nēnē pen would be located. The vegetation and wildlife within this area are generally consistent with those at HO, as described in the ATST EIS (NSF, 2009). Further detail regarding the biological resources within the study area was provided in the Draft Habitat Conservation Plan (HCP) for Construction and Operation of the Advanced Technology Solar Telescope (NSF, 2010), which addressed the potential take of the federally-endangered Hawaiian petrel. In addition, subsequent to the HCP and in support of this project, an *Arthropod Habitat Reconnaissance and Assessment* field survey and report were completed (Appendix A). This survey profiled the habitat and botanical communities within the conservation area and searched for the presence of arthropods known to occur in the region. A summary of the biological resources present within the study area is presented below, based on the information contained in these reports.

2.3.1 Vegetation

Mapping of the existing vegetation conducted by the U.S. Department of Interior in July 2009 indicated that 74 percent of the conservation area is classified as barren, 11 percent is vegetated by Hawai‘i montane-subalpine dry shrubland, less than one percent is vegetated by Hawai‘i alpine dwarf shrubland, and the remaining 14 percent is classified as developed (including developed, open space, developed low intensity, and developed medium intensity) (NSF, 2009). In general, shrublands are sparsely vegetated with dwarf native shrubs. Vegetation cover and stature are limited by harsh environmental conditions. Vegetation cover is generally less than ten percent and vegetation is generally shorter than three feet tall (IfA, 2005).

Dominant species documented within the conservation area include *Styphelia tameiameiae* (pukiawe)*; Vaccinium reticulatum* (ohelo); *Argyroxipbium sandwicense* (‘ahinahina; or Haleakalā silversword); *Dubautia menziesii* (naenae); herbs such as *Tetramolopium humile* (tetramolopium); and grasses including *Agrostis sandwicensis* (bentgrass), *Deschampsia nubigena (*hairgrass), and *Trisetum glomeratum* (mountain pili). Three species of native ferns (*Asplenium adiantum-nigrum* [iwaiwa], *A. trichomanes* ssp. *densum* [oalii], and *Pellaea ternifolia* [kalanoho]) are found tucked into rock crevices and overhangs and on steep slopes. Recent surveys at the HO site also found new native species *Dryopteris wallichiana, Pteridium aquilinum* var. *decompositum*, and *Silene struthioloide*, all of which are presumed to have a wider distribution into the proposed conservation area. These same recent surveys also found newly discovered non-native *Ageratina adenophora, Bromus diandrus, Conyza bonariensis, Dactylis glomerata, Festuca rubra, Pennisetum clandestinum, Trifolium repens,* and *Vulpia myuros* (IfA, 2005, as cited in NSF, 2010).

Two federally- and State-listed plant species occur in the summit area of Haleakalā; these are further described in Section 2.3.3.

The 10-acre Park Operations area is located within the subalpine shrublands vegetative zone which typically is dominated by pukiawe (*Styphelia tameiameiae*), mamane (*Sophora chrysophylla*) and ‘ohelo (*Vaccinium reticulatum*). Alien grasses such as velvetgrass (*Holcus lanatus*) and sweet vernalgrass

(*Anthoxanthum odoratum*) are commonly mixed in with these native shrubs. Based on the vegetation survey conducted by Park botanists within the project area in February 2006, all of these native and alien species are present within this area. Only 19 percent (or 7 out of 37) of all plant species identified were native -- which is to be expected in a highly disturbed area. The area contains non-native trees (Monterey pine [*Pinus radiata*] and blue gum [*Eucalyptus globulus*]) and many non-native weeds (e.g., blackjack [*Bidens pilosa*], Kikuyu grass [*Pennisetum clandestinum*]).

2.3.2 Wildlife

Fauna within the conservation area consist of bird, mammal, and invertebrate species, including several federally- and State-listed species; these are further described in Section 2.3.3.

Avian species within the conservation area generally include common, introduced bird species. Other introduced fauna occurring in the summit area include the feral goat (*Capra* sp.), feral house cat (*Felis catus*), house mouse (*Mus musculus*), Polynesian rat *(Rattus exulans),* and the roof rat (*Rattus rattus*). The Indian mongoose (Iole manakuke, *Herpestes javanicus)* is also occasionally observed on the summit.

Invertebrates within the conservation area include a variety of insect and spider species. A 2003 inventory of the adjacent HO site identified 58 arthropod species, 29 of which are indigenous to Hawai‘i (Pacific Analytics, 2003); additional sampling conducted in June 2009 identified a total of 71 species. Surveys near the entrance station to the road identified 60 arthropod species. A recent survey of the conservation area identified a variety of arthropod species including an endemic carabid beetle (*Mecyclothorx*) and two rare species of longhorn beetles of the genus *Plagithmysus*, but generally found the area to be less diverse than that in the adjacent HO. No federally- or State-listed invertebrate species were detected during this survey (Pacific Analytics, 2010).

Based on observations and anecdotal information from Park records, five native bird species, in addition to the federally endangered nēnē, occur or are likely to occur within the 10-acre Park Operations area: kolea or Pacific golden plover (*Pluvialis fulva*), Maui ‘amakihi (*Hemignathus virens wilsoni*), Maui ‘alauahio (*Paroreomyza montana newtoni*), ‘i‘iwi (*Vestiaria coccinea*), and ‘apapane (*Himatoine sanguinea sanguinea*). However, non-native bird species predominate. In addition, wildlife surveys by Park staff have confirmed the presence of 10 non-native mammals in the Park Operations Area. Black rats (*Rattus rattus*), Norway rats (*Rattus norvegicus*), Polynesian rats (*Rattus exulans*), mongooses (*Herpestes auropunctatus*), house mice (*Mus musculus*), axis deer (*Axis axis*), feral cats *(Felis catus*), dogs (*Canis familiaris*), pigs (*Sus scrofa*) and goats (*Capra hircus*) either reside in or traverse through the 10-acre area. Based on limited surveys, a total of 128 insect species have been identified in the area (Kaholoa‘a, 2006); only 47 percent of these species were native. The Park Operations area is highly disturbed, and the presence of Argentine ants (*Linepithema humile*) is associated with declined populations of many native insects (NSF, 2009). The most abundant insects collected in the area were non-native flies (Kaholoa‘a 2006).

2.3.3 Threatened and Endangered Species

Flora

No federally- or State-listed plant species were observed within the study area. Critical habitat is, however, present for two plant species: ‘ahinahina, or Haleakalā silversword, which is federally listed as threatened, and many-flowered geranium (nohoanu, *Geranium multiflorum*), which is federally-listed as endangered. A total of approximately 2.5 ac (1 ha) of *Geranium multiflorum* critical habitat and 1,031.6 ac (417.4 ha) of Haleakalā silversword critical habitat occur within the study area adjacent to the road and within the proposed conservation area. Primary threats to this habitat include ungulate impacts, such as trampling and browsing, and invasion by non-native plant species.

Fauna

The Hawaiian petrel, Hawaiian goose, and Hawaiian hoary bat are known to occur within the study area. The nēnē is highly unlikely to occur in the 328-ac conservation area, but is known to occur along the Park Road corridor and within the 10-acre Park Operations area. Nēnē use the Park Operations area throughout the year for flocking, feeding, nesting, and rearing young. However, the site of the proposed pen is not situated near nēnē nest locations. The Hawaiian hoary bat may occasionally forage, but is not known to reside in the proposed conservation area. The Hawaiian hoary bat uses the Park Operations area throughout the year for foraging, and may also use the Park Operations area to roost and nest.

Hawaiian Petrel

The federally endangered Hawaiian petrel is a medium-sized seabird belonging to the family Procellariidae, which includes shearwaters, petrels, and fulmars. The Hawaiian petrel nests in high elevation areas of Haleakalā in burrows under rock outcroppings, along talus slopes, on cliffs, or along edges of lava flows where there is suitable soil underneath the rock substrate for excavation of tunnels. Burrows average a depth of three to six feet, and sometimes reach a depth of 15 feet or more. At Haleakalā nests are typically found in rock crevices in sparsely vegetated, xeric habitat. Petrels spend much of their time at sea feeding on squid, small fish, and crustaceans (NSF, 2010).

The petrel has a well-defined nesting season. The birds arrive in their colonies in late February, visiting their nests regularly at night for a period of burrow maintenance work and social activity. Pairs return to the same burrow each year. They then return to the sea, occasionally visiting their burrows at night, until late April when egg-laying commences. Egg-laying and incubation starts from mid-March to mid-April. Incubation typically ranges from 45 to 58 days. Both adults incubate the egg and feed the chicks. After a brief brooding period, both adults forage at sea and will have absences from the nest. Petrel chicks fledge between late September and late November, after an average of 111 days after hatching. Colonies generally are empty by the end of November. Three months occur between the end of one breeding season and the beginning of the next (NSF, 2010)

Non-breeding birds also inhabit the colony from during the incubation period, from February until late July. Many of these are young birds gaining experience seeking mates and prospecting for nest sites; the remaining portion are experienced breeders that did not elect to breed. Non-breeders and failed breeders typically begin leaving the colony once the eggs have hatched (NSF, 2010).

As more thoroughly explained in Section 3.3 of the FEIS, there are 30 known petrel burrows in the vicinity of HO. As discussed above, following the issuance of the FEIS, NSF, the State, USFWS, the NPS, and IfA entered into additional consultations to discuss the potential take of petrels associated with the construction and operation of the ATST. The result of those consultations was the draft HCP that is currently under review by the public (available online at http://hawaii.gov/dlnr/dofaw/pubs/DRAFT_HCP_ATST_OEQC.pdf). The draft HCP concludes that up to 35 petrels will be taken if the ATST is constructed and operated.

There are 203 known Hawaiian petrel burrows located in the proposed 328-ac conservation area, 31 of which occur within 1,250 feet of the ATST construction site (**Figure 1-2**). Burrow clusters and individual burrows to the west and northwest of the ATST construction site have not been highly used by nesting petrels, and approximately 5 to 10 burrows, mostly inactive, are 500 to 800 feet from the construction site to the west. Approximately 61 of the burrows in the 328-ac conservation area are known to be active (NSF, 2010), but many more active burrows are likely to exist within the conservation area. An additional petrel burrow survey is planned prior to the construction of the conservation fence.

Known threats to the Hawaiian petrel in the study area include predation by introduced cats, rats, mongoose, and non-native owls; collision with anthropogenic structures and objects (fences, buildings, utility poles, and vehicles); attraction and confusion by anthropogenic light sources; habitat degradation,

such as burrow collapse by feral ungulates; and disturbance from vehicles, hikers, road resurfacing, and other human activities. Predation accounts for 36 percent of mortality of the petrels, 41 percent of which is caused by rats (NSF, 2010). Hawaiian petrels are believed to navigate by stars, and are confused by manmade light sources. Birds have been known to fall to the ground from exhaustion after flying around lights. During the 2006 nesting season, petrel burrow cameras captured video of feral ungulates and rats visiting burrows at the HO colony. An adult was observed striking the GTE building, northeast of the proposed ATST, while a juvenile petrel died after flying into a rock outcropping on the Haleakalā Crater on its fledgling flight to sea (NSF, 2010).

After the placement of a new barbed wire fence around the Park in the 1980s, 26 dead petrels were recovered along the fence over a two-year period. However, only 15 petrel burrows were known to exist within the Park before the fence, and now, possibly due to ungulate exclusion from the area and predator control implemented by the Park, thousands of burrows now exist in the area. Within two years the barbed wire was removed from the fence. Since the removal of the barbed wire from the fence, no dead petrels have been found along the fence (NSF, 2010).

Nēnē

The nēnē, or Hawaiian goose, is a federally- and State-listed endangered bird species found on the islands of Hawai'i, Kaua'i, and Maui. The nēnē can be found from sea level to approximately 8,200 feet in habitats such as non-native grasslands; sparsely vegetated, high-elevation lava flows; cinder deserts; native alpine grasslands and shrublands; open native and non-native alpine shrubland-woodland community interfaces; mid-elevation (from approximately 2,300 to 3,900 feet) native and non-native shrubland; and early successional cinder fall. No critical habitat has been established for the nēnē. The nēnē is known to fly over HO, but does not feed in the area, as HO is out of the known nēnē feeding range. Nēnē are browsing grazers and feed on over 50 species of native and non-native plants. The nēnē does occur along the Park road corridor from the Park entrance to Leleiwi Overlook, and sometimes above, as well as outside the Park on the lower slopes of Haleakalā (NSF, 2009).

Nesting for the nēnē occurs from October to March. Nest sites typically are found on the ground in sparsely to densely vegetated beach strands, shrublands, grasslands, and woodlands on well-drained soils (NSF, 2009).

The primary causes of the decline in population of the nēnē were habitat loss, hunting during the nēnē breeding season, and adverse impacts caused by non-native mammals introduced during the Polynesian and western colonization. Current threats include predation, nutritional deficiency due to habitat degradation, lack of lowland habitat, human-caused disturbance, road-kills, behavioral problems, and inbreeding depression. Dogs, cats, mongoose, roof rats, and pigs are known to prey on nēnē, while feral cattle, goats, pigs, and sheep are known to alter and degrade the nēnē habitat (NSF, 2009).

Current potential threats, based on the USFWS classification of factors that may negatively affect a species, leading to its decline, as identified in Section 4(a) of the ESA, include: (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) over-utilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; and (5) other natural or manmade factors affecting its continued existence. Relating to the last threat, an average of one nēnē per year is killed by vehicles along the Park Road (NSF, 2009).

The USFWS Draft Revised Recovery Plan for the nēnē depicts a high degree of threat to this species, but also indicates that there is a high recovery potential due to the fact the nēnē does not interbreed with domestic geese and does not conflict with regular human activities.

Hawaiian Hoary Bat

The Hawaiian hoary bat resides on the lower slopes of Haleakalā. On the island of Hawai‘i, most observations have been from between sea level and 7,500 feet above sea level, although individuals have been recorded at elevations as high as 13,000 feet. Bats have been detected near the Park Headquarters Visitor Center and Hosmer Grove (Frasher et al., 2007). Even though several sightings have been reported near HO, it is unlikely that the bat is a resident of the area, due to the relatively cold summit temperatures and the lack of flying insects in the area, which is the preferred food source (AFRL, 2005). It is believed that bats typically depart the roost shortly before sunset and return before midnight, although this is based on a small number of observations (USFWS, 1998). Bats are most often observed foraging in open areas, near the edges of native and non-native forests, over both marine and fresh open water, and over lava flows.

Habitat requirements may vary seasonally and with reproductive condition, but this is not clear. Breeding probably occurs mostly between September and December, with young being born in May or June. Hawaiian hoary bats do not migrate off-island, although seasonal elevation movements and island-wide migrations may occur. The availability of roosting sites is believed to be a major limitation in many bat species, but other threats to this subspecies include direct and indirect impacts of pesticides, predation, alteration of prey availability (introduced insects), and roost disturbance (USFWS, 1998). The recovery plan for the Hawaiian hoary bat (USFWS, 1998) suggests the subspecies is experiencing a moderate degree of threat and has a high potential for recovery. Critical habitat has not been designated for this species (NSF, 2010).

2.4 Visual Resources and View Plane

Approximately 1.6 million people are drawn to Haleakalā National Park each year for its spectacular views (NPS, 2010b). The slopes of the Park are covered with richly colored ash layers. Views from the Park toward other parts of the island of Maui are highly dependent on atmospheric conditions and time of day. They tend to be best in the early morning before the daytime cloud inversion layer builds up and in the late afternoon after the inversion layer dissipates. On the clearest days, visitors have views across Maui and beyond. On cloudless nights, Haleakalā summit provides excellent conditions from which to view the night sky and outer space due to the relatively clean atmosphere, the lack of degrading light sources, and the position above the cloud inversion layer.

2.5 Visitor Use and Experience

Haleakalā National Park encompasses approximately 33,230 acres and attracts more than one million visitors annually. The three visitor centers, Park Headquarters Visitor Center, Haleakalā Visitor Center, and Kipahulu Visitor Center, feature cultural and natural history exhibits and vista points. There are many hiking, picnicking, and camping opportunities throughout the Park. Hikes may range from short walks to multi-day backpacking excursions. A survey conducted in 2000 found that visitors engage in hiking and camping in the Park to experience solitude, the sounds of nature, a sense of remoteness, lack of human development, and the Park’s flora and fauna (Lawson et al., 2008).

There are three general Park areas accessible to tourists: the Summit Area, the Wilderness Area, and Kipahulu. The Summit Area includes Haleakalā Visitor Center, which is located on the rim of the crater near the Pa Ka‘oao cinder cone. It also includes the Pu‘u ‘Ula‘ula Overlook which is located at the highest point of Haleakalā and is popular for sunrise and sunset viewing. Pu‘u ‘Ula‘ula Overlook and Haleakalā Visitor Center are the most visited parts of the Summit Area (Lawson et al., 2008). The Summit Area also includes the Leleiwi and Kalahaku Overlooks located along the Park Road (Highway 378, the main road by which visitors travel through the Park) north of the Pu‘u ‘Ula‘ula Overlook. Kalahaku Overlook features the rare ‘ahinahina (Haleakalā silversword) that draws many nature enthusiasts (NPS, 2009).

The Wilderness Area is comprised of Haleakalā Crater and Kipahulu Valley. The Kipahulu Area is located on the eastern side of the Park, near the coast. Neither of these locations would be affected by the proposed conservation measures.

The proposed conservation area is located adjacent to the southwest corner of the Park. The closest visitor facility, Pu‘u ‘Ula‘ula Overlook (Red Hill Lookout), is approximately a quarter-mile from the conservation area. The Haleakalā Visitor Center and Keonehe’ehe’e (Sliding Sands) Trailhead are less than a quarter-mile from the conservation area. The conservation area is also in close proximity to the Park Road.

2.6 Noise

Sound energy levels are measured in decibels (dB), a logarithmic unit of measurement that expresses the intensity of the sound energy level relative to a reference level, namely, the threshold of human hearing (0 dB). A-weighted decibel (dBA) sound measurements apply to the middle area of the sound frequency range, where humans and birds have the greatest sensitivity. Noise attenuation (i.e., reduction of noise as perceived by a listener) can be affected by distance from the noise source and terrain shielding. Sound measurements of a source (in dBA) are always associated with a distance. Typically, when the distance is doubled, without landscape or shielding effects, the sound level is reduced by 3 dBA.

The study area is zoned as a Class A district, defined as “all areas equivalent to lands zoned residential, conservation, preservation, public spaces, open space, or similar type” (HAR 11-46-4). The Class A district does not apply to Park lands. The maximum allowable noise levels for non-transportation-related sources within the Class A zone are 55 dBA during daytime hours (7 a.m. to 10 p.m.) and 45 dBA during nighttime hours (10 p.m. to 7 a.m.) at the property line. Noise limits are not to be exceeded more than 10 percent of the time in any 20-minute period and are adjusted upwards by 10 dBA for impulsive sources. Hawai’i does not exempt construction activities, but does allow for a permit for projects “in the public interest and which may be subject to reasonable conditions as the director may prescribe.”

Table 2.6-1 below provides an example of existing noise levels at Haleakalā along with other common sources for comparison.

Existing noise levels at the Haleakalā summit vary, depending on location, wind conditions, and operation of nearby sources. Moderate wind speeds at the Haleakalā summit can increase the baseline noise levels to 45 to 50 dBA. Based on previous noise measurements taken at HO, truck traffic is the primary mobile source of noise, while HVAC units including chillers and exhaust fans are the loudest stationary noise source (NSF, 2009). Backup generators at HO average 73 to 84 dBA, while construction-related vehicles average 82 to 93 dBA, both at a distance of 50 feet. Baseline noise levels in the Crater, absent wind or other ambient sources, typically are 10 dBA (NSF, 2009).

Traffic estimates at the entrance of Haleakalā National Park indicate that approximately 22 cars and 0.89 buses per hour (one-way traffic) utilize the Park Road (NSF, 2009). Based on this estimation the approximate daytime baseline noise from visitor traffic along the Park Road is 47 dBA, which is similar to a rural setting (NSF, 2009).

Table 2.6-1. Existing Noise Sources Within Study Area.

	Noise Source	Decibel (dBA) at 50 feet from source
1	Limit to human hearing	0 dBA
2	Closed audiometric booth / bottom of Haleakalā Crater	10 dBA
3	Rustling leaves, tall grass in a light to moderate wind, and typical daytime urban residential area away from major streets	35 to 55 dBA
4	Ambient noise in front of Hawaiian petrel burrow at Haleakalā Observatory Hawaiian petrel colony with 5 mph wind	55 to 68 dBA
5	Office, Restaurant, Library, toilet refilling its tank, air conditioning unit	60 dBA
6	Passenger car, traveling at 30 mph	65 dBA
7	Large barking dog	70 dBA
8	Passenger car, van, jeep at Haleakalā	71 to 75 dBA
9	Tour buses at Yosemite National Park	58 to 77 dBA
10	City bus	80 dBA
11	Tour buses at Haleakalā	77 to 91 dBA
12	Backhoe, earth movers	80 dBA
13	Crane	82 dBA
14	EPA maximum permissible truck noise level	83 dBA
15	Bulldozer	82 to 85 dBA
16	Robinson R22 or Eurocopter EC 130 Helicopter (used in the Park)	85 to 95 dBA
17	Jackhammer	97 dBA
18	Rockhammers / drills	99 dBA

Note:

This table presents approximate noise levels of ATST construction equipment and vehicles (at 50 ft [15 m]), in comparison to familiar noise levels humans hear.

Source: *Draft Habitat Conservation Plan for Construction and Operation of the Advanced Technology Solar Telescope at the Haleakalā High Altitude Observatory Site, Maui, Hawai'i* (NSF, 2010); Federal Aviation Administration Integrated Noise Model (INM) 6.2.

2.7 Transportation and Traffic

The proposed conservation area would be accessed by the Park Road (Highway 378), a two-lane paved road. The corridor along the Park Road is owned and managed by the National Park Service. The Park Road originates at the Park entrance and climbs 10.6 miles through the Park, terminating at the summit of Haleakalā. The entrance to HO is located here and general public access is restricted. However, Native

Hawaiians are welcome at any time to enter HO to participate in cultural and traditional practices. Conditions of the Park Road are further explained in the ATST EIS (NSF, 2009).

A Federal Highway Administration report indicated that the average traffic volume from 2004 to 2008 was 190,000 total vehicle trips annually, comprising approximately 443 daily passenger car trips and 30 daily bus trips. A 2003 traffic study found that approximately 48 vehicles enter and leave the HO daily (NSF, 2009).

As indicated by the traffic counts, visitors to the Park generate most of the traffic on the Park Road. The highest traffic volumes occur in the early morning hours when visitors arrive for the sunrise. High elevations combined with the steep grades and numerous switchback curves on the road limit vehicle speeds, particularly those of trucks and tour buses.

2.8 Air Quality

The State of Hawai‘i Department of Health (DOH) plans, operates and maintains the statewide ambient air quality monitoring network. Monitoring data are used for a variety of purposes including determining compliance with National Ambient Air Quality Standards (NAAQS), timely reporting of the U.S. Environmental Protection Agency’s (EPA’s) Air Quality Index (AQI), tracking and characterizing air quality trends, evaluating emission control strategies, and supporting health studies.

All areas in Hawai‘i are considered to comply with federal and State ambient air quality standards; no areas of Hawai‘i are classified as non-attainment or maintenance areas. Therefore, all of Maui, including Haleakalā, is currently an attainment area for EPA “criteria” pollutants, which include sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, lead, and certain forms of particulate matter. Furthermore, Haleakalā National Park has been designated a “Class I” attainment area under the Clean Air Act. This category the EPA reserves for the most pristine areas of the country in order to maintain the excellent level of air quality already attained.

2.9 Geology, Soils, and Topography

Haleakalā, the larger volcano on the eastern side of Maui, rises to 10,023 feet (3,055 meters) above sea level. The last eruption occurred at some time between 1650 and 1790. The project area is rugged and barren, consisting of lava and pyroclastic materials. Within a 4-mile radius of the summit, the elevation drops approximately 3,600 feet (1,097 meters), with an average slope greater than 30 percent. Over the course of Haleakalā’s formation, three distinct phases of eruption have taken place. The first, called the Honomanu Volcanic Series is responsible for the formation of Haleakalā’s primitive shield and most likely its three prominent rift zones. The second series, or Kula Volcanic Series, overlaid the previous Honomanu Series with its lava flows. Eruptions of this series were considerably more explosive than its predecessor, leading to the formation of most of the cinder cones along the three rift zones. A period of inactivity followed the Kula Series, during which time erosion began to predominate the formation of Haleakalā Crater by forming great valleys leading to the coast. After this long period of erosion, the final volcanic eruptions, called the Hana Volcanic Series, partially filled the deep valleys (NSF, 2009).

The proposed conservation area and the areas adjacent to the Park Road are covered with volcanic ejecta consisting of lava, cinder, and ash of the Kula and Hana Volcanic Series. There is no soil development in the immediate vicinity of Haleakalā summit. Soil development occurs with increased distance (greater than 1.5 miles) from the summit. Most of the area is situated on Cinder Land (rCl), which is thought to be of the Kula period of volcanism (NSF, 2009). A foundation investigation conducted in1991, in the northern area of HO revealed that cinder in this area is underlain by five feet of volcanic clinker and 16 feet of volcanic cinder.

The topography and soils on the proposed nēnē pen site have been highly disturbed by the construction of the U.S. Amy base camp between 1941 and 1942 and subsequent use by the Army, private owners, and finally NPS. The topography is gently sloping and ranges in elevation from 6,760 to 6,800 feet above mean sea level, and the soils can be characterized as Laumaia-Kaipoioi-Olinda association (Foote et al., 1972). This association consists of well-drained, medium-textured soils which developed in material weathered from volcanic ash. The soils derived from volcanic ash typically consist primarily of clayey silt to sandy silt. Based on soil investigations conducted within the project area, areas of artificial fill are present (Beyaz & Patel, Inc., 1993; Henrickson, 2006). Basalt bedrock occurs at a depth of 3 feet to 5 feet or more below surface.

Based on past surveys conducted in the project area, the areas in which the proposed conservation measures would be implemented are unlikely to experience faulting or instability (NSF, 2009).

3.0 ENVIRONMENTAL CONSEQUENCES

This chapter evaluates the potential environmental impacts of the Proposed Action and alternatives and the No-Action Alternative. This analysis includes likely beneficial and adverse impacts on the natural and human environment, including short-term and long-term impacts, direct and indirect impacts, and cumulative impacts. The analysis of impacts on resources focuses on environmental issues in proportion to their potential effects.

Detailed consideration is given to those resources that have a potential for environmental impacts. Interpretation of impacts in terms of their duration, intensity, and scale are provided where possible. Impacts under the No-Action Alternative are compared against baseline effects of each resource discussed in Chapter 2. Although the ATST facility would be constructed and operated, the No-Action analysis is based on present-day conditions.

Those conditions not affected by the Proposed Action and action alternatives were not considered in this evaluation, including water resources; hazardous materials; solid waste; infrastructure and utilities; socioeconomics and environmental justice; public services and facilities; and natural hazards.

Each section below describes the methodology used for impact analysis and factors used to determine the significance of impacts (40 CFR 1508.8). Impacts on each resource are described, including both direct and indirect impacts; direct impacts are caused by the Proposed Action and occur at the same time and place, while indirect impacts are caused by the Proposed Action but occur later in time or at a distance from the proposed measures. Following the description of impacts, Section 3.10 discusses whether the Proposed Action and action alternatives would contribute to cumulative impacts on this resource.

To determine whether an impact is major, Council on Environmental Quality (CEQ) and HRS 343 regulations also require the consideration of context and intensity of potential impacts (40 CFR 1508.27; HRS 343§11-200-9, 12). Context normally refers to the setting, whether local or regional, and intensity refers to the severity and duration of the impact. Each resource has its own impact intensity standards which are listed and explained in tables under each resource section. Impacts are categorized under one of four levels of significance: negligible, minor, moderate, or major. For the purpose of this analysis, no impact and negligible impact are synonymous.

There may be both adverse and beneficial impacts within a single resource category; for example, a conservation measure could create a short-term noise impact on a protected species (an adverse impact), while protecting that species from long-term predation (a beneficial impact). Where there are adverse and beneficial impacts, both are described.

3.1 Land Use and Existing Activities

This impact analysis focuses on the potential to affect land use and existing activities in the project study area, either beneficially or adversely, directly or indirectly—in other words, measures that may change the use of or develop the land; require approvals or confirmation of compliance to adopted laws, regulations or plans; or change or hinder activities on that land. Because only Measures 1, 3, and 4 have the potential to affect this resource, this Land Use and Existing Activities analysis has eliminated Measures 2 and Measures 5 through 9 from further discussion.

3.1.1 Impact Assessment Methodology

Impacts are described by the level of intensity, categorized as either negligible, minor, moderate, and major. For this analysis, these terms are defined as follows:

- A negligible impact would result in no change to land use and types of existing activities, or a minimal change so small it would not be measurable or perceivable.
- A minor impact would result in a change to land use and types of existing activities, but would be small, localized, and of little consequence.
- A moderate impact would result in a measurable change to a land use or types of existing activities.
- A major impact would result in a noticeable change to land use and types of existing activities; the change would be measurable and result in a severely adverse or highly beneficial impact.

Impacts are also quantifiable by the duration of the impact. A short-term impact is one that occurs only during the construction of the habitat conservation area (fencing). A long-term impact continues after construction of the habitat conservation area.

3.1.2 Proposed Action

Land use and existing activities within the Conservation District and along the Park Road would not be adversely affected by the Proposed Action. The proposed conservation measures would aid in achieving the objective of the Conservation District by conserving, protecting, and preserving important natural resources, such as the Hawaiian petrel, Hawaiian goose, and the Haleakalā silversword and their associated habitats.

Implementation of the Proposed Action would be consistent with the uses of the Limited, Resource, and General Subzones, and would not limit other potential uses of the land. Specifically, the proposed fence would be constructed across the boundaries of those three subzones and would support the objective of sustaining natural resources on all three. Construction activities (Measure 1) and predator control (Measure 3) and monitoring (Measure 4) would require human access and staging of materials within the conservation area. This is a short-term activity, however, and measures would be taken to minimize impacts, such as staging site selection away from slopes or vegetation and in close proximity to, at regular intervals along, the proposed fence line. Further staging would be kept to the Resource Subzone and human access would avoid the Limited Subzone, thereby avoiding land use conflicts. Further, the fence would connect to and close the gap in the existing ungulate fencing surrounding Haleakalā National Park.

The uses of the Park Road or the HO would not be affected by implementing the Proposed Action. Additionally, proposed Hawaiian petrel monitoring within the conservation area, burrow surveys within the conservation area, construction of Hawaiian goose propagation and protection pens on Park land near the entrance of the Park Road, and Haleakalā silversword management actions within the conservation area would not affect land use adversely. Access for cultural practices within the project area would not be disrupted by these activities. Existing land uses would also not be affected within the 10-acre Park

Operations area, which is currently used as an administrative area for the Park, and is the site of an existing nēnē pen. The data from the monitoring and searches could provide a minor benefit to land use of the Forest Reserves and the Park by providing new data on the location of threatened and endangered species, thereby providing better information to manage the land to protect those species.

As stated in Section 2.1, the proposed conservation fence may require a Conservation District Use Permit. All state and federal requirements associated with such permits would be followed.

In summary, impacts to land use and existing activities associated with the Proposed Action would require permitting for use of the Conservation District. By limiting human access and staging to the Resource Subzone of the Conservation District, impacts on land use would be minor, adverse, and long-term. No further mitigation is required.

3.1.3 Alternative 1

The impacts on land use and existing activities would be the same as for the Proposed Action.

3.1.4 Alternative 2

The impacts on land use and existing activities would be the same as for the Proposed Action.

3.1.5 No-Action Alternative

There would be no change in land use if the proposed conservation measures are not implemented. The effectiveness of the associated habitat conservation plan, which is not analyzed in this EA, would be limited without these measures.

3.1.6 Summary of Impacts

The impacts of the Proposed Action and alternatives on land use and existing activities are summarized below in **Table 3.1-1**.

Table 3.1-1. Land Use and Existing Activities Impact Summary.

Alternative	Impact	Mitigation	Final Impact
Proposed Action	Minor, Adverse, Long-term impact on level of use of the land and current land use designation (Conservation District).	Limit human access and staging to Resource Subzone of the Conservation District	Minor, Adverse, Long-term
Alternative 1	Same as for Proposed Action	Same as Proposed Action	Minor, Adverse, Long-term
Alternative 2	Same as for Proposed Action	Same as Proposed Action	Minor, Adverse, Long-term
No-Action Alternative	Negligible Impact.	None	No Impact

3.2 Cultural, Historic, and Archeological Resources

Information to evaluate impacts relevant to this section has been obtained through review of existing documentation on cultural, historic and archeological resources and by conducting an additional cultural resource survey of the project area. The information obtained has been considered in determining the level of impacts on cultural, historic, and archeological resources. Because only Measures 1, 2, 3, 5, 7, and 9 have the potential to affect this resource, this Cultural, Historic, and Archeological Resources analysis has eliminated Measures 4, 6, and 8 from further discussion.

3.2.1 Impact Assessment Methodology

Impacts are described by the level of intensity of impacts on cultural, historic, and archeological resources, and are categorized as either negligible, minor, moderate, or major. The levels of effect to the resources under Section 106 are also provided. For this analysis, these terms are defined as follows:

- A negligible impact is at the lowest levels of detection with neither adverse nor beneficial consequences and would neither alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of practices and beliefs. This is analogous to a determination of *no effect* under Section 106 of the NHPA.

- A minor impact would result in little, if any, loss of integrity and would be slight but noticeable, but would neither appreciably alter resource conditions such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of practices and beliefs. This is analogous to a determination of *no adverse effect* under Section 106 of the NHPA.

- A moderate impact would result in loss of integrity and impact(s) would be apparent and would alter resource conditions. There would be an interference with traditional access, site preservation, or the relationship between the resource and the affiliated group's practices and beliefs, even though the group's practices and beliefs would survive. Also included are major impacts that have been mitigated to reduce their intensity under NEPA CEQ 1508.20 from major to moderate. The determination of effects for Section 106 would be *adverse effects*.

- A major impact would result in the disturbance of a site(s) and in loss of integrity, and impact(s) would alter resource conditions. There would be a barrier to, or great effect on, traditional access, site preservation, or the relationship between the resource and the affiliated group's body of practices and beliefs, to the extent that the survival of a group's practices and/or beliefs would be jeopardized. This is analogous to a determination of *adverse effect* under Section 106 of the NHPA, and measures to minimize or mitigate adverse effects cannot be agreed upon that would reduce the intensity of impacts under NEPA CEQ 1508.20 from major to moderate.

The duration of impacts is described as either short-term (occurs only during project construction) or long-term (continues after construction).

3.2.2 Proposed Action

Impacts to cultural, historic and archeological resources could occur with construction and maintenance of the conservation fence (Measure 1) under the Proposed Action. The proposed alignment of the fence line runs through Site 5438 (a previously identified site consisting of a rock-walled enclosure, 4 terraces, and a rock mound) and directly through a number of other features. Several other features are within the 14-m-wide survey area centered on the proposed fence line (Cochrane, 2010). These features are all within 8 meters of the proposed fence line. A known archeological site is also present in the area proposed for the nēnē holding pen (Measure 7). The Proposed Action would result in major, adverse, long-term, direct impacts to archeological resources if the fence were built exactly along the proposed

conservation area boundary or within the archeological site in the Measure 7 area. Likewise, this would result in an adverse effect under Section 106.

To mitigate this impact, a cultural monitor would be on site during the staging and construction of the fence to identify these resources and adjust the fence alignment to avoid identified archeological resources. Furthermore, the greatest density of archeological features occurs on rocky and boulder-strewn substrate, and not on the cinder sand surfaces that form much of the landscape in and around the project area. Therefore, moving the proposed fence line to a more appropriate location would minimize the likelihood of encountering archeological features. With mitigation, this impact would be reduced to a negligible, adverse, long-term, direct impact, and these effects on this site would result in a *no effect* determination under Section 106.

Known historic structures are located within the 10-acre Park Operations area where the proposed nēnē holding pen would be built (Measure 7). The specific area where the holding pen would be constructed is a disturbed horse pasture, and the proposed pen would be located approximately 100 feet from a known historic resource (Site HQ-21).No archeological sites or historic structures would be altered or damaged. Therefore, the impact from Measure 7 would be negligible and no mitigation would be necessary. Likewise, this would be a *no effect* under Section 106.

Implementation of Proposed Action, including construction of the proposed conservation fence and installation of the nēnē pen, could visually impact the use of traditional and historic sites. However, this change would be minor and would not affect the integrity of the resources. Further, because the proposed fencing will have the same general appearance, and will be installed in generally the same manner as the conservation fencing currently surrounding the Park property, it would not introduce a significant change. Likewise, although pre-painting of construction equipment and exposed structures during ATST construction (Measure 2) may reduce the visual obstruction slightly, this would not presumably reduce the impact on traditional practices as experienced by cultural practitioners. In this regard, Measure 2 does not alter the determinations made in the previous Section 106 process. A discussion of potential visual impacts is discussed in Section 3.4, Visual Resources and View Plane. Installation of traffic-calming devices (Measure 5) would occur along the historic Park Road, which, as described in Section 2.2, is eligible for listing in the NRHP and is listed on the SIHP. However, these temporary measures, including speed humps and speed-measuring signs, would not alter the amount of traffic along the road, the character of roadway design, or access to Haleakalā or other locations for cultural practice. Therefore, the impact to the historic Park Road would be negligible, adverse, and long-term, and this would be a *no effect* under Section 106.

Implementation of year-round construction (Measures 9) and long-term predator control, including the removal of feral cats (Measure 3), also could impede the ability of native Hawaiians to engage in cultural practices in the project area. Because access would still be provided during construction, with coordination with construction crews to ensure their safety, the disruption due to construction would be minor and short-term. Removal of predators also could result in some disturbance to cultural practices; however, these activities would be short-term and sporadic in nature, and are unlikely to conflict with cultural practice on a frequent basis. This impact would be would be minor, adverse and short-term. Under Section 106, this would result in a *no effect* determination.

3.2.3 Alternative 1

Impacts with implementation of Alternative 1 would be the same as for the Proposed Action. Presence of a cultural monitor during material staging and construction of the conservation fence and avoidance of archeological sites would mitigate impacts to archeological resources to negligible. This would be a *no effect* under Section 106.

Under this alternative, the visibility of the proposed conservation fence could be slightly greater with the use of polytape than without. The visibility of the fence could impact the use of traditional and historic sites. As described above, the proposed fencing will have the same general appearance, including the white polytape strips, and will be installed in generally the same manner as the conservation fencing currently surrounding the Park property. Therefore, the proposed fencing would not introduce a significant visual change. This impact would be minor, adverse and long-term. Under Section 106, this would result in a *no effect* determination.

3.2.4 Alternative 2

Impacts with implementation of Alternative 2 would be the same as for Alternative 1.

3.2.5 No-Action Alternative

Under the No-Action Alternative, the Proposed Action would not be implemented. Current use of the historic Park Road, operation of the HO facilities, and cultural practices throughout Haleakalā would continue. There would be no change and negligible impacts on cultural, historic, and archeological resources under the No-Action Alternative. Under Section 106, this would result in a *no effect* determination.

3.2.6 Summary of Impacts

The impacts of the proposed the Proposed Action and alternatives on cultural, historic and archeological resources are summarized below in **Table 3.2-1**.

Table 3.2-1. Cultural, Historic and Archeological Resources Impact Summary.

Alternative	Impact	Mitigation	Final Impact
Proposed Action	Measures 1 and 7: Major, adverse, long-term, direct impacts to archeological sites identified within the study area. Measures 2, 3, and 9: Minor, adverse, short-term impacts to cultural resources Measures 5 and 7: Negligible, adverse, long-term impacts to historic resources	Cultural monitor on site during staging and construction to ensure avoidance of impacts to archeological and historic sites. Adjusting the fence line to avoid archeological and historic resources.	Measures 2, 3, and 9: Minor, adverse, short-term impacts to cultural resources Measures 1, 5, and 7: negligible, adverse, long-term to archeological sites and cultural resources Section 106: *No Effect*
Alternative 1	Same as for Proposed Action	Same as Proposed Action	Negligible to minor, adverse, short- and long-term Section 106: *No Effect*
Alternative 2	Same as for Proposed Action	Same as Proposed Action	Negligible to minor, adverse, short- and long-term Section 106: *No Effect*
No-Action Alternative	Negligible, adverse, long-term impact	None	Negligible, adverse, long-term Section 106: *No Effect*

3.3 Biological Resources

3.3.1 Impact Assessment Methodology

The methods used to determine whether the Proposed Action and alternative actions would have an impact on biological resources include reviewing and evaluating the potential for each action to result in diminished health, diversity, or population of biological resources. Specifically, the measures were evaluated to determine the potential for impacts on biological resources due to noise, vibration, and vehicular traffic. Noise and vibration were estimated based on industry standards and applied to known thresholds for adverse impacts on certain species. Compliance with applicable federal, State, and County regulations was also evaluated.

The assessment of effects on natural and biological resources considered direct and indirect impacts to threatened or endangered species, designated critical habitat, or otherwise ecologically sensitive areas. Impacts were assessed based on whether the proposed project would result in any of the following: (1) potential "take" of a threatened or endangered species, as defined by the ESA and H.R.S. 195D; (2) loss or impairment of sensitive or other native habitats, including wetlands or riparian corridors; (3) interference with the movement of any native resident or migratory wildlife; or (4) introduction or spread of invasive or otherwise undesirable non-native species.

The level of intensity of an impact is described as negligible, minor, moderate, or major.

- A negligible impact would either not impact biological resources or the impact would be below the lower levels of detection.
- A minor impact would result in a detectable change, but it would be small, localized, and of little consequence.
- A moderate impact would result in an apparent change to biological resources over a wide area. Mitigation measures would be necessary to offset moderate adverse impacts.
- A major impact would result in substantial change to the character of the biological resource over a large area. Extensive mitigation would be required to offset major adverse impacts.

The duration of the impact is defined as either short-term or long-term. A short-term impact would occur only during construction of the conservation area (fencing). A long-term impact would occur after the construction of the fencing.

3.3.2 Proposed Action

In general, under the Proposed Action, all of the nine conservation measures would be implemented primarily to provide either short-term or long-term benefits for biological resources, primarily the Hawaiian petrel. This would be consistent with the purpose of H.R.S. 195D and would serve as the basis of the issuance of an Incidental Take License. However, some short-term adverse impacts could result, including those from construction of the conservation fencing. The anticipated affects of each conservation measure are described below.

Measure 1: Conservation Fencing

Known causes of Hawaiian petrel mortality on Haleakalā from 1994 to 2003 included predation by introduced cats, rats, mongoose and non-native owls; collision with anthropogenic structures and objects (such as fences, buildings, utility poles, and vehicles); attraction and confusion by anthropogenic light sources; habitat degradation (for instance, burrow collapse by feral ungulates); and disturbance from vehicles, hikers, road resurfacing, and other human activities (Natividad Bailey, unpublished, as cited in NSF, 2010). As described in the HCP, installation of conservation fencing along portions of the Park boundary in the 1980s is believed to have resulted in a substantial increase in active petrel burrows within

the Park. Bird strikes documented in the two years following fence installation were attributed to the use of barbed wire; no additional bird strikes have been documented since the barbed wire was replaced with barbless wire (NSF, 2010). Observations of a petrel colony on Lana'i indicate that the use of polytape to increase visibility of a structure can help to minimize collisions (NSF, 2010).

Under the Proposed Action, the conservation fence would be constructed of barbless hog wire fencing with no polytape. In combination with the predator control measures (Measure 3), the conservation fencing would protect the conservation area from feral ungulates and predators. Barbless wire would be expected to significantly reduce, if not eliminate, bird strikes. This option does not include the use of polytape, and thus the potential exists for long-term minor impacts associated with collision. Overall, the measure is still anticipated to provide a moderate, long-term benefit to the Hawaiian petrel, although potentially less than if polytape were used.

Short-term adverse impacts to biological resources could occur during the construction of the fencing. However, the fencing would be constructed with hand tools, and materials would be brought in by helicopter over a 1-2 day period during the period when petrels are not present on Haleakalā (November through January). The helicopter would place construction materials for the fencing at regular intervals along the proposed fence line. Measures would be taken to minimize impacts, such as placing staging areas for materials away from slopes or vegetation. The helicopter delivery would occur outside of the breeding season of the Hawaiian petrel and while the petrel is absent from the area from November to January. A survey for petrel burrows would be conducted prior to the placing of the fence, and identified burrows would be avoided by construction activities. If, despite the precautions taken to avoid this, active burrows are identified in close proximity to the proposed fence line, either by surveys completed prior to fence construction activities or by the biological monitor present during construction, the posts for the fence line in these areas would be driven when the petrels are not present. Construction of the fence would be completed within 3 months. With monitoring efforts taken to avoid petrel burrows, impacts to Hawaiian petrels during construction of the fence are anticipated to be negligible.

Workers and construction materials brought in for the fence could potentially bring invasive weed and arthropod species into the study area. The measures described in the HO Long Range Development Plan (LRDP) for the prevention of introduction of invasive exotic weeds, however, will be followed during construction and maintenance of fencing. Furthermore, specific alien arthropod control measures, adapted from those already required pursuant to the LRDP and as described in the ATST EIS, will be taken to further minimize the spread and establishment of alien insects. The LRDP specifies the steps that must be taken to protect the natural and cultural resources within and near HO, especially during construction in the area. With implementation of these measures, construction-related impacts are expected to be negligible and short-term with moderate, beneficial effects over the long term.

Measure 2: Pre-painting of all Project Structures, Including the Crane and Construction Equipment

The ATST EIS identified an impact with birdstrike fatalities resulting from the petrel not seeing certain unpainted structural materials and construction equipment, including the large crane to be used for primary facility construction. Pre-painting all project structures and construction equipment white and, where useful, polytaping for added visibility would minimize the potential for birdstrike during the construction period. Although this in itself is not considered a beneficial impact on the Hawaiian petrel, it would further reduce an adverse impact identified in the ATST EIS.

Measure 3: Predator Control

Consistent with the methodology described in the ATST EIS (NSF, 2009), predator control would be implemented prior to and throughout the Hawaiian petrel breeding season, beginning when the birds return to Haleakalā in February and ending when they leave the mountain for the winter months in November (based on existing protocols used by the Park). Predator control consists of placing and baiting mammal traps, properly containing trash, and baiting for rats. Feral ungulates, mongoose, rats, and cats

prey on the petrel. Rats account for 41 percent of the mortality by predators (NSF, 2010). The implementation of predator control would include the installation and maintenance of 49 bait stations located on previously disturbed areas along edges of buildings, roads, and trails throughout the HO petrel colony area for the duration (50 years) of the ATST project. Potential impacts to the Hawaiian petrel as a result of the implementation of predator controls include annual increase in adult survivorship. There is the possibility that a petrel could be incidentally trapped in mammal traps. Any that are caught would be released unharmed and the trap would be resituated to avoid future incidental trappings of the petrel. Additionally, the use of live traps (the mammal traps) increases nesting success by 14 percent (NSF, 2010).

Improperly discarded trash is known to attract predators. Discarding of waste properly in contained structures would reduce the presence of potential predators in the project area. Measure 3 would have long-term, moderate, beneficial impacts to biological resources.

Measure 4: Hawaiian Petrel Monitoring

Hawaiian petrel monitoring includes monitoring vibrations to minimize the potential for a burrow to collapse, noise monitoring to monitor the effects of construction-related noise on the petrel, and using cameras in burrows to monitor fledgling activity. The goal of the monitoring is to show the effect of management activities associated with the conservation measures and to determine when the net recovery benefit is achieved. A spatial control area would be used to show the effectiveness of the fenced-in area versus an area that is not fenced-in. Nests within the fenced area and the control area would be monitored twice per month for direct and indirect signs of activity (NSF, 2010). Petrel monitoring would reduce the potential of take and increase effectiveness of management and mitigation activities. Measure 4 would have long-term, moderate, beneficial impacts to the petrel.

Measure 5: Traffic-Calming Devices along Park Road

Adverse impacts to the Hawaiian goose may occur as a result of ATST-related vehicles. Traffic-calming devices would slow the speed of traffic and limit the potential for the nēnē to be hit by a vehicle. These measures are temporary in any one location and would only be implemented where and when nēnē are frequenting the road. The incorporation of traffic-calming devices along the Park road would have long-term, minor, beneficial impacts to the nēnē.

Measure 6: Hawaiian Goose (Nēnē) Monitoring

Personnel associated with the ATST construction and operation and implementation of the associated conservation measures would work with Park staff to detect and report Hawaiian geese found struck along the Park road. Hawaiian goose fatalities that, through adequate evidence, can be attributed directly to HO and conservation measure traffic would be reported to the USFWS and NPS. Implementation of this measure is not expected to have any direct impact on biological resources, but could indirectly affect nēnē by improving the collective understanding of threats to this species. This impact is considered negligible, beneficial, and long-term.

Measure 7: Construction of Hawaiian Goose (Nēnē) Holding Pen

Construction of the nēnē holding pen and rehabilitation and propagation of nēnē would be a continuation and improvement upon an existing practice by the Park resulting in a long-term, minor, beneficial impact on the nēnē.

Measure 8: Haleakalā Silversword Propagation and Planting

With the implementation of proposed propagation and outplanting of 300 Haleakalā silversword plants into a fenced and managed site, the project will have a positive contribution to the conservation and recovery of this endangered plant. In addition, fencing of the conservation area will provide protected

areas of habitat along the periphery of the historic range of Haleakalā silversword. Accordingly, Measure 8 would have a long-term, minor, beneficial impact to the Haleakalā silversword.

Measure 9: Year-Round Construction

The ATST EIS (NSF, 2009) placed certain restrictions on construction activities generating noise and vibration during Hawaiian petrel incubation season [April through July]. These restrictions were developed based on early informal consultation with USFWS. Continued consultation and studies, however, concluded that while working through the incubation period would result in "take" of Hawaiian petrels, it would result in less overall reduction in breeding success. Implementing year-round construction would reduce the duration of adverse effects of noise, vibrations, traffic, and other construction activities to biological resources by approximately one year. Under this scenario, construction activities would continue through the Hawaiian petrel incubation period with the exception of caisson (underground concrete columns to support the ATST structure) drilling, which would occur outside of the petrel breeding season and would be completed in year one of ATST construction. Due to the potential for take, working through the incubation period would result in a moderate, long-term, adverse impact. Implementation of Measures 1 through 8 would reduce the adverse impact of Measure 9, resulting in a net recovery benefits to petrels compared to constructing the project with a construction-period blackout. However, this impact is conservatively still considered moderate, long-term and adverse.

3.3.3 Alternative 1

The impacts of the implementation of Alternative 1 would be the same as for the Proposed Action, with the exception of the usage of white fence polytape. The white fence polytape would add visibility of the fence and would reduce the potential for a petrel to collide with the fencing, thereby minimizing flight hazards for Hawaiian petrels and other avian species. As discussed under the Proposed Action, construction of the conservation fence would benefit the petrel by keeping ungulates out of its habitat, and use of white polytape on the fence would reduce the potential for collision.

3.3.4 Alternative 2

The impacts of the implementation of Alternative 2 would be the same as for Alternative 1, with the exception of the usage of black fence polytape, to decrease the visibility to Park visitors. Black polytape along the fence has not been used at the Park, and therefore the effects of using black polytape are unknown; however, black polytape would be expected to be of the same effectiveness with respect to petrel flight avoidance as the white polytape because it would help the fence to resemble a solid object. As discussed under the Proposed Action and Alternative 1, construction of the conservation fence would benefit the petrel by keeping ungulates from the habitat, and use of black polytape would likely reduce the potential for collision.

3.3.5 No-Action Alternative

Under the No-Action Alternative no Incidental Take License would be issued and none of the conservation measures or mitigation activities associated with the Proposed Action or Alternatives 1 and 2 would be implemented when the ATST facility is constructed. Present-day activities on Haleakalā including HO operations, maintenance of the HO and Park facilities, and visitor and HO traffic would still occur and would result in a take of up to 35 petrels as described in the draft HCP, as incorporated herein by reference. The No-Action Alternative would result in moderate, long-term, adverse impacts to biological resources at HO and along the Park Road..

Under the No-Action Alternative, the nēnē holding pen would not be constructed. Following the issuance of the FEIS, NSF reinitiated consultations with the NPS, the State, and USFWS concerning impacts of the ATST to the nēnē within the Park. The result of those consultations was that there would be a take of up to nine nēnē within the Park if the ATST were constructed and operated. This would be due to the speed

and volume of traffic along the Park road associated with ATST. Therefore, under the No-Action Alternative, the impacts to nēnē would be moderate, long-term, and adverse.

3.3.6 Summary of Impacts

The impacts of the Proposed Action and alternatives on biological resources are summarized below in **Table 3.3-1**.

Table 3.3-1. Biological Resources Impact Summary.

Alternative	Impact	Mitigation	Final Impact
Proposed Action	Measure 1: Adverse, short-term during construction Moderate, Beneficial, long-term impact to Hawaiian petrel	Implementation of HO Long Range Development Plan measures	Moderate, beneficial, long-term
	Measure 2: Reduction of adverse impact identified in ATST EIS	Monitoring to avoid petrel burrows Implementation of HO Long Range Development Plan measures	Reduction of adverse impact
	Measure 3:Moderate, beneficial, long-term	None	Moderate, beneficial, long-term
	Measure 4: Moderate, beneficial, long-term	None	Moderate, beneficial, long-term
	Measure 5: Minor, beneficial, long-term	None	Minor, beneficial, long-term
	Measure 6: Negligible, beneficial, long-term	None	Negligible, beneficial, long-term
	Measure 7: Minor, beneficial, long-term	None	Minor, beneficial, long-term
	Measure 8: Minor, beneficial, long-term	None	Minor, beneficial, long-term
	Measure 9: Moderate, adverse, long-term	Implementation of Conservation Measures 1 through 8	Moderate, adverse, long-term
Alternative 1	Same as for Proposed Action, with reduction of potential for petrel to collide with fencing	None	Same as for Proposed Action, with reduction of potential for petrel to collide with fencing
Alternative 2	Same as for Proposed Action, with reduction of potential for petrel to collide with fencing	None	Same as for Proposed Action, with reduction of potential for petrel to collide with fencing
No-Action Alternative	Moderate, adverse, long-term	None	Moderate, adverse, long-term

3.4 Visual Resources and View Plane

The proposed conservation area is immediately adjacent to the southwest corner of the Park. Nine conservation measures have been proposed, three of which (Measures 1, 2, and 9) could affect visual resources and view planes. Measure 1 consists of the erection of a 5-foot conservation fence around the 14,108-foot project boundary. The fence has three options that must be evaluated for visual impacts. Under the Proposed Action, the fence would be composed of hog wire, a smooth, non-barbed wire. Under Alternative 1, white polytape would be interwoven into the hog wire. Under Alternative 2, black polytape would be interwoven. Measure 2 consists of the painting of external building structures and construction equipment white. Measure 9 consists of shortening the construction period by one year.

The study area for the consideration of the effects of the Proposed Action on visual resources and view planes includes the Park, Highway 378 (Park Road), HO, and areas from the rest of the Maui landmass from which the project would be visible.

3.4.1 Impact Assessment Methodology

To evaluate potential visual impacts from the Proposed Action and alternatives, existing views were compared to proposed views, which include photographic simulations. Three viewpoints were selected for analysis (see **Figure 3.4-1**). A photograph taken from each point was used to provide the basis for development of a simulation to depict the view as it would appear with the completed proposed conservation fencing (Measure 1) in place.

To analyze the potential visual impacts of Measure 1, three locations within the study area were chosen as representative viewpoints from which the conservation fence would be most visible: Puʻu ʻUlaʻula Overlook on Red Hill (Viewpoint 1), the East Ahu at HO (Viewpoint 2), and the West Ahu at HO (Viewpoint 3) (**Figure 3.4-1**). Puʻu ʻUlaʻula Overlook is one of the most visited sites in the Park and the closest (less than 0.25 mile) visitor facility to the project site. Viewpoints 2 and 3 are views from an *ahu*, or cairn, on HO property accessible to Native Hawaiians. Computer modeling and rendering techniques were used to produce the simulated images of the three viewpoints, as shown in **Figures 3.4-2, 3.4-3, and 3.4-4** at the end of this subsection.

Existing topographic and site data provided the basis for developing an initial digital model. KC Environmental Inc. provided detailed site plans and architectural plans for the Proposed Action, which were digitized, using Microsoft Digital Image Pro, into sections of the Proposed facilities. These were used to create three-dimensional (3D) digital models of the proposed Action. These models were then combined with the digital site model to produce a complete computer model of the Proposed Action as seen within the views from certain viewpoints. Computer “wire frame” perspective plots were overlaid on the photographs of the views from the simulation viewpoints to verify scale and viewpoint location. Color and reflectivity matched digital visual simulation images were produced as a next step based on computer renderings of the 3D model combined with high-resolution digital versions of base photographs. Inserts have been included that show how features associated with the Proposed Action would appear if the viewer were to use optical enhancement (i.e., binoculars, telescope, telephoto camera lens, etc.)

Federal Highway Administration (FHWA) methodology was used to assess the potential visual impacts of the Proposed Action. The FHWA approach was chosen because it considers the change to visual resources resulting from a proposed project and viewer response to the change. Existing visual resources are discussed in terms of the proposed project site’s visual character and the quality of views. Changes to visual resources are assessed by the degree to which the existing visual character or quality would be altered. Viewer response to the proposed changes takes into account viewer exposure to the proposed project and viewer sensitivity.

Figure 3.4-1. Viewpoint Locations for Visual Resources Analysis.

To be consistent with the ATST EIS analysis, once the changes between existing and proposed views were identified, the intensity of the impact to views was assessed and categorized as either negligible, minor, moderate, or major, as defined below.

- A negligible impact would either not impact the visual quality of the landscape, or changes would be so slight that there would be no measurable or perceptible consequence to the observer.
- A minor impact would result in a detectable change to the visual quality of the landscape; this change would be localized, small, and of little consequence to the observer.
- A moderate impact would impact the visual quality of the landscape; this impact would be readily detectable, localized, and have consequences at the regional level. Mitigation measures would be necessary to offset adverse impacts and would likely be successful.
- A major impact would result in a substantial change to the visual quality of the landscape with substantial consequences to the visitor use and experience in the region. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

Impacts are also quantifiable by the duration of the impact. A short-term impact is one that occurs only during the construction of the habitat conservation area (fencing). A long-term impact continues after construction of the habitat conservation area.

The compliance of each alternative with applicable federal, State, or County regulations (particularly NEPA and HAR 343 Title 11, 200-12, item 12 concerning substantial effects to scenic vistas and view planes) was assessed.

3.4.2 Proposed Action

Measure 1: Conservation Fencing

Under the Proposed Action, a 5-foot conservation fence would be erected around the 14,108-foot project boundary. The fence would be composed of hog wire, a smooth, non-barbed wire. No polytape would be interwoven into the conservation fence line.

Viewpoint 1: Puʻu ʻUlaʻula Overlook

Figure 3.4-2a shows the existing view toward the proposed conservation fence from Viewpoint 1. **Figure 3.4-2b** shows the same view with a simulation of the conservation fence as it would appear under the Proposed Action. In the inset of **Figure 3.4-1b**, the conservation fence is magnified to appear as it would through binoculars. From the Puʻu ʻUlaʻula Overlook, the current HO complex is plainly visible including the existing observatories and associated structures, a road, and a wooden pole transmission line.

Comparison of the existing and simulated views shows that the proposed conservation fence would not be visible from the Puʻu ʻUlaʻula Overlook with the unaided eye. In the magnified inset, the stakes of the conservation fence would be visible but would not be obtrusive. The impact of the Proposed Action, Measure 1, to visual resources and view planes from Viewpoint 1 would be adverse but minor. Because the fence would likely remain following construction, this impact is considered long-term.

Viewpoint 2: East Ahu

Figure 3.4-3a shows the existing view toward the proposed conservation fence from Viewpoint 2, and **Figure 3.4-3b** shows the same view with a simulation of the conservation fence as it would appear under the Proposed Action. In the inset of **Figure 3.4-3b**, the conservation fence is magnified to appear as it would through binoculars. The photograph was taken at 5:30pm, when the sun angle is low and the conservation fence is more likely to be visible than at other times of the day. The existing view features

the south slope of Haleakalā. The only visible built feature is an access roadway adjacent to the southern portion of the HO area, south of the ATST project site, maintained by the Federal Aviation Administration (FAA) to access facilities in the Saddle Area and the FAA Low Site.

Comparison of the existing and simulated views indicates that the proposed conservation fence under the Proposed Action would barely be visible from East Ahu with the unaided eye; however, aside from the roadway, the fence would be the only linear, human-made feature visible in the view. Although the fence would not substantially obstruct any landscape elements, it would be noticeable in views. The appearance of the fence is also not consistent with the undeveloped visual character of much of the view and is noticeable in part because it cuts across the slope lines rather than going with them. The impact of the Proposed Action, Measure 1, to visual resources and view planes from Viewpoint 2 would be adverse, minor, and long-term.

Viewpoint 3: West Ahu

Figure 3.4-4a shows the existing view toward the proposed conservation fence from Viewpoint 3, and **Figure 3.4-4b** shows the same view with a simulation of the conservation fence as it would appear under the Proposed Action. In the inset of **Figure 3.4-4b**, the conservation fence is magnified to appear as it would through binoculars. The existing view features a native Hawaiian shrine in the foreground and the west slope of Haleakalā. Aside from the ahu, the only built visible features are two stakes in the center of the view and the existing conservation fencing along the western side of the Park (see **Figure 1-1**). The Park fencing is interwoven with white polytape.

Comparison of the existing and simulated views indicates that the proposed conservation fence under the Proposed Action would barely be visible from the West Ahu with the unaided eye, and would be less visible than the existing transmission line. The impact of the Proposed Action, Measure 1, to visual resources and view planes from Viewpoint 3 would be adverse, minor, and long-term.

Measure 2: Pre-painting of Structures

Under Measure 2, structures and equipment associated with construction, including the lattice boom cranes, would be painted white prior to arriving at the construction site. The intent of Measure 2, as developed in consultation with NPS and USFWS, is to increase the visibility to the Hawaiian petrel to avoid birdstrike. From views where construction equipment is visible, predominantly from lower elevations, the lighter color also would be expected to result in less visual contrast as compared to the background of blue sky and white clouds than would be apparent if equipment was colored to blend with immediately surrounding terrain. White paint on construction equipment may, thereby, reduce the visibility of construction structures and equipment to Park visitors. The degree of visibility would depend on viewpoint and atmospheric conditions. At close range, from places such as the Puʻu ʻUlaʻula Overlook, the Haleakalā Visitor Center, and Magnetic Peak, the construction equipment would still be very apparent but would not be completely inconsistent with the existing HO structures, some of which are at least partially white. It is in the longer range views that the white color would allow the construction equipment to blend in better with the horizon line, which tends to become bluish-grey in the distance (Lancaster, 1996; Shaw, 1836). The viewpoint from much of the study area toward the project site would be from below. During overcast conditions, when viewed from below, the construction equipment would tend to blend into the sky and be less visible. During clear conditions, the construction equipment, when viewed from below, would stand out against the blue skies but still likely be less visible than if it were painted in non-white colors. However, while implementation of Measure 2 may reduce the adverse impact to visual resources and view planes as compared to approved ATST project construction without this measure, the impact is still considered moderate, adverse, and short-term.

Measure 5: Traffic-Calming Devices

Under this measure, installation of devices such as speed humps to minimize vehicle collisions with Hawaiian geese would occur. Certain traffic-calming devices such as the signs would represent a visible change to Park users. However, as only 6 permanent signs would be installed, and the design of all proposed signs would be coordinated with Park staff, this impact would be negligible, adverse, and long-term. Moreover, traffic-calming devices would be temporary in any one location and would only be implemented where and when the nēnē frequent the road.

Measure 7: Construction of Hawaiian Goose (Nēnē) Holding Pen

Under Measure 7, NPS would construct a 20-ft by 40-ft closed-top holding pen on an approximately 10-acre area of Park property near the entrance of the Park entrance station (see Figure 1-3). This site is an already developed property in the front-country horse pasture along the Park boundary fence adjacent to the Park Maintenance and Resource Management Division's maintenance yard. Therefore, the installation of the pen would not introduce a substantial change in the visual setting. This impact would be minor, adverse, and long-term.

Measure 9: Year-Round Unrestricted Construction

Under Measure 9, construction would last an estimated one year less than that stated in the ATST Project EIS. The construction period would be 6-7 years rather than 7-8. The EIS identified the primary impacts to visual resources and view planes to be short-term impacts associated with prominent equipment such as tall cranes visible from various sides of the island and long-term impacts associated with the visibility of the ATST facility from many areas of the island, including the Park. Impacts were found to be moderate and adverse (NSF, 2009). Measure 9 would result in the short-term construction phase impacts to visual resources and view planes identified in the EIS (NSF, 2009) lasting one year less than under the baseline schedule. Also note that by implementing Measure 2, structures and equipment observed during this reduced construction period would be less detectable than originally analyzed. The long-term visibility of the ATST facility would not be affected by this measure and is not considered in this analysis. Measure 9 would result in less adverse impacts than would occur with a 7-8 year construction duration. However, impacts to visual resources and view planes are still considered moderate, adverse, and short-term.

3.4.3 Alternative 1

Under Alternative 1, the fence would be as described in the Proposed Action but it would be interwoven with white polytape. Measures 2, 5, 7 and 9 would be implemented the same under Alternative 1 as under the Proposed Action. Impacts would therefore be identical and are not discussed further in this analysis.

Measure 1: Conservation Fencing

Viewpoint 1: Puʻu ʻUlaʻula Overlook

Figure 3.4-2a shows the existing view toward the proposed conservation fence from Viewpoint 1. **Figure 3.4-2c** shows the same view with a simulation of the conservation fence as it would appear under Alternative 1. In the inset of **Figure 3.4-2c**, the conservation fence is magnified to appear as it would through binoculars. From the Puʻu ʻUlaʻula Overlook, the current HO complex is plainly visible including the existing observatories and associated structures, HO access road, and a wooden pole transmission line.

Comparison of the existing and simulated views shows that, under Alternative 1, the proposed conservation fence would be barely visible from the Puʻu ʻUlaʻula Overlook with the unaided eye. Though the fence is barely visible Under Alternative 1, it appears to be slightly more visible than it would be under the Proposed Action. In the magnified inset, the conservation fence is somewhat visible but is not obtrusive. The impact of Alternative 1, Measure 1, to visual resources and view planes from Viewpoint 1 would be adverse but minor and long-term.

Viewpoint 2: East Ahu

Figure 3.4-3a shows the existing view toward the proposed conservation fence from Viewpoint 2, and **Figure 3.4-3c** shows the same view with a simulation of the conservation fence as it would appear under Alternative 1. In the inset of **Figure 3.4-3c**, the conservation fence is magnified to appear as it would through binoculars. The photograph was taken at 5:30 pm, when the sun angle is low and the conservation fence is more likely to be visible than at other times of the day. The existing view features the south slope of Haleakalā. The only visible built feature is the access road to the FAA Low Site.

Comparison of the existing and simulated views indicates that the proposed conservation fence under Alternative 1 would be somewhat visible from East Ahu with the unaided eye and more visible than the Proposed Action from Viewpoint 2. Under Alternative 1, the fence draws the eye because the view is uncomplicated and there aren't many other human-made features that compete with it in terms of visibility. The appearance of the fence is also not consistent with the undeveloped visual character of much of the view and is noticeable because it cuts across the slope lines rather than going with them. The impact of Alternative 1, Measure 1, to visual resources and view planes from Viewpoint 2 would be adverse, moderate, and long-term.

Viewpoint 3: West Ahu

Figure 3.4-4a shows the existing view toward the proposed conservation fence from Viewpoint 3, and **Figure 3.4-4c** shows the same view with a simulation of the conservation fence as it would appear under Alternative 1. In the inset of **Figure 3.4-4c,** the conservation fence is magnified to appear as it would through binoculars. The existing view features a native Hawaiian shrine in the foreground and the west slope of Haleakalā. Aside from the shrine, the only built visible features are two stakes in the center of the view and the existing conservation fencing along the western side of the Park (see **Figure 1-1**). Like the proposed fence under Alternative 1, the existing Park fencing is interwoven with white polytape.

Comparison of the existing and simulated views indicates that the proposed conservation fence under Alternative 1 would barely be visible from West Ahu with the unaided eye, and would be less visible than the existing Park conservation fence line. From Viewpoint 3, Alternative 1, Measure 1 appears to have very similar visual impacts as the Proposed Action, Measure 1. The impact of Alternative 1, Measure 1, to visual resources and view planes from Viewpoint 3 would be adverse, minor, and long-term.

3.4.4 Alternative 2

Under Alternative 2, the fence would be as described in the Proposed Action but it would be interwoven with black polytape. Measures 2, 5, 7 and 9 would be implemented the same under Alternative 2 as under the Proposed Action. Impacts would be identical and are therefore not discussed further in this analysis.

Measure 1: Conservation Fencing

Viewpoint 1: Puʻu ʻUlaʻula Overlook

Figure 3.4-2a shows the existing view toward the proposed conservation fence from Viewpoint 1. **Figure 3.4-2d** shows the same view with a simulation of the conservation fence as it would appear under Alternative 2. In the inset of **Figure 3.4-2d**, the conservation fence is magnified to appear as it would through binoculars. From the Puʻu ʻUlaʻula Overlook, the current HO complex is plainly visible including the existing observatories and associated structures, a road, and a wooden pole transmission line.

Comparison of the existing and simulated views shows that, under Alternative 2, the proposed conservation fence would be the most visible of the three project options in views from Viewpoint 1. It would be somewhat visible from the Puʻu ʻUlaʻula Overlook with the unaided eye. In the magnified inset, the conservation fence is visible but not obtrusive. The conservation fence disappears against the backdrop of the hill so does not make the view appear to be more developed or cluttered. It is consistent with the visual character of the view from the Puʻu ʻUlaʻula Overlook toward HO since the view already

contains multiple structures. In addition, the fence has a linear character that is consistent with that of the adjacent road and wooden pole transmission line. The impact of Alternative 2, Measure 1, to visual resources and view planes from Viewpoint 1 would be adverse but minor, and long-term.

Viewpoint 2: East Ahu

Figure 3.4-3a shows the existing view toward the proposed conservation fence from Viewpoint 2, and **Figure 3.4-3d** shows the same view with a simulation of the conservation fence as it would appear under Alternative 2. In the inset of **Figure 3.4-3d**, the conservation fence is magnified to appear as it would through binoculars. The photograph was taken at 5:30 pm, when the sun angle is low and the conservation fence is more likely to be visible than at other times of the day. The existing view features the south slope of Haleakalā. The only visible built feature is the access roadway to the FAA Low Site.

Comparison of the existing and simulated views indicates that the proposed conservation fence under Alternative 2 would be barely visible from East Ahu with the unaided eye. Under Alterative 3, the fence would be less visible than in Alternative 1 and more visible than in the Proposed Action. However, though the fence would not be very obtrusive, it still draws the eye to some extent because the view is uncomplicated and there aren't many other features to compete with it. The appearance of the fence is also not consistent with the undeveloped visual character of much of the view and is noticeable because it cuts across the slope lines rather than going with them. The impact of Alternative 2, Measure 1, to visual resources and view planes from Viewpoint 2 would be adverse, minor, and long-term.

Viewpoint 3: West Ahu

Figure 3.4-4a shows the existing view toward the proposed conservation fence from Viewpoint 3, and **Figure 3.4-4b** shows the same view with a simulation of the conservation fence as it would appear under Alternative 2. In the inset of **Figure 3.4-4b**, the conservation fence is magnified to appear as it would through binoculars. The existing view features a native Hawaiian shrine in the foreground and the west slope of Haleakalā. Aside from the shrine, the only built visible features are two stakes in the center of the view and the existing conservation fencing along the western side of the Park (see **Figure 1-1**).

Comparison of the existing and simulated views indicates that the proposed conservation fence under Alternative 2 would barely be visible from West Ahu with the unaided eye, and would be less visible than the existing Park fence line. From Viewpoint 3, Alternative 2, Measure 1 appears to have very similar visual impacts as the Proposed Action or Alternative 1. The impact of Alternative 2, Measure 1 to visual resources and view planes from Viewpoint 3 would be adverse, minor, and long-term.

3.4.5 No-Action Alternative

If the No-Action Alternative were implemented, the conservation fence, there would be negligible and long-term impacts to visual resources and view planes because the proposed conservation fence would not be erected. The conservation fencing surrounding the adjacent Haleakalā National Park property would remain.

If the No-Action Alternative were implemented, there would be no immediate impacts visual resources and view planes ; however, when the ATST facility is constructed, there would be moderate (depending on the color of the equipment), adverse, indirect (because the impacts would occur in the future), and short-term impacts to visual resources and view planes because the construction equipment would be used as evaluated and approved in the ATST Project EIS (NSF, 2009) and would not be painted white, and would likely be more visible, especially at longer ranges.

If the No-Action Alternative were implemented, no signs would be installed along the Park road. There would be a negligible, long-term impact on visual resources and view plane.

If the No-Action Alternative were implemented, the nēnē holding pen would not be constructed. There would be a negligible, long-term impact on visual resources and view plane.

If the No-Action Alternative were implemented, there would be moderate, direct, adverse, and short-term impacts to visual resources and view planes. Without Measure 9 the moderate impact associated with the ATST construction phase visual impacts, as evaluated in the ATST Project EIS (NSF, 2009), would still be realized. The construction period, with this moderate adverse impact, would continue 1 year longer followed by moderate operational impacts associated with the visibility of the ATST facility.

3.4.6 Summary of Impacts

The impacts of the Proposed Action and alternatives on visual resources and view planes are summarized below in **Table 3.4-1**.

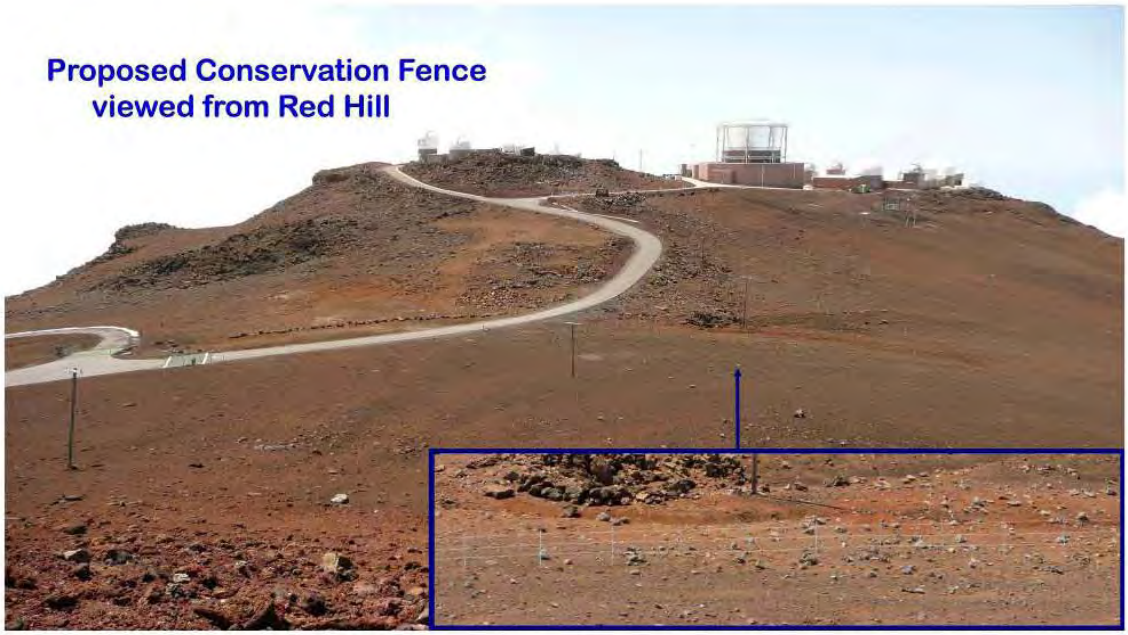
Table 3.4-1. Visual Resources and View Planes Impact Summary.

Alternative	Impact	Mitigation	Final Impact
Proposed Action	Measure 1 (Viewpoints 1, 2 and 3): Minor, adverse, long-term Measure 2: Moderate, adverse, short-term. Measure 5: Negligible, adverse, long-term Measure 7: Minor, adverse, long-term Measure 9: Moderate, adverse, short-term	None	Measure 1: Minor, adverse, long-term Measure 2: Moderate, adverse, short-term. Measure 5: Negligible, adverse, long-term Measure 7: Minor, adverse, long-term Measure 9: Moderate, adverse, short-term
Alternative 1	Measure 1: Viewpoint 1: Minor, adverse, long-term Viewpoint 2: Moderate, adverse, long-term Viewpoint 3: Minor, adverse, long-term Measures 2, 5, 7, and 9: Same as for Proposed Action.	None	Measure 1: Viewpoint 1: Minor, adverse, long-term Viewpoint 2: Moderate, adverse, long-term Viewpoint 3: Minor, adverse, long-term Measures 2, 5, 7, and 9: Same as for Proposed Action.
Alternative 2	Measure 1 (Viewpoints 1, 2, and 3): Minor, adverse, minor, long-term. Measures 2, 5, 7, and 9: Same as for Proposed Action.	None	Measure 1: Minor, adverse, minor, long-term. Measures 2, 5, 7, and 9: Same as for Proposed Action.
No-Action Alternative	In place of Measure 1: Negligible, long-term In place of Measure 2: Moderate, adverse, short-term In place of Measure 5: Negligible, long-term In place of Measure 7: Negligible, long-term In place of Measure 9: Moderate, adverse, short-term	None	In place of Measure 1: Negligible, long-term In place of Measure 2: moderate, adverse, short-term In place of Measure 5: Negligible, long-term In place of Measure 7: Negligible, long-term In place of Measure 9: Moderate, adverse, short-term

A. Viewpoint 1. Existing view toward the proposed conservation fence site from Pu'u Ula'ula Overlook. The existing Haleakalā Observatories complex is clearly visible in the background.

B. Viewpoint 1. Simulated view toward the proposed conservation fence site with no polytape (Proposed Action). Inset image shows the fence magnified to appear as it would through binoculars. The fence would not be visible to the unaided eye from this Viewpoint.

Figure 3.4-2 (a - b). Viewpoint 1: View from Pu‘u ‘Ula‘ula Overlook.

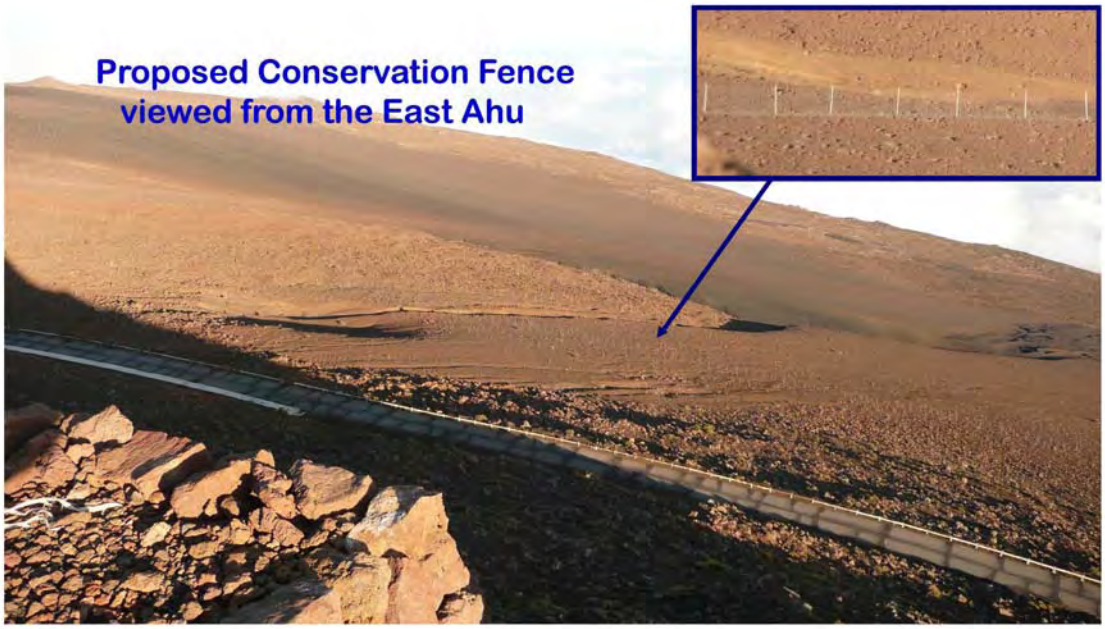


C. Viewpoint 1. Simulated view toward the proposed conservation fence site with white polytape (Alternative 1). Inset image shows the fence magnified to appear as it would through binoculars. The fence with white polytape would be barely visible to the unaided eye.

D. Viewpoint 1. Simulated view toward the proposed conservation fence site with black polytape (Alternative 2). Inset image shows the fence magnified to appear as it would through binoculars. The fence with black polytape would be slightly more visible to the unaided eye compared to the other alternatives.

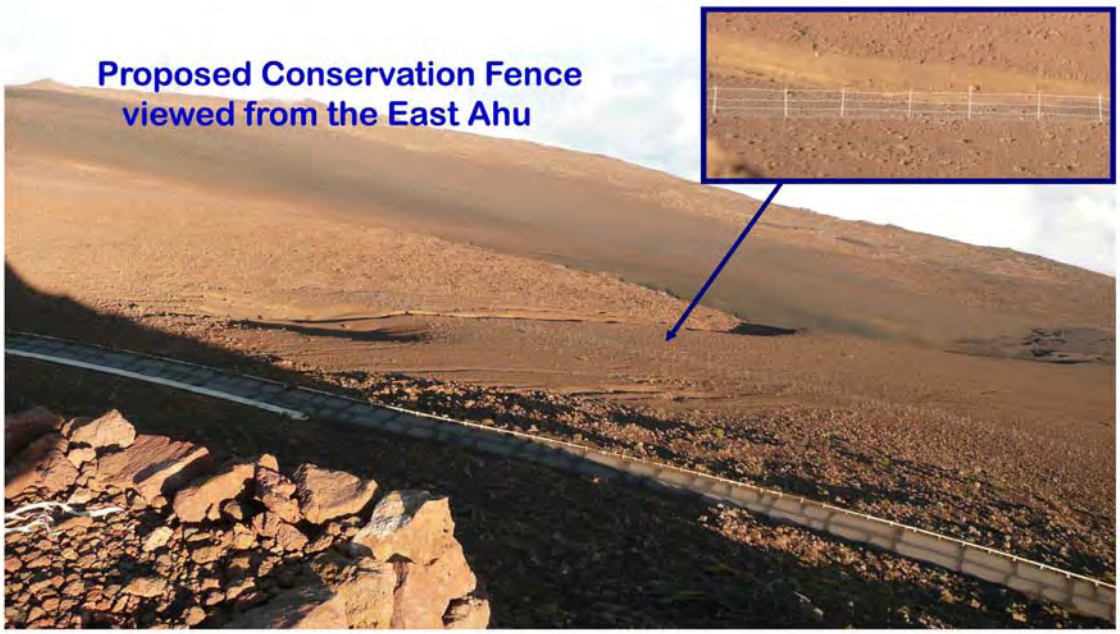
Figure 3.4-2 (c - d). Viewpoint 1: View from Puʻu ʻUlaʻula Overlook.

A. Viewpoint 2. Existing view toward the proposed conservation fence site from East Ahu. The only visible built feature is the access roadway for the FAA Low Site.

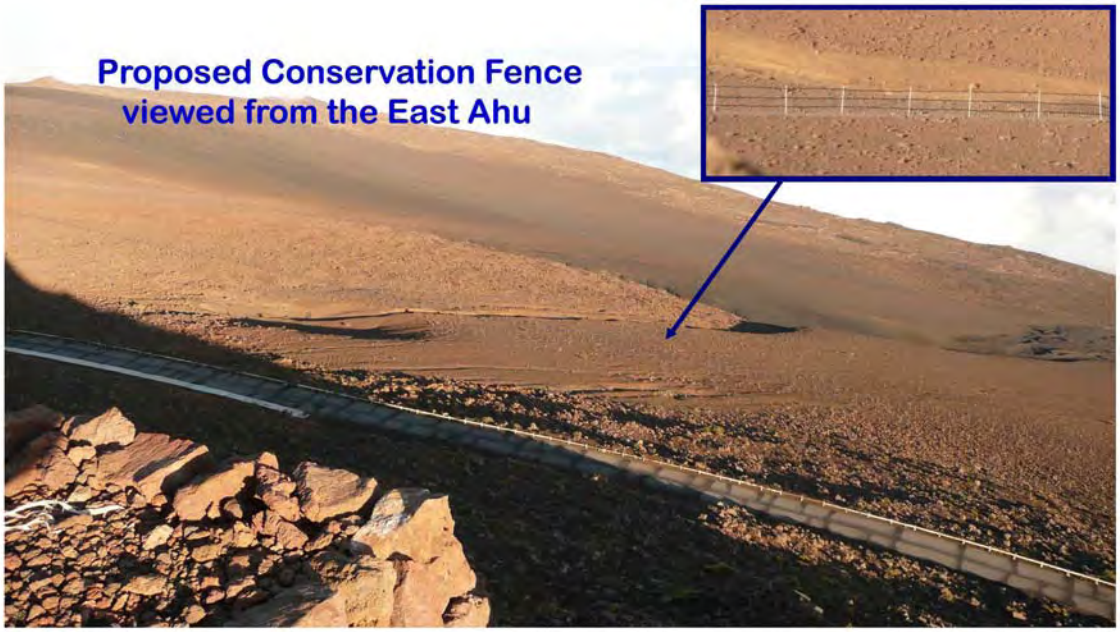


B. Viewpoint 2. Simulated view toward the proposed conservation fence site with no polytape (Proposed Action). Inset image shows the fence magnified to appear as it would through binoculars. The fence would be barely visible to the unaided eye from this Viewpoint.

Figure 3.4-3 (a - b). Viewpoint 2: View from East Ahu.



C. Viewpoint 2. Simulated view toward the proposed conservation fence site with white polytape (Alternative 1). Inset image shows the fence magnified to appear as it would through binoculars. The fence with white polytape would be somewhat visible to the unaided eye, and more visible than Proposed Action from this Viewpoint.



D. Viewpoint 2. Simulated view toward the proposed conservation fence site with black polytape (Alternative 2). Inset image shows the fence magnified to appear as it would through binoculars. The fence with black polytape would be barely visible to the unaided eye – more visible than under Proposed Action but less visible than under Alternative 1.

Figure 3.4-3 (c - d). Viewpoint 2: View from East Ahu.

A. Viewpoint 3. Existing view toward the proposed conservation fence site from West Ahu. The view features a native Hawaiian shrine (ahu) in the foreground and the west slope of Haleakalā, as well as two stakes in the middle of the view and the existing conservation fencing along with western Park boundary on the right side.

B. Viewpoint 3. Simulated view toward the proposed conservation fence site with no polytape (Proposed Action). Inset image shows the fence magnified to appear as it would through binoculars; the fence is faintly visible in the background behind the stake. The fence would be barely visible to the unaided eye from this Viewpoint.

Figure 3.4-4 (a - b). Viewpoint 3: View from West Ahu.

C. Viewpoint 3. Simulated view toward the proposed conservation fence site with white polytape (Alternative 1). Inset image shows the fence magnified to appear as it would through binoculars. As under Proposed Action, the fence would be barely visible to the unaided eye from this Viewpoint.

D. Viewpoint 3. Simulated view toward the proposed conservation fence site with black polytape (Alternative 2). Inset image shows the fence magnified to appear as it would through binoculars. As under Alternatives 1 and 2, the fence would be barely visible to the unaided eye from this Viewpoint.

Figure 3.4-4 (c - d). Viewpoint 3: View from West Ahu.

3.5 Visitor Use and Experience

The proposed conservation area is immediately adjacent to the southwest corner of the Park. This area is largely inaccessible to visitors due to the steep slopes and rocky terrain. The primary issue affecting visitors to Haleakalā would be their view plane and soundscape experience from nearby visitor areas, especially Puʻu ʻUlaʻula as it is the closest viewpoint to the proposed conservation area.

Nine conservation measures have been proposed, five of which (Measures 1, 2, 5, and 9) could affect visitor use and experience. Measure 1 consists of the erection of a 5-foot conservation fence around the 14,108-foot ATST project boundary. There are three proposed options for the fence that must be evaluated for visual impacts and visitor view plane. Under the Proposed Action, the fence would be composed of hog wire, a smooth, non-barbed wire, with no polytape incorporated. Under Alternative 1, white polytape would be interwoven into the hog wire. Under Alternative 2, black polytape would be interwoven into the hog wire. Measure 2 consists of painting external building structures and construction equipment white. Measure 5 entails the installation of traffic-calming devices along a portion of the Park Road for a period of 10 years. Measure 9 consists of shortening the construction period by one year.

The study area for consideration of impacts to visitor use and experience encompasses publically accessible areas within the Park, the Park Road, and the Maui landmass from which the proposed ATST project and the Proposed Action and alternatives may be visible.

3.5.1 Methodology for Impacts Assessment

The methods used to determine the extent to which the Proposed Action and alternatives would affect visitors' services and experiences are as follows:

1. Review and evaluate existing and past actions to identify the potential impact on visitor use and experience.
2. Review and evaluate each Proposed Action to identify its potential to adversely affect the visitor use and experience within the study area, including potential effects on existing visual resources and soundscapes.
3. Assess the compliance of each alternative with applicable federal, State, or County regulations.

Impacts on visitor use and experience could be considered adverse if they result in a decline in the quality or quantity of existing recreational facilities. Impacts are analyzed in terms of direct and indirect impacts to visitor use and experience from the Proposed Action and alternatives. Direct impacts are those caused by the Proposed Action and alternatives and occurring at the same time and place. For example, a decrease in the overall quality of experience for a visitor at the Park due to increased noise levels generated by the helicopter delivering construction materials to the conservation area is a direct impact. Indirect impacts are caused by an action but occur later or farther away, but at a reasonably known time or place. If wildlife relocate away from the easily accessible visitor areas due to increased noise levels during construction of the conservation fencing, the lower number of wildlife sightings could be an indirect impact on visitor experience.

The thresholds of change for the intensity of impacts on visitors' services are consistent with those used in the ATST EIS (NSF, 2009); impacts are classified as either negligible, minor, moderate, or major, as defined below.

- A negligible impact would not impact visitor use and enjoyment of Park resources. Visitors would not likely be aware of the changes.
- A minor impact would result in detectable changes to the character of the Park and would impact visitor use and enjoyment of Park resources. The changes in visitor use and experience would,

however, be slight and likely short-term. Other areas in the Park would remain available for similar visitor use and experience without degradation of Park resources and values.

- A moderate impact would result in detectable changes to the character of the Park and would impact visitor use and enjoyment of Park resources. Changes in visitor use and experience would be readily apparent and likely long-term. Other areas in the Park would remain available for similar visitor use and experience without degradation of Park resources and values, but visitor satisfaction might be measurably affected (visitors could be either satisfied or dissatisfied with their visit overall). Some visitors who desire to continue their use and enjoyment of the activity/experience would be required to pursue their choice in other available local or regional areas. Mitigation measures, if needed to offset adverse impacts, would be extensive and likely successful.

- A major impact would result in substantial changes to the character of the Park and would impact visitor use and enjoyment of Park resources. Changes in visitor use and experience would be readily apparent and long-term. The change in visitor use and experience from the proposed alternative would preclude future generations of some visitors from enjoying Park resources and values. Some visitors who desire to continue their use and enjoyment of the activity/ experience would be required to pursue their choice in other available local or regional areas. Extensive mitigation measures would be needed to offset any adverse impacts and their success would not be guaranteed.

Impacts are also quantifiable by the duration of the impact. A short-term impact is one that occurs only during the construction of the habitat conservation area (fencing). A long-term impact continues after construction of the habitat conservation area.

3.5.2 Proposed Action

Measure 1: Conservation Fencing

The conservation fence under the Proposed Action would have at most a minor impact on visitor visual experience. As is discussed in Section 3.4, Visual Resources and View Planes, the conservation fence under the Proposed Action would not be visible with the unaided eye from the closest visitor facility, Puʻu ʻUlaʻula Overlook. The conservation fence under the Proposed Action would not impact soundscape aspects of visitor use and experience except for one or two days when construction materials are delivered by helicopter. Although this impact would be short-term, the helicopter has the potential to produce a minor impact on visitor soundscape at nearby visitor facilities such as Puʻu ʻUlaʻula Overlook. The conservation fence under the Proposed Action would not affect visitor access. Overall impacts to visitor experience of the Proposed Action, Measure 1 would be adverse, direct, minor to moderate, and long-term.

Measure 2: Pre-Painting of External Structures and Equipment

Under Measure 2, structures and equipment associated with ATST project construction would be painted white prior to arrival at the project site. Measure 2 has the potential to reduce the adverse impact to visual aspects of visitor use and experience, as compared to approved ATST project construction without this measure. However, the impact to visitor use and experience is still considered moderate, adverse, and short-term.

As is discussed in Section 3.4, Visual Resources and View Planes, Measure 2 would have an adverse, moderate, short-term impact on visual experience. Measure 2 would likely make the construction equipment less obtrusive from close up and less visible from far away, though the degree of visibility would depend on viewpoint and atmospheric conditions. At close range, Measure 2 is not likely to affect the visibility of the construction equipment but it would help it blend in and visually harmonize with the

HO complex since some of the structures are at least partially white, e.g., telescope domes. As such, Measure 2 could somewhat diminish the visual impacts of construction equipment from tourist facilities relatively close to the project site such as from Puʻu ʻUlaʻula Overlook, Haleakalā Visitor Center, and Keonehe'ehe'e (Sliding Sands) Trailhead. For sites that are further away, such as those within the crater or from the rest of the Maui landmass where the project area is visible along the ridgeline, Measure 2 could cause the construction equipment to better blend into the skyline. Particularly for visitors to the crater area of the Park, this could increase visitors' sense of being in the wilderness by contributing to a perceived lack of human presence or development.

Measure 2 would not affect visitor experience of the Park soundscape or visitor access aspects of visitor use and experience. Overall impacts on visitor experience of Measure 2 would be adverse, moderate, and short-term.

Measure 5: Traffic-Calming Devices

Measure 5 entails the temporary installation of traffic-calming devices along a portion of the Park Road. These could include speed humps, speed limit signs, speed measuring signs, and message boards alerting drivers to vehicle risks regarding Hawaiian geese. These devices would only be installed where and when nēnē are frequenting the road.

Measure 5 would likely have a negligible effect on certain aspects of visitor use and experience such as soundscape and access (see the discussions in Section 3.6, Noise, and Section 3.7, Traffic). The reduction in noise or potential for traffic congestion resulting from Measure 5 are anticipated to be negligible and not likely noticeable due to the already steep terrain and frequent switchbacks that currently limit speeds on this road (see Section 3.6, Noise, and 3.7, Traffic, for full analyses). Rather, this measure will make visitors aware of their speeds and of the potential presence of the Hawaiian goose. Measure 5 would have a negligible, direct, adverse, and long-term impact on visitor use and experience.

Measure 9: Year-Round Unrestricted Construction

Through the implementation of year-round construction, Measure 9 would reduce the ATST construction period by 1 year from that stated in the EIS (NSF, 2009). The construction period would be reduced from 7-8 years to 6-7 years. Although the construction period would be shortened overall, traffic related to construction would occur year-round with this measure.

Traffic associated with the Proposed Action, as discussed in Section 3.7, would result in an increase of 0.7 percent above past average traffic levels. Further, installation of the proposed traffic-calming devices would slow traffic in up to three locations along the Park Road; however, because traffic speeds are already limited due to the terrain and frequent switchbacks, this measure is not anticipated to noticeably affect traffic congestion or visitor experience. The impact of traffic associated with the Proposed Action on visitor use, access, or experience would be negligible.

Measure 9 also has the potential to reduce the full duration of visual impacts of visitor use and experience; however, the visual intrusion would be apparent year-round. In the EIS, ATST construction was found to have moderate impacts on visual aspects of visitor use and experience. While Measure 9 has the potential to reduce the severity of the adverse impact on visitor use and experience during construction of ATST, this impact is still considered to be moderate, adverse, and short-term.

3.5.3 Alternative 1

Under Alternative 1, the fence would be as described in the Proposed Action but it would be interwoven with white polytape. Measures 2, 5, and 9 would be implemented the same under Alternative 1 as under the Proposed Action. Impacts of these three Measures would be identical to those under the Proposed Action and are therefore not discussed further in this analysis.

Measure 1: Conservation Fencing

The conservation fence under Alternative 1 would have a minor impact on visitor visual experience. As is discussed in Section 3.4, Visual Resources and View Planes, the conservation fence under Alternative 1 would barely be visible with the unaided eye from the closest visitor facility, Puʻu ʻUlaʻula Overlook. The conservation fence under Alternative 1 would not impact soundscape aspects of visitor use and experience except on the one or two days that construction materials would be delivered by helicopter. Although this impact would be short-term, the helicopter has the potential to produce a moderate to major impact on visitor experience of Park soundscapes at nearby visitor facilities such as Puʻu ʻUlaʻula Overlook. The conservation fence under Alternative 1 would not affect visitor access. Overall impacts to visitor experience of Alternative 1, Measure 1 would be adverse, direct, minor to moderate, and long-term.

3.5.4 Alternative 2

Under Alternative 2, the fence would be as described in the Proposed Action but it would be interwoven with black polytape. Measures 2, 5, and 9 would be implemented the same under Alternative 2 as under the Proposed Action. Impacts would be similar and slightly less than those discussed under Alternative 1 and are therefore not discussed further in this analysis.

Measure 1: Conservation Fencing

The conservation fence under Alternative 2 would have an at most minor impact on visitor visual experience. As is discussed in Section 3.4, Visual Resources and View Planes, the conservation fence under Alternative 2 would be somewhat visible with the unaided eye from the closest visitor facility, Puʻu ʻUlaʻula Overlook. However, the viewer's eye would be drawn to the complex of structures at the top of the hill which dominate the view rather than the relatively bare mid-hill area which would contain the conservation fence.

The conservation fence under Alternative 2 would not impact soundscape aspects of visitor use and experience except on the one or two days that construction materials would be delivered by helicopter. Although this impact would be short-term, the helicopter has the potential to produce a moderate to major impact on visitor soundscape at nearby visitor facilities such as Puʻu ʻUlaʻula Overlook. The conservation fence under Alternative 2 would not affect visitor access. Overall impacts to visitor experience of Alternative 2, Measure 1 would be adverse, direct, minor to moderate, and long-term.

3.5.5 No-Action Alternative

If the No-Action Alternative were implemented in place of Measure 1, the conservation fence, there would be minor, beneficial, direct, and long-term impacts to visual and soundscape aspects of visitor use and experience the because the proposed conservation fence would not be erected.

If the No-Action Alternative were implemented in place of Measure 2, pre-painting of external structures and equipment, there would be no immediate impact to visitor experience; however, when ATST construction commences in the future, there would be moderate, adverse, direct, and short-term impacts to visual aspects of visitor use and experience, as described in the EIS. Without implementation of this measure, construction equipment would not be painted white and would be somewhat more visible.

If the No-Action Alternative were implemented in place of Measure 5, traffic-calming devices, there would be negligible, beneficial, direct, and long-term impacts to noise and traffic aspects of visitor use and experience.

If the No-Action Alternative were implemented in place of Measure 7, the nēnē holding pen would not be constructed and there would be negligible noise impacts affecting visitor use and experience.

If the No-Action Alternative were implemented in place of Measure 9, year-round unrestricted construction, there would be moderate, direct, adverse, and short-term impacts to traffic, noise, and visual

aspects of visitor use and experience. The severity of this impact would not be reduced, as it would under the Proposed Action, because the construction period would continue 1 year longer.

3.5.6 Summary of Impacts

The impacts of the Proposed Action and alternatives on visitor use and experience are summarized below in **Table 3.5-1**.

Table 3.5-1. Visitor Use and Experience Impact Summary.

Alternative	Impact	Mitigation	Final Impact
Proposed Action	Measure 1: minor to moderate, adverse, direct, long-term. Measure 2: moderate, adverse, short-term Measure 5: negligible, adverse, direct, long-term Measure 9: moderate, adverse, short-term	None	Measure 1: minor to moderate, adverse, direct, long-term. Measure 2: moderate, adverse, short-term Measure 5: negligible, adverse, direct, long-term Measure 9: moderate, adverse, short-term
Alternative 1	Measure 1: Minor to moderate, adverse, direct, long-term Measures 2, 5, and 9: same as for Proposed Action	None	Measure 1: Minor to moderate, adverse, direct, long-term Measures 2, 5, and 9: same as for Proposed Action
Alternative 2	Same as for Alternative 1	None	Same as for Alternative 1
No-Action Alternative	In place of Measure 1: minor, beneficial, direct, long-term In place of Measure 2: moderate, adverse, direct, short-term In place of Measure 5: negligible, beneficial, direct, long-term In place of Measure 9: moderate, adverse, direct, short-term	None	In place of Measure 1: minor, beneficial, direct, long-term In place of Measure 2: moderate, adverse, direct, short-term In place of Measure 5: negligible, beneficial, direct, long-term In place of Measure 9: moderate, adverse, direct, short-term

3.6 Noise

3.6.1 Impact Assessment Methodology

The methods used to assess the level of potential impact that the Proposed Action and alternatives would have on noise levels included reviewing and evaluating past and ongoing noise generating actions and activities within the study area that could provide a baseline for identifying potential adverse noise impacts. The analysis also included the evaluation of expected noise from the Proposed Action using industry-standard methods to identify potential sound levels within the study area. Finally, the analysis evaluated compliance of expected noise with applicable federal, State, and County regulations.

The intensity of impacts are categorized as either negligible, minor, moderate, or major, as defined below.

- A negligible impact would result in either no change in noise levels or an increase of less than 3 dBA.
- A minor impact would result in an increase between 3 and 10 dBA.
- A moderate impact would result in an increase between 10 and 15 dBA.
- A major impact would substantially adversely change noise conditions, resulting in a noise increase greater than 15 dBA.

The duration of the impact may be short-term or long-term. Short-term impacts only occur during construction and placement of the Proposed Action, specifically the fencing. Long-term impacts would continue after construction of the proposed fencing.

3.6.2 Proposed Action

Because only Measures 1 (conservation fence), 3 (predator controls), and 4 (petrel monitoring) have the potential to affect this resource, this Noise analysis eliminates the remaining conservation measures from further discussion.

To avoid further impacts on the natural and largely undisturbed terrain of the conservation area, no vehicles would be allowed where the fence would be placed. Materials would be transported in one or two trips on one flatbed truck to a designated helicopter landing zone shown on **Figure 1-2**. A helicopter would then airlift the materials and place them along the proposed fence line approximately 300 feet apart. Use of the helicopter is estimated to last no more than two days and will only occur during daylight hours. Noise generated by helicopters has the potential to create a short-term, major noise impact on the Hawaiian petrel. To mitigate this impact, the helicopter would only be used when the Hawaiian petrel is not present on Haleakalā (November through January). Furthermore, based on petrel burrow surveys completed prior to fence construction, if a burrow is located in the vicinity of the proposed fence alignment, but at a sufficient distance not to require realignment of the fence, the fence posts will be driven during the period petrels are not present to minimize noise impacts to the protected bird. With this mitigation, the potential major noise impact on the petrel would be avoided entirely.

Helicopters are used occasionally in and around the study area and would not represent a new or sustained source of noise. Still, visitors to Puʻu ʻUlaʻula (Red Hill Lookout) may experience temporary noise from the helicopter during the one or two days of materials delivery. To ensure that noise levels would not conflict with land management, flight path restrictions, or other helicopter use, helicopter operators would coordinate flight plans with Park rangers and the State. With this coordination, flight patterns could be adjusted to avoid passing though the Park, such that the closest helicopter approach would be approximately 820 ft (250 m) from Puʻu ʻUlaʻula (Red Hill Lookout). As indicated in **Table 2.6-1**, peak noise when the helicopter is approaching is estimated at up to 95 dBA at a 50 ft distance. Noise levels at HO range between 73 dBA and 93 dBA. These would be similar to the higher noise levels generated by

the helicopter. Further, geometric spreading from a point source estimates a dissipation of sound by 6 dBA per doubling of distance. Considering this metric, at a distance of 820 ft (250 m) between Pu'u 'Ula'ula and the closest point of helicopter use, the highest noise levels potentially heard at the visitor center would be 77 dBA. This noise level would be experienced for approximately 10 minutes.

By maintaining flight paths on only State lands and coordinating helicopter usage with Park rangers and State personnel prior to flights, the noise impact on Park users would be minor, adverse, and short-term.

Noise would occur intermittently during the remaining three months of fence construction as posts are hammered and fence installed; however, these noise levels are not anticipated to noticeably exceed existing noise levels. Because of the distance and intermittent/isolated activities of the fence installation, visitors to Pu'u 'Ula'ula and personnel working inside facilities within HO would not likely hear the hammering from fence post installation.

Traffic associated with installing and maintaining conservation fencing (Measure 1), predator control (Measure 3), and petrel monitoring (Measure 4) would also contribute to a temporary increase in noise levels. As noted in Section 3.7, Traffic, these measures and the reduced ATST facility construction period (Measure 9) would represent a 0.67 percent increase over that analyzed in the ATST EIS. Estimates from the EIS concluded that ATST-related construction and operations traffic would raise existing noise levels along the Park Road by 3 dBA (NSF, 2009). Traffic associated with the Proposed Action, and the associated noise impacts, would be substantially less. Based on these estimates, therefore, traffic noise levels along the Park Road would change only to a negligible, imperceptible degree with implementation of Proposed Action. Traffic related impacts would be negligible, adverse, and short-term.

3.6.3 Alternative 1

The impacts on noise would be the same as for the Proposed Action.

3.6.4 Alternative 2

The impacts on noise would be the same as for the Proposed Action.

3.6.5 No-Action Alternative

Under the No-Action Alternative, the proposed fence would not be constructed. Predator control and petrel monitoring would still occur as outlined under the ATST EIS but would not extend beyond HO and the Park road. Noise generating activities would continue including traffic, visitor voices, wind, and observatory operations. These impacts would be minor, adverse, and long-term.

3.6.6 Summary of Impacts

The noise impacts of the Proposed Action and alternatives are summarized below in **Table 3.6-1**.

Table 3.6-1. Noise Impact Summary.

Alternative	Impact	Mitigation	Final Impact
Proposed Action	Minor, adverse, short-term noise impact from fence construction activities. Negligible, adverse, short-term noise impact from traffic related to other measures	Phasing helicopter activities when the Hawaiian petrel is not present Coordinate flight plans with Park rangers and State personnel None	Minor, adverse, short-term Negligible, adverse, short-term
Alternative 1	Same as the Proposed Action	Same as the Proposed Action	Same as the Proposed Action
Alternative 2	Same as the Proposed Action	Same as the Proposed Action	Same as the Proposed Action
No-Action Alternative	Minor, Adverse, Long-term	None	Minor, Adverse, Long-term

3.7 Transportation and Traffic

3.7.1 Impact Assessment Methodology

Methods used to determine impacts to traffic along the Park Road and to and from HO include assessing the traffic impacts of existing and past actions to identify potential impacts of the Proposed Action and alternatives.

The intensity of impacts is described as either negligible, minor, moderate, or major, as defined below.

- A negligible impact would result in a change in existing traffic too small to be of any measurable or perceptible consequence.
- A minor impact would result in a small, localized change of little consequence.
- A moderate impact would result in a measurable and consequential change in traffic and transportation.
- A major impact would result in substantial change to existing traffic levels and transportation, with severe adverse or beneficial impacts.

Impacts may be short-term or long-term. A short-term impact would only occur during construction of the habitat conservation fencing. A long-term impact would occur after construction of the fencing.

3.7.2 Proposed Action

The proposed measures that may have the potential to impact traffic include Measure 1 (conservation fencing), Measure 3 (predator controls), Measure 4 (petrel monitoring), Measure 5 (traffic-calming devices), and Measure 9 (year-round construction). **Table 3.7-1** summarizes the effects of these conservation measures on annual traffic estimates for the Park Road.

As shown in **Table 3.7-1**, the increase in traffic associated with Measures 1, 3, 4, and 9 would be approximately 0.7 percent greater than average traffic levels during year 1. Measure 9 traffic estimates compare the difference in traffic if the construction phase were reduced by one year[3]. The difference results in 596 additional trips per year for the first six years and no construction-related trips in year 7. This difference is considered in the traffic increase estimation. During years 2 through 6, the increase in traffic would be even less, since initial fence construction and maintenance would be complete. During years 7 through 10, traffic levels would be consistent with years 2 through 6 and may decrease further based on the success of the Proposed Action. This increase is considered minor, adverse, and short-term.

It is anticipated that a total of 53,665 total vehicle round-trips would access the ATST site during the 20-year period of analysis (NSF, 2009). 25,000 round-trips would be associated with construction activities during the first six years, due to Measure 9, year-round construction. Therefore, an additional 596 trips per year for the next six years would result in a 16.7 percent increase in traffic above those estimated in the ATST EIS. This increase is considered minor, adverse, and short-term.

Speeds of vehicles are currently limited by steep inclines and extreme curves associated with the switchbacks. Therefore, while the placement of up to six speed humps (three in each direction) may cause slow traffic, this impact would be minor as the change may be noticeable, but would be small, localized, and of little consequence. Use of the speed humps and other traffic control devices are not anticipated to cause further congestion, but rather to slow traffic slightly to make travelers aware of their speed and the

[3] The ATST EIS considered a construction duration of 7 to 8 years. Conservation Measure 9 would reduce this term to between 6 and 7 years, for an approximate reduction of one year. The difference between 6 and 7 years identifies a greater (more conservative) difference in traffic volume during the initial construction phase.

Table 3.7-1. Effects of Conservation Measures on Annual Traffic Estimates for the Park Road.

Annual Traffic Estimates	Number of Vehicle Round Trips on the Park Road						
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7 through 10 (if required)**
Estimated Traffic Using Average Traffic Counts [a]	232,210	232,210	232,210	232,210	232,210	232,210	928,840
Measure 1: Fence Construction and Maintenance	362	4	4	4	4	4	0
Measure 3: Predator Control	72	72	72	72	72	72	288
Measure 4: Petrel Monitoring	488	450	450	450	450	450	1,800
Measure 5: Place Traffic-calming Devices	24	0	0	0	0	0	0
Measure 9: Year-round Construction [b]	4,167	4,167	4,167	4,167	4,167	4,167	0
Estimated ATST Operations Traffic [c]	0	0	0	0	0	0	8,190

Notes:

Traffic counts were estimated based on discussions NSF and Park staff.

[a] Average of 2007 and 2008 traffic data, which was 251,874 and 212,547 visits, respectively (NSF, 2009). Does not include traffic associated with ATST or Habitat Conservation Plan, only includes estimations using past traffic data.

[b] Based on estimation of 25,000 ATST construction visits averaged over 6 years.

[c] Based on estimation of 28,665 visits averaged over 14 years, times four years.

potential presence of the Hawaiian goose. Further, these devices would be installed temporarily, and would only be implemented where and when nēnē frequent the road. The impact of Measure 5 on traffic and transportation is considered minor, adverse, and long-term.

Measure 6 (Hawaiian Goose Monitoring) would not add traffic, but rather construction crews accessing the summit would be trained to identify the Hawaiian goose. If construction crews or Park personnel find individuals along the roadway, NPS and USFWS would be notified. There would be no impact on traffic and transportation from Measure 6.Overall, construction associated with implementation of the Proposed Action would result in a minor increase in traffic over the next 6 to 10 years. Traffic-calming measures may result in some delays, but these would be minor given that speeds along the Park Road are already limited. This impact would be adverse, long term and minor.

3.7.3 Alternative 1

Impacts on traffic would be the same as for the Proposed Action.

3.7.4 Alternative 2

Impacts on traffic would be the same as for the Proposed Action.

3.7.5 No-Action Alternative

Under the No-Action Alternative there would be no additional traffic associated with the construction of the proposed fencing and implementation of the Proposed Action. Current traffic volumes associated with Park and HO activities would continue, and congestion associated with the terrain and frequent switchbacks along the Park Road would maintain a limited speed on the roadway. These impacts are considered minor, adverse, and long-term.

3.7.6 Summary of Impacts

The impacts of the Proposed Action and alternatives on Park Road traffic are summarized below in **Table 3.7-2.**

Table 3.7-2. Traffic Impact Summary.

Alternative	Impact	Mitigation	Final Impact
Proposed Action	Measures 1, 3, 4: Minor, adverse, short-term impacts related to increases in traffic levels along the Park road during construction Measure 9: Minor, adverse, short-term impacts related to increases in traffic levels and vehicle round trips Measure 5: Minor, adverse, long-term impacts from traffic delays resulting from the placement of traffic-calming devices.	None	Measures 1, 3, 4: Minor, adverse, short-term impacts related to increases in traffic levels along the Park road during construction Measure 9: Minor, adverse, short-term impacts related to increases in traffic levels and vehicle round trips Measure 5: Minor, adverse, long-term impacts from traffic delays resulting from the placement of traffic-calming devices
Alternative 1	Same as the Proposed Action		Same as Proposed Action
Alternative 2	Same as the Proposed Action		Same as Proposed Action
No-Action Alternative	Minor, adverse, and long-term impact.	None	Minor, adverse, and long-term impact.

3.8 Air Quality

This analysis focuses on the affect, either beneficially or adversely, directly or indirectly, of the Proposed Action and alternatives on air quality within the project area.

3.8.1 Methodology of Impact Assessment

Impacts are categorized by the level of intensity of impacts on air quality as either negligible, minor, moderate, or major. For this analysis, these terms are defined as follows:

- A negligible impact would either not result in a change in air quality, or changes would be so small that it would not be of any measurable or perceptible consequence.
- A minor impact would result in a detectable change in air quality, but the change would be small, localized, and of little consequence.
- A moderate impact would result in a measurable and consequential change in air quality. Mitigation may be needed to offset adverse impacts and would be relatively simple to implement and likely to be successful.
- A major impact would result in a substantial change in air quality. Extensive mitigation measures to offset adverse impacts would be needed and their success could not be guaranteed.

The duration of impacts is described as either short-term (occurs only during project construction) or long-term (continues after construction).

3.8.2 Proposed Action

Minor air quality impacts associated with ground disturbance, vehicle traffic and helicopter use would occur during construction. However, adverse impacts on air quality would be temporary, intermittent, and at levels substantially below both human health and hazardous air pollutant industrial hygiene criteria. Long-term impacts to air quality would be negligible.

Use of transport vehicles and the helicopter would result in low-level, intermittent exhaust emissions. No heavy equipment, with the exception of the helicopter, would be used for construction of the proposed fence or nēnē holding pen. Small amounts of mobile source emissions would also result from vehicle traffic associated with project maintenance and monitoring activities. The actual increase in daytime traffic during construction, as compared to baseline conditions, however, would not result in appreciable impacts on air quality. Further, while a helicopter would be used for up to two days on Haleakalā, related effects to air quality are considered minor. Air quality around the Hawaiian Islands is considered excellent. Helicopters are currently used on a semi-frequent basis on Park lands. The helicopter contractor would coordinate flight, operations, and safety plans with Park rangers and the State to ensure compliance with applicable federal and State protocols.

Installation of the proposed conservation fence and the nēnē pen also would generate small amounts of fugitive dust. To minimize fugitive dust emissions, contractors would be required to comply with applicable State regulations under HAR 11-60.1-33, which require the implementation of "reasonable precautions" for controlling fugitive dust (DOH, 2005). Dust-control measures and best management practices (BMPs) as mandated by the LRDP would also be implemented. These practices would limit controllable emissions from project activities that could adversely affect the local air quality.

Overall, air quality impacts would be minor, adverse, and short-term.

3.8.3 Alternative 1

Impacts with implementation of Alternative 1 would be the same as for the Proposed Action.

3.8.4 Alternative 2

Impacts with implementation of Alternative 2 would be the same as for the Proposed Action.

3.8.5 No-Action Alternative

Under the No-Action Alternative, the proposed fence and nēnē pen would not be constructed and current Park operations and traffic on Haleakalā would continue. Although these activities do generate fugitive dust, they do not currently pose a threat to the quality of air in Hawai‘i. Therefore, the impact under the No-Action Alternative on air quality is considered long-term and negligible.

3.8.6 Summary of Impacts

The impacts of the Proposed Action and alternatives on air quality are summarized below in **Table 3.8-1**.

Table 3.8-1 Air Quality Impact Summary.

Alternative	Impact	Mitigation	Final Impact
Proposed Action	Negligible impact to long-term air quality Minor, adverse, short-term construction related impacts.	Implementation of HO LRDP BMPs	Negligible impact to long-term air quality Minor, adverse, short-term construction related impacts
Alternative 1	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
Alternative 2	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
No-Action Alternative	Negligible, adverse, and long-term	None	Negligible, adverse, and long-term

3.9 Geology, Soils, and Topography

This analysis focuses on the affect, either beneficially or adversely, directly or indirectly, of the Proposed Action and alternatives on topography, geology and soils within the project area. This resource has the potential to be affected by Measure 1 (construction of the proposed conservation fence) and Measure 7 (construction of the proposed nēnē holding pen). Other conservation measures would not notably disturb geologic formations, soils or topography and are therefore omitted from further analysis.

3.9.1 Methodology of Impact Assessment

Impacts are described by the level of intensity of impacts on topography, geology and soils, and are categorized as either negligible, minor, moderate, or major. For this analysis, these terms are defined as follows:

- A negligible impact would either not result in a change to the topography, geology, or soils, or changes would be so small that they would not be of any measurable or perceptible consequence.
- A minor impact would result in a detectable change to the topography, geology, or soils, but the change would be small, localized, and of little consequence.
- A moderate impact would result in a measurable and consequential change to the topography, geology, or soils. Mitigation may be needed to offset adverse impacts and would be relatively simple to implement and likely to be successful.
- A major impact would result in a substantial change to the topography, geology, or soils. Extensive mitigation measures to offset adverse impacts would be needed and their success could not be guaranteed.

The duration of impacts is described as either short-term (occurs only during project construction) or long-term (continues after construction).

3.9.2 Proposed Action

Some soil disturbance would occur with construction of the proposed conservation fence and the nēnē pen under the Proposed Action. However, soil disturbance would be minimal and would occur only along the proposed fenceline and within the general area where the nēnē pen would be installed. Fence installation would require inserting the fence posts to a depth of approximately 18 inches. Soils excavated would remain onsite. No grading or earth movement would be necessary for the temporary staging prior to helicopter transport or along the fenceline. These activities would not affect stormwater management or stormwater flow.

Minor grading may be necessary prior to placement of the foundation of the nēnē pen. Similar to the fence construction, soils would remain onsite and there would be no effect on stormwater management.

There would be no impact on topography or geologic formations as a result of the proposed mitigation measures. With implementation of HO Stormwater Management Plan BMP, project impacts on soils would be negligible, adverse, and short-term.

3.9.3 Alternative 1

Impacts with implementation of Alternative 1 would be the same as for the Proposed Action.

3.9.4 Alternative 2

Impacts with implementation of Alternative 2 would be the same as for the Proposed Action.

3.9.5 No-Action Alternative

Under the No-Action Alternative, the proposed conservation fence and nēnē holding pen would not be constructed. There would be no change to topography, geology or soils. This impact would be negligible.

3.9.6 Summary of Impacts

The impacts of the Proposed Action and alternatives on topography, geology, and soils are summarized below in **Table 3.9-1**.

Table 3.9-1. Topography, Geology, and Soils Impact Summary.

Alternative	Impact	Mitigation	Final Impact
Proposed Action	Negligible impact to topography and geology Minor, adverse, short-term impact to soils.	Implementation of HO Stormwater Management Plan BMPs	Negligible adverse, short-term to topography, geology, and soils
Alternative 1	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
Alternative 2	Same as for Proposed Action	Same as for Proposed Action	Same as for Proposed Action
No-Action Alternative	Negligible, long-term	None	Negligible, long-term

3.10 Cumulative Impacts

The CEQ NEPA-implementing regulations define cumulative impacts as the incremental environmental impacts of a proposed action when added to other "past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions." Cumulative impacts can result from individually minor, but collectively significant actions taking place over time.

As described in Section 1.6, resources that would not be directly or indirectly affected by implementation of the Proposed Action include water resources; hazardous materials; solid waste; infrastructure and utilities; socioeconomics and environmental justice; public services and facilities; and natural hazards. Therefore, by definition, the Proposed Action would not contribute to cumulative impacts to these resources, and they are not addressed further.

The resources to which the project could contribute cumulative impacts are land use and existing activities; cultural, historic and archeological resources; biological resources; visual resources and view planes; visitor use and experience; noise; and traffic (discussed below). In general, implementation of the Proposed Action is intended to provide long-term benefits to biological resources, primarily the Hawaiian petrel. There is, however, the potential for minor adverse impacts to other biological and environmental resources as a result of the proposed action.

To assess the cumulative impacts, the impacts to each resource were considered together with the impacts from past, present, and reasonably foreseeable activities within the study area. The cumulative analysis area is the same as that discussed in the resource-specific affected environment sections, and is primarily characterized as the proposed 328-ac conservation area of unencumbered State Conservation Lands surrounding the summit of Haleakalā, the Park Road corridor, and the proposed nēnē holding pen site. This cumulative analysis area is similar to that considered for the ATST project, with the addition the above areas. As such, the cumulative activities associated with other past, present, and reasonably foreseeable activities in the area that are considered in this analysis are the same as discussed in the ATST EIS (NSF, 2009), including the ATST project, which has now been approved for construction.

Table 3.10-1 at the end of this section summarizes the baseline impacts associated with the past, present and reasonably foreseeable future actions within the study area, as described in the ATST EIS. Major cumulative impacts associated with these activities relate to cultural, historic and archeological resources; biological resources; visual resources and view planes; and visitor use and experience. **Table 3.10-1** also summarizes the impacts associated with implementation of the Proposed Action, according to each resource category. In general, the extent to which the Proposed Action will contribute to cumulative impacts is dependent on the degree to which they are expected to impact the various resources within the study area. Overall, implementation of the Proposed Action is expected to result in negligible to minor impacts, with some long-term beneficial impacts, and as such will not significantly contribute to cumulative impacts. These impacts are summarized below.

3.10.1 Land Use and Existing Activities

The Proposed Action would require a conservation district use permit for activity on State Conservation District land; however, the activities proposed are largely compliant with the designated land use. By limiting human activity within the resource subzone, the impact to land use is minor. Likewise, other cumulative activities, including those occurring within HO, within Haleakalā National Park and on adjacent lands would not conflict with the designated uses of the land. The cumulative impact on land use and existing activities would be minor, long-term, and adverse.

3.10.2 Cultural, Historic and Archeological Resources

Impacts to cultural resources within the study area from construction of the fence would be minimal, as monitoring would be conducted prior to fence installation to facilitate avoidance of archeological resources during staging and installation. Furthermore, the conservation fence would not preclude access for Native Hawaiians to visit HO or other areas of Haleakalā. As discussed in Section 3.2, known archeological and historic resources are located in the vicinity of the proposed fence line and within the 10-acre Park Operations area. If known archeological resources were not avoided, construction of the conservation fence would have major, adverse, effects; however, by choosing an alignment within the conservation area that would avoid these archeological resources, this impact would be reduced to negligible. Construction of the nēnē holding pen would not alter or affect the existing cultural resources on Park land, and would have a negligible impact. Impacts related to the use of the project area for cultural practices would be minor and short-term; this would result in *no effect* under Section 106. Therefore, the project would not contribute considerably to cumulative impacts to cultural, archeological or historic resources in the area.

3.10.3 Biological Resources

Impacts to biological resources within the study area from construction of the fence would be minimal, as monitoring would be conducted prior to fence installation to facilitate avoidance of petrel burrows and other sensitive biological resources during staging and installation. Over the long term, the proposed conservation fence is anticipated to provide beneficial impacts to biological resources, primarily the Hawaiian petrel, by excluding ungulates from their habitat. Other measures, including predator control and monitoring/reporting, will also provide long-term benefits to biological resources. These collective beneficial impacts would reduce cumulatively identified adverse impacts to a moderate, adverse level.

3.10.4 Visual Resources and View Planes

Visual resources and visitor experience would also be adversely affected due to the long-term presence of the conservation fence; however, these impacts are expected to be minimally noticeable, regardless of whether polytape is used or not, and would be consistent with the existing Park fence line. Impacts to visual resources are characterized in the visual resource analysis as minor with the exception of one view, the East Ahu Viewpoint (Viewpoint 2), being moderate. In views from Viewpoint 2, the conservation fence, though marginally noticeable, would be detectable to the human eye. Visual impacts from Measures 2 (pre-painting of structures) and 9 (year-round construction) would reduce the moderate adverse impacts identified in the ATST EIS to some extent. However, impacts related to the visibility of construction equipment and structures would remain moderate and adverse.

3.10.5 Visitor Use and Experience

The proposed conservation fence would be visible, though slightly, by visitors at Puʻu ʻUlaʻula, most noticeably under Alternative 2. This would be a long-term, adverse impact, however minor. The pre-painting and, as appropriate, polytaping of construction equipment and structures may reduce the moderate adverse impacts associated with the visual intrusion to visitors, as compared to approved ATST project construction without this measure. This would reduce the cumulative impact from ATST construction activities on visitor use, although this impact would remain moderate, adverse, and short-term. The contribution of the proposed measures on traffic would be negligible to minor, even with the installation of traffic-calming devices along the Park Road. The cumulative impact on visitor use and experience would be adverse, minor to moderate, and beneficial, and would include both short- and long-term impacts.

3.10.6 Noise

Installation of the fence could result in increased noise levels associated with helicopter use for material staging, which will be limited to no more than two days outside of petrel nesting season. Noise associated

with the installation of the fence may be noticeable in certain locations and would contribute at a minor level to existing noise levels from traffic, other construction, Park visitors, and wind. Helicopter use during construction would result in a minor, short-term, adverse effect, and therefore would not contribute noticeably to cumulative noise impacts in the project area.

3.10.7 Transportation and Traffic

Implementation of the Proposed Action could adversely affect traffic, due to increased numbers of vehicles and traffic levels. However, adverse impacts resulting from increased traffic along the Park Road during construction and traffic delays associated the placement of traffic-calming devices would be minor, and would not contribute noticeably to cumulative congestion. This impact would be minor, adverse, and long-term.

3.10.8 Air Quality

Minor, adverse, and short-term impacts to air quality would occur with implementation of the Proposed Action. Impacts would be associated primarily with emissions from crew and delivery trucks and from the use of helicopters. These vehicles would also generate fugitive dust. Adverse impacts on air quality would be temporary, intermittent, and minor, and would not contribute considerably to cumulative impacts on air quality in the project area.

3.10.9 Geology, Soils, and Topography

No impacts to geology or topography would occur with implementation of the Proposed Action. Minimal soil disturbance would be required for installation of the conservation fence and the nēnē pen. Project impacts would be negligible, adverse, and short-term, and would not contribute noticeably to cumulative impacts on geology, soils, and topography.

Table 3.10-1. Potential Cumulative Impacts from Implementation of the Proposed Action.

Impacts	Land Use and Existing Activities	Cultural, Historic and Archeological Resources	Biological Resources	Visual and View Planes	Visitor Use and Experience	Noise	Transportation and Traffic	Air Quality	Geology, Soils, and Topography
Baseline Impacts From Past, Present and Reasonably Foreseeable Future Actions Including the Proposed ATST Project	Minor Adverse Long-term	Major Adverse Long-term	Major Adverse Long-term	Major Adverse Long-term	Major Adverse Long-term	Minor Adverse Long-term	Minor Adverse Long-term	Minor Adverse Long-term	Minor Adverse Long-term
Anticipated Impacts of the Conservation Measures	Minor Adverse Long-term	Minor Adverse and Moderate Beneficial Long-term	Negligible Adverse Short-term	Minor Adverse and Moderate Short- and Long-term	Minor Adverse and Moderate Short- and Long-term	Negligible to Minor Adverse Short-term	Minor Adverse Short- and Long-term	Minor Adverse Short-term	Negligible to Minor Adverse Short-term
Cumulative Impacts From Past, Present and Reasonably Foreseeable Future Actions Including the Conservation Measures	Minor Adverse Long-term	Moderate Adverse Long-term	Major* Adverse Long-term	Moderate Adverse Long-term	Moderate Adverse Long-term	Minor Adverse Long-term	Minor Adverse Long-term	Minor Adverse Short-term	Negligible to Minor Adverse Short-term

Note:
* Major cumulative impact with negligible, if any, adverse contribution from the proposed conservation measures.

1

4.0 OTHER REQUIRED ANALYSES

4.1 Introduction

In addition to the analyses discussed in Section 2.0, Affected Environment, and Section 3.0, Environmental Consequences, NEPA requires additional evaluation of the project's impacts with regard the relationship between local short-term uses of the environment and long-term productivity, irreversible or irretrievable commitment of resources, and unavoidable adverse impacts.

4.2 Relationship Between Local Short-Term Uses of the Environment and Long-Term Productivity

The impacts associated with the proposed conservation measures would be largely short-term and are intended to provide a long-term benefit, or productivity, to the environment, and primarily to the Hawaiian petrel. Short-term impacts would occur associated with helicopter noise and fence installation during the construction of the conservation fencing (Measure 1). Similarly, noise associated with the installation of traffic-calming devices (Measure 5) would occur for only a few days. Longer-lasting short-term impacts would occur as most construction activities associated with building the ATST facility would continue year-round (Measure 9) instead of being restricted during the petrel incubation period. Measure 9 will reduce the overall construction period to 6-7 years (one year less than analyzed in the ATST EIS [NSF, 2009]), which is expected to benefit the petrels in the long run even though impacts to the soundscape, viewshed, cultural practices, biological resources, and traffic on Haleakalā would occur throughout the year.

The analyses performed for this Environmental Assessment indicate that all of these measures will enhance the productivity of the Hawaiian petrel and Hawaiian goose over the long term—e.g., by protecting the petrel nests from ungulates and predators (Measure 1), and by reducing nēnē mortality along the Park Road (Measure 5) and constructing the proposed nēnē pen (Measure 7). The actual effectiveness of these measures in enhancing productivity of these resources will be monitored over the course of ATST construction.

4.3 Irreversible and Irretrievable Commitments of Resources

There is a NEPA requirement for analysis of the extent to which the proposed project's impacts would commit non-renewable resources to uses that would be irreversible or irretrievable to future generations. A commitment would be irreversible when impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of resources that are neither renewable nor recoverable for future use.

Fuel would be used by the delivery helicopter and construction vehicles and by staff vehicles during fence maintenance and petrel monitoring. Implementation of Proposed conservation measures would otherwise neither irreversibly nor irretrievably commit such resources.

4.4 Unavoidable Adverse Impacts

There are no major adverse impacts associated with the proposed conservation measures that could not be mitigated to a reduced level. The original intent of the measures is in fact to provide beneficial effects to biological resources, and while several short-term adverse impacts were identified (including noise caused by construction of the conservation fencing and by extending ATST construction year-round), these impacts would not be permanent and would be intermittent. Furthermore, the higher noise levels associated with the helicopter delivery would be phased during a period when the Hawaiian petrel would not be present, thereby eliminating the biological noise impact during that period. Other environmental impacts are either negligible or beneficial.

4.5 Agency Consultation and Public Involvement

Consultation activities and public input gathered during the ATST project were considered in the development of the proposed conservation measures and during this EA planning process. Those activities that occurred before and during the ATST EIS planning process are summarized in the ATST EIS (NSF, 2009). Since the final EIS was completed, however, continued consultation efforts with the USFWS, NPS, the State (DLNR), and IfA resulted in the development of a draft HCP pursuant to H.R.S 195D. The HCP development and approval process provides for a thorough review and assessment of the levels of endangered species take, incorporates appropriate minimization and avoidance measures and an assessment of the cumulative impacts on species and habitats, and requires that any permitted incidental take be fully mitigated to [provide a net benefit to the affected species. An HCP and ITL will not be issued unless the HCP and proposed take meets the issuance criteria in H.R.S. 195D-4 and 195D-21. The draft HCP is currently out for a 60-day public comment period. In addition, the State will hold a public hearing on the draft HCP on Monday, August 23, 2010. A final HCP will be developed in response to public comments received on the draft HCP. The final HCP will then go before the ESRC and, if approved to go forward, will be subject to final approval by the Board of DLNR.

A Biological Opinion from USFWS is also being prepared pursuant to the federal ESA Section 7. The conservation measures analyzed in this EA were developed during preparation of the draft Biological Opinion and draft HCP as a response to offset potential impacts to the Hawaiian petrel and Hawaiian goose.

Pursuant to NEPA and Section 106 of the National Historic Preservation Act, NSF has initiated consultation with the State Historic Preservation Office regarding the proposed measures and to solicit feedback on potential impacts. In addition, NSF has raised the Proposed Action through informal meetings with members of the public and also with the ATST Native Hawaiian Working Group. Formal meetings with both the public and the ATST Native Hawaiian Working Group will allow additional opportunities to provide input regarding potential effects of the proposed conservation measures. The first meeting will take place on August 30th, which will also serve as the public hearing for the Draft EA under NEPA. The second meeting will take place on September 1st during the next meeting of the ATST Native Hawaiian Working Group.

Letters with copies of the Draft EA have been distributed to affected and interested agencies and stakeholders, based on the ATST planning process, to notify land owners, land users, and interested parties of the proposed conservation measures and to solicit feedback on potential impacts.

Pursuant to NEPA and H.R.S. 343, a 30-day public review of the draft EA will be initiated with a public notice in the Office of Environmental Quality Control Environmental Bulletin on **August 23, 2010**. A public meeting is scheduled for **August 30, 2010**.

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APPENDIX A

Arthropod Habitat Reconnaissance and Assessment at a Proposed Conservation Area on Haleakalā, Maui, Hawai`i

ARTHROPOD HABITAT RECONNAISSANCE AND ASSESSMENT AT A PROPOSED CONSERVATION AREA ON HALEAKALĀ MAUI, HAWAI`I

In support of the Advanced Technology Solar Telescope Endangered Species Mitigation Process

APRIL 2010

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ARTHROPOD HABITAT RECONNAISSANCE AND ASSESSMENT AT A PROPOSED CONSERVATION AREA ON HALEAKALĀ MAUI, HAWAI`I

April 2010

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II. EXECUTIVE SUMMARY

The National Science Foundation (NSF) has authorized the development of the Advanced Technology Solar Telescope (ATST) within the 18-acre University of Hawai`i Institute for Astronomy High Altitude Observatories (HO) site. The ATST represents a collaboration of 22 institutions, reflecting a broad segment of the solar physics community. The ATST project will be the largest and most capable solar telescope in the world. It will be an indispensable tool for exploring and understanding physical processes on the Sun that ultimately affect Earth. The ATST Project will be contained within a 0.74 acre site footprint in the HO site. An Environmental Impact Statement was completed for the ATST project (NSF 2009), and the NSF issued a Record of Decision in December of 2009.

Although an Informal Consultation document from the U.S. Fish and Wildlife (USFWS) stated that the ATST is not likely to adversely affect any endangered species, NSF has adopted a conservative position with respect to protection of listed species during the construction and operation of the ATST. In continuing consultations with the USFWS, National Park Service (NPS), and the University of Hawai`i Institute for Astronomy (IfA) a Biological Opinion/Habitat Conservation Plan (HCP) is being developed that identifies conservation measures developed to avoid or minimize impact from the ATST project. An Environmental Assessment is being prepared to assess environmental impacts on the conservation measures not covered by the ATST EIS (NSF 2009).

A proposed 328 ac (133 ha) conservation area adjoining and immediately west of Haleakalā National Park (HALE) has been identified as part of the conservation measures. Conservation fencing has been proposed to be erected around the conservation area to exclude ungulates. Information about arthropods that may occur along the fence line and within the conservation area is necessary to understand potential impacts, if any, due to the proposed conservation measures.

This arthropod habitat reconnaissance and assessment was conducted in March 2010. The goal of this study was to investigate the arthropod fauna and their habitats that occur within the conservation area, and to identify Hawaiian native arthropod species or habitats, if any, that could be adversely affected by the proposed conservation fence. The results of this study indicate there are no special concerns related to invertebrate resources in the conservation area. The habitat within the conservation area is generally similar to that found within the HO, and the arthropod fauna that occurs there are likely to be very similar to that found within the HO.

III. INTRODUCTION

The Haleakalā volcano on the island of Maui is one of the highest mountains in Hawai`i, reaching an elevation of 3,055-m (10,023-ft) at its summit on Pu`u `Ula`ula. Near the summit is a volcanic cone known as Kolekole with some of the best astronomy viewing in the world. In 1961, an Executive Order of Hawai`i Governor Quinn established the Haleakalā High Altitude Observatories (HO) Site, sometimes referred to as "Science City". The site is managed by the University of Hawai`i.

The highest elevations of Haleakalā were once considered largely lifeless with only sparse vegetation, but biologists have discovered a diverse fauna of unique resident insects and spiders (Medeiros and Loope 1994). These arthropods inhabit unusual natural habitats on the bare lava flows and cinder cones. Feeding primarily on windblown organic material, they form an aeolian ecosystem.

The term aeolian has generally been used to describe ecosystems on snow, ice, meltwater, and barren rock, but in Hawai`i it has been used to characterize non-weathered lava substrates, mostly but not exclusively found at high elevations (Howarth 1987, Medeiros and Loope 1994).

On Haleakalā, aeolian and sub-aeolian ecosystems begin at about 2,300-m (7,546-ft) elevation in the cinder-dominated habitat inside the crater, and at around 2,600-m (8,530-ft) on the older western slope of the volcano, and extend up to the summit at 3,055-m (10,023-ft). Climate conditions are extreme, with widely varying diurnal temperatures and little precipitation. Solar radiation can be intense, and the conditions often affect visitors not accustomed to high elevations.

The Haleakalā aeolian ecosystem is extremely xeric, caused by relatively low precipitation, porous lava substrates that retain negligible amounts of moisture, little plant cover, and high solar radiation. The dark, heat-absorbing cinder provides only slight protection from the extreme temperatures. Thermal regulation and moisture conservation are critical adaptations of arthropods that occur in this unusual habitat.

Vegetation covers less than 5% of the open ground, and food is apparently scarce. Wind-assisted diurnal movement and seasonal migrations of insects from the surrounding lowlands are the primary source of food for the resident scavenger and predator arthropods in this remarkable ecosystem. Aeolian ecosystems are not unique to Haleakalā in Hawai`i. Similar ecosystems also occur on Mauna Kea and Mauna Loa on the Island of Hawai`i (Howarth and Montgomery 1980). Each volcano has its own unique aeolian fauna that exploit the windblown organic material.

An inventory and assessment of the arthropod fauna at the HO site was conducted in 2003 as part of the Long Range Development Plan (LRDP) for the Haleakalā High Altitude Observatories. This inventory and assessment was updated in December 2005 to provide a more detailed description of the arthropod fauna at the two proposed ATST sites, and identify Hawaiian native arthropod species or habitats, if any, that could be impacted by construction or operation of the ATST. In an effort to be complete, supplemental sampling was conducted in 2007 to provide a seasonal component and additional nighttime sampling not included in the previous two inventories. A subsequent and more detailed study was conducted in June, 2009 to begin establishing a baseline characterization of invertebrates at HO as part of a programmatic monitoring effort to avoid, minimize or mitigate potential impacts, if any, due to construction and operation of the ATST.

Sampling was conducted over 5 days March 23-28, 2010. The intended purpose of this study is to gather reliable scientific information about the current status of arthropods and other invertebrate species and their habitats within the proposed 328 ac (133 ha) conservation area adjacent to HALE that would be used to assess the potential impacts, if any, due to conservation measures proposed the ATST project.

This study is consistent with the Long Range Development Plan for the Haleakalā High Altitude Observatories Site (HO) by promoting the good stewardship of the natural resources located there.

IV. METHODS

Description of study area

Proposed conservation measures associated with the ATST project would occur along the 10.6 mile (17.0 km) HALE roadway accessing HO, within the HO property, and on approximately 328 ac (133 ha) of unencumbered Hawaii State Conservation lands surrounding the HO property and the adjacent Federal Aviation Administration and the Department of Energy facilities. This study was conducted within the 328 ac (133 ha) conservation area (Figure 1).

Sampling Procedures

Care was taken to avoid archeological sites. These sites have cultural and historical significance and precautions were made to prevent their disturbance. Habitat was accessed with a minimum of disturbance and care was also taken to prevent creation of new trails or evidence of foot traffic.

Visual Observations and Habitat Collecting Under Rocks and in Leaf Litter

Time was spent sampling under rocks, in leaf litter, and on foliage to locate and collect arthropods within the 328 ac conservation area. Sampling sites were selected that provided the greatest likelihood of harboring native arthropods. Hand picking, while sorting through leaf litter and bunch grasses, and searching beneath stones was the most effective sampling for litter and soil associated forms.

Collecting on Foliage

Foliage of various common plant species was sampled by beating sheet. A one-meter square beating sheet or insect net was placed under the foliage being sampled and the branch hit sharply three times using a small plastic pipe. After the initial collection the foliage was beat again to dislodge persistent individuals. Care was taken to avoid sensitive plants and to leave all vegetation intact.

Nets

Aerial nets and sweep nets were used as necessary to capture flying insects and arthropods that occur on grasses.

Collections and Identification

No specimens were collected. All identifications were made in the field. The principal investigator has extensive experience identifying insects from high elevations on Haleakalā and is familiar with the species that are likely to be found within the conservation area.

Schedule/Start and End dates

Sampling was conducted over five days in March 2010, starting on March 23, 2010 and ending on March 28, 2010. Sampling typically occurred between 9:00 am and 3:00 pm.

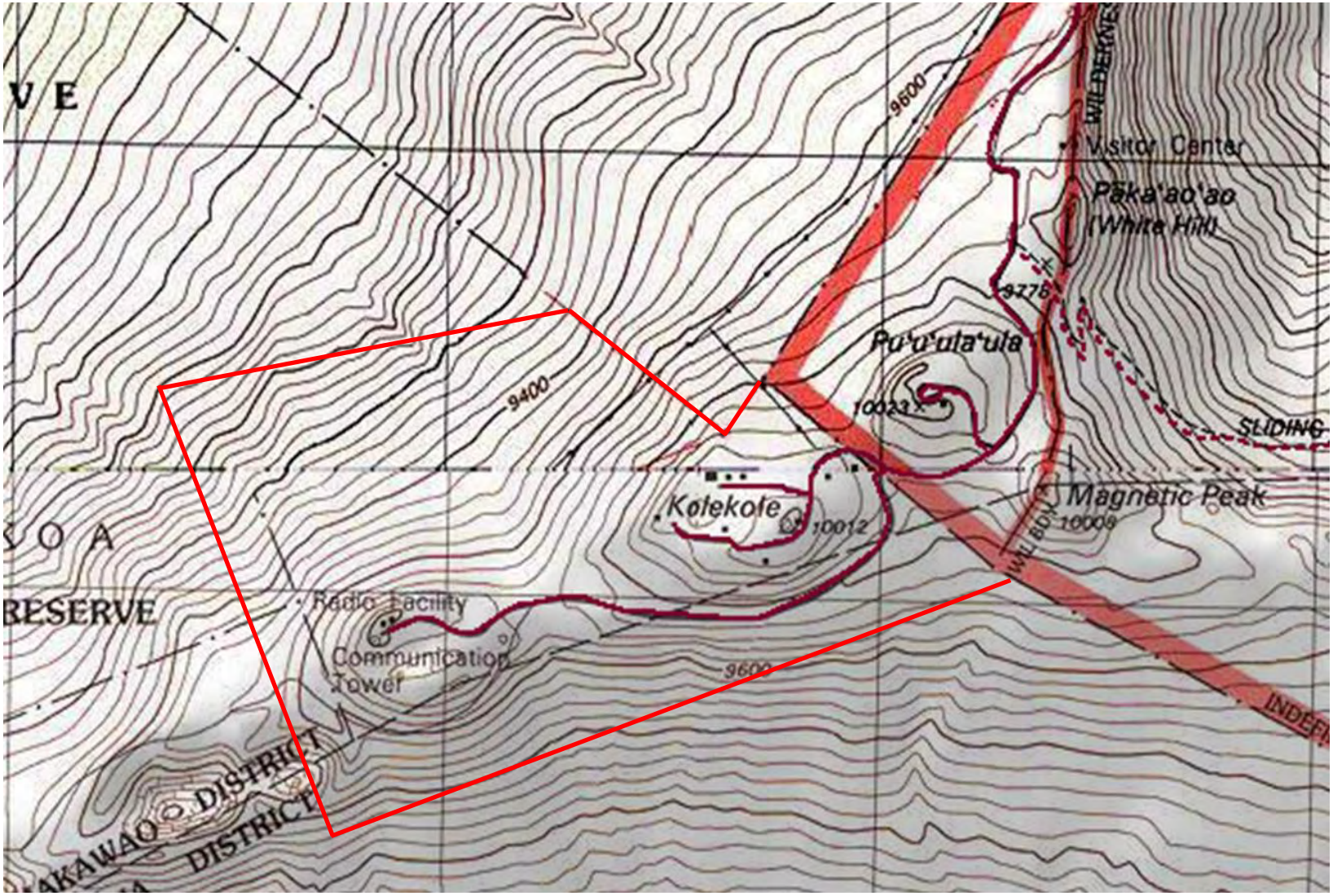

Figure 1. **Approximate boundary of the conservation area reconnaissance study.**

V. LITERATURE SUMMARY

The summit of Haleakalā has been sampled by several entomologists. Some of the first specimens known from there were collected by the Reverend Thomas Blackburn over 100 years ago. Near the beginning of the twentieth century, R.C.L. Perkins sampled the upper reaches of Haleakalā. During the first half of the century other entomologists who sampled Haleakalā included O.H. Swezey who recorded host plant information for many insect species, E.C. Zimmerman who collected information for the Insects of Hawai‘i series and studied the flightless lacewings of Haleakalā, and D.E. Hardy who worked extensively with the Diptera (flies) found there.

Entomological studies continued in the 1960’s when John Beardsley (1966) investigated species of Nysius that were disrupting operation of the Haleakalā Observatory. Beardsley collected fifty-one insect species from 36 families in nine orders from malaise traps on Pu`u Kolekole in that study.

In 1980, John Beardsley completed his basic inventory of the insects of the Haleakalā National Park crater district for the Cooperative National Park Resources Studies Unit of the University of Hawai‘i at Manoa. This was the first published report of a thorough inventory of the upper portion of Haleakalā listing the species collected. Three hundred and eighty-nine species of insects representing ninety families from thirteen orders were collected from the Crater District in this study. About 60% of the species were believed to be endemic to Hawai‘i, and 83 species (21%) were determined to be endemic to Haleakalā.

An inventory of arthropods of the west slope shrubland and alpine ecosystems of HALE was conducted in 2007 (Krushelnycky et al.). The investigators collected a total of 60,146 individual arthropods in the course of the inventory. Of these, 11,086 (18.4%) were mites (Acari), mealybugs (Hemiptera: Pseudococcidae), or parasitic wasps (Hymenoptera), and were not further identified. The remaining arthropods represented a total of 257 taxa in 17 orders.

The HO property adjacent to HALE has been studied several times. The first review of the arthropod fauna at the HO site occurred in 1994 (Medeiros and Loope 1994). The study was limited to the proposed Air Force Advanced Electro-Optical System (AEOS) Construction Site. The number of species collected is not listed in that report. The report concluded “The study site is basically a typical but somewhat depauperate example of the Haleakalā aeolian zone.”

An inventory of arthropods at the HO site was conducted in 2003 (Pacific Analytics 2003). In that study, fifty-eight arthropod species were identified from the facility, twenty-nine that are indigenous to Hawai`i. Finally, an ATST site-specific update to that study was conducted in 2005 (Pacific Analytics 2005) and a supplemental sampling specifically for the purpose of night sampling was conducted in March 2007 (Pacific Analytics 2007). During June 2009, additional sampling was conducted at HO to further supplement the first three collections, including nighttime samples. Seventy-one species of invertebrates were collected during that study.

VI. RESULTS AND DISCUSSION

Observations

The conservation area has had minimal disturbance outside the developed areas (i.e., observatory footprints within the HO, building and antenna footprints of the FFA and DOE facilities, and the building and antenna footprints of the broadcast and communication facilities adjacent to the HO). Vegetation in this area is largely undisturbed native species consisting primarily of *pūkiawe* (Leptecophylla tameiameiae), *naʻenaʻe* (Dubautia menziesii), and mountain pili (Trisetum glomeratum). The terrain is steep and covered with volcanic ejecta consisting of lava, cinder, and ash.

Vegetation northwest of the broadcast facility consists of *pūkiawe* and mountain pili.

Insects were most abundant on the naʻenaʻe where several species of *Nysius* were observed. These were the same species observed within the HO in previous studies. One species of plant bug (family Miridae, *Orthotylus* sp.) was also observed on naʻenaʻe.

The insect fauna on *pūkiawe* was noticeably less abundant than that which occurred at the HO. Many individuals of *Hylaeus* bee, endemic to Hawai`i were observed on *pūkiawe* at the HO but none were seen in the larger conservation area. Also absent were honey bees and parasitic wasps that commonly occur at the HO.

Lycosid spiders (*Lycosa hawaiiensis*) were common. Several juvenile spiders were observed during daytime sampling. *Lycosa hawaiiensis* is the predominant predator of the arthropod fauna in the crater district of Haleakalā (Medeiros and Loope 1994). This spider is also known from the islands of Oahu and Hawai`i.

Haleakalā flightless moths (*Thyrocopa apatela*) were not observed, but their absence may be attributed to the season of sampling. One dead specimen of small (< 4-mm) carabid beetle was

found under a rock, but was too decomposed to make positive identification. Two genera of small carabid beetles are known from the summit area, the endemic genus, *Mecyclothorax* and the non-indigenous *Trechus*. Neither genus is abundant at the HO site but they can be detected with sufficient searching under rocks and in leaf litter.

In general, the arthropod fauna in the larger conservation area was less diverse than that found in similar habitat at the HO, however, with sufficient sampling during various seasons, many more species may be detected. The results of this arthropod survey indicate there are no special concerns or legal constraints related to invertebrate resources in the project areas. No invertebrate species listed as endangered, threatened, or that are currently proposed for listing under either federal or State of Hawai'i endangered species statutes were found at the project site (DLNR 1997, Federal Register 1999, 2005).

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